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Extending Two-Dimensional Knowledge Management System Theory with Organizational Activity Systems' Workflow Dynamics

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Dana Ladd

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Walden University
2016

Abstract

Extending Two-Dimensional Knowledge Management System Theory with Organizational Activity Systems' Workflow Dynamics

by

Dana F. Ladd

MS, Eastern Nazarene College, 2000

BS, Chaminade University, 1985

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Applied Management and Decision Sciences

Walden University

May 2016

Abstract

Between 2005 and 2010 and across 48 countries, including the United States, an increasing positive correlation emerged between national intellectual capital and gross domestic product per capita. The problem remains organizations operating with increasingly complex knowledge networks often lose intellectual capital resulting from ineffective knowledge management practices. The purpose of this study was to provide management opportunities to reduce intellectual capital loss. The first research question addressed how an enhanced intelligent, complex, and adaptive system (ICAS) model could clarify management's understanding of organizational knowledge transfer. The second research question addressed how interdisciplinary theory could become more meaningfully infused to enhance management practices of the organization's knowledge ecosystem. The nature of this study was phenomenological to gain deeper understanding of individual experiences related to knowledge flow phenomena. Data were collected from a single historical research dataset containing 11 subject interviews and analyzed using Moustakas' heuristic framework. Original interviews were collected in 2012 during research within a military unit, included in this study based on theme alignment. Organizational, knowledge management, emergent systems, and cognition theories were synthesized to enhance understandings of emergent ICAS forces. Individuals create unique ICAS flow emergent force dynamics in relation to micro- and macro-meso sensemaking and sensegiving. Findings indicated individual knowledge work significantly shapes emergent ICAS flow dynamics. Collectively enhancing knowledge stewardship over time could foster positive social change by improving national welfare.

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Dedication

This work is dedicated preeminently to El Shaddai, my consistent source of insight and inspiration.

Acknowledgments

Firstly, I appreciate the consistent and tireless support of my wife. Without her persistent encouragement, this work would have never found completion. I also appreciate the support of my adult children, Melissa, Joshua, and James, during my course of study. I thank each of you for always believing I would complete this journey, even when I doubted myself.

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Lastly, certainly not least, I wish to acknowledge the many faculty, colleagues, and friends that have provided encouragement and timely feedback spanning my nine year odyssey. I would like to acknowledge specifically the significant contributions and continuous encouragement from my most recent chair, Dr. Anthony Lolas. His unique insights provided constant inspiration for new perspectives. Dr. David Gould provided excellent support and feedback, as did Dr. David Banner. Dr. Gould and Dr. Banner provided precision feedback for both final layout and final production quality.

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Chapter 1: Introduction to the Study

Looking forward to the twenty-first century, Drucker (1988) postulated that our society would become, in essence, a knowledge society. As envisioned years ago, managing organizational knowledge is fundamental to an organization’s sustainability in the current knowledge economy (Argote, 2012; Zack, 2013). Thus, becoming a knowledge-based organization remains a strategic imperative for many organizations (Zack, 2013).

A contemporary organization that successfully evolves into a sustainable knowledge-based organization could be considered the quintessential learning organization (Senge, 1994). Over the past decade, knowledge has become more clearly defined as an essential building block for developing an organization’s competitiveness within increasingly complex and shifting markets (Asheim, 2012; Lopez-Nicholas & Merono-Cerdan, 2011). As a result, organizations world-wide in an increasing number are attempting to generate knowledge-based intellectual capital (IC) to improve their annual return on investment (ROI) (Marcin, 2013). IC is dependent upon effective organizational knowledge management practices (Asheim, 2012; Marcin, 2013).

Background of the Study

Organizational pursuit of knowledge is often for the sole purpose of capitalizing upon knowledge expressly as a form of wealth, creating intellectual capital to be leveraged within the firm (Marcin, 2013). Yet, organizational understanding of knowledge in its true essence remains an enigma, as knowledge exists neither in a state or form, nor is knowledge bound in some creative continuum. Interpreting research and industry perspectives of knowledge management over the past five decades could likewise be viewed as “changing neither wholly continuously and cumulatively nor by comprehensive replacements of one monolithic paradigm by another” (Sayer, 1992, p. 84).

Theory aligns conceptualization to ordered observations and data but does not explicitly order those observations and data (Sayer, 1992). Likewise, in the knowledge management (KM) discipline, there appears no distinct revolutionary and all-ordering theory. Conceptualizing KM has progressed with significant shifts in research focus regarding knowledge creation and subsequent knowledge system conceptualization (Dalkir & Liebowitz, 2011). Contemporary knowledge conceptualizations and managing knowledge shift away from knowledge classification schemas toward macrocognition knowledge within an emergence dynamic (Kozlowski & Chao, 2012).

Several significant transitions in defining and understanding knowledge have been correlated with KM evolutions (Dalkir & Liebowitz, 2011). Each shift had foundation in some form of information technology emphasis. Prior to the information age, a common lament was that organizational leadership simply did not know what they did not know. As a result, there was no meaningful KM capability within the firm. With the advent of the information age, the first KM evolution focused on information acquiring, classifying, categorizing, coding, and storing by establishing retrieval and storage information systems (Dalkir & Liebowitz, 2011).

During this period, organizational decision-making was overloaded by information. Volumes of information were produced beyond any one individual’s capacity to assimilate and meaningfully organize (Eppler & Mengis, 2004; O'Reilly, 1980). This was the first knowledge capture generation of the knowledge creating company (Dalkir & Liebowitz, 2011). The second generation or KM evolution aligned KM focus and practice with people, the primary knowledge asset.

During the second KM generation, the emphasis shifted to the human factor, social structures, and group cultures within the emergent virtual organizations. This led to the adopting information technology enabling tools such as communities of practice (Dalkir & Liebowitz, 2011). A third and current generation in KM practice moves focus towards a shared context, with an emphasis on social networks and connections to create intellectual capital (Dalkir & Liebowitz, 2011). Contemporary research focuses on organizational network dynamics as evolving social networks within organizationally structured networks (Ahuja, Soda, & Zaheer, 2012).

Shifts in social science research have corresponded to shifts in KM research focus. During the initial information systems and technologies, management theory was viewed as chaotic (Narayanan & Nath, 1999). During the early 1960s, organizations witnessed the open systems model as an integrating framework (Narayanan & Nath, 1999). Management theory received contributions from many disciplines, yet without unification between disciplines (van Baalen & Karsten, 2012). During this same period IBM marketed open systems architecture for information technology systems.

During the 1970s and 1980s, a research shift focused on integration frameworks for management theory, emphasizing a strategic approach that linked the organization with people and environment. The organization during the second generation KM apex focused on defining dynamic equilibrium, such as process efficiency and operational effectiveness, while maintaining balance with operational integrity in an organization's evolving structures (Eisenhardt & Brown, 1999). Management theory research at this time correlated very closely to an equivalent shift in KM. Second generation KM research shifted emphasis to organizational culture as well as enabling information technologies (Dalkir & Liebowitz, 2011).

During the mid-1990s, a third transition in management research shifted focus towards systems models. A significant influence in this thought stream was the management systems thinking discipline, called the Fifth Discipline (Senge, 1994). Leveraging key concepts from systems thinking, management theories shifted towards a contingency model representing the organization as a system.

During this period, organizational dynamics framed by systems theory included five interwoven and dynamically linked cultural, social, informational, functional, and political subsystems (Narayanan & Nath, 1999). A key shift in conceptualizing knowledge resulted from changes in both management and KM theory during the mid-1990s through the start of the twenty-first century. Transitioning into the current century, interdisciplinary research further blended organization, management, and organizational knowledge theory, specifically changing focus to shared understanding (Snowden, 2002).

The third age of KM altered knowledge conceptualization and understanding KM systems (KMS) by separating context and narrative as autonomous knowledge creation elements (Snowden, 2002). Separating context and narrative elements remains viable, providing insights into organizational knowledge conceptualized as both flow and a thing requiring multiple management perspectives (Snowden, 2002).

The three transitions in KM research focus correlate to equivalent theoretical research shifts in organizational management (Narayanan & Nath, 1999; Snowden, 2002). These transitions appeared to coincide with shifts in information technologies and other research disciplines beyond management and information systems. Within the third KMS generation, complexity theory began to dominate research (Bennet & Bennet, 2004; Linger et al., 2007; Snowden, 2002; Yang & Shan, 2008).

It was not until an organization was viewed as an intelligent, complex, and adaptive system (ICAS) that knowledge management models and methods focused on knowledge transfer within emergent organizational characteristics (Bennet & Bennet, 2004). Through the ICAS perspective the organization is viewed as organic. A primary outcome derived from emergent environmental and self-organizing force dynamics within the ICAS organization is organizational intelligence (Bennet & Bennet, 2004).

During this same period, management research shifted to interdisciplinary research to better understand emergent organizational dynamics (Bennet & Bennet, 2004; Yang & Shan, 2008). However, organizational leadership was unprepared to address the consequence when viewing the organization as an ICAS (Bennet & Bennet, 2004; Meyer & Davis, 2003; Yang & Shan, 2008).

As the rate of change in the environment around organizations continued to accelerate, so did organizational complexity, requiring new management paradigms (Meyer & Davis, 2003). However, organic complexity in context to organizational change should be qualified with new insights, specifically re-conceptualizing ICAS dynamics as metaphors versus objects in a flow diagram (Boxenbaum & Rouleau, 2011). Managing complexity thus should remain in context to this accelerating rate of change while including new ICAS conceptualizations (Jiao et al., 2013; Mangia et al., 2013).

A significant historical perspective remains relevant. A dynamic relationship persists between concept and the concept use by people in the course of business (Sayer, 1992). For theory to have success in the practical world, the network of sense-relations has to result in expectations that make sense and relate to the "actual structure of the world" (Sayer, 1992, p. 58). Only when the concept finds relevance in the individual thought framework does that concept have practical value. This construct holds true for increasingly larger and more complex spheres of socially-networked relationships (Ahuja et al., 2012; Amani, 2010; Cavaliere & Lombardi, 2013).

Consequently, leadership in rapidly changing business structures should understand organizational capabilities as a dynamic and adaptive nature in context to and in relationship with all other organizations in any given market space, and to a larger extent, the global market ecosystem (Jiao et al., 2013). The resultant shift in focus within business environments towards dynamic capabilities vs. operational capabilities emphasizes the ICAS organization's organic capacity to adapt and change to emerging environmental pressures (Jiao et al., 2013).

While maintaining this organizational capabilities macrolevel view, organizations should also understand microlevel organic forces surrounding an organization's work group activity systems (Kozlowski & Chao, 2012). Microlevel activity systems change concurrently and rapidly within macrolevel organizational transformations (Ravishankar & Pan, 2012). Within this organic knowledge ecosystem, complexity theory remains relevant to organizational leadership. And leadership should become willing to embrace organic complexity to more effectively manage their organization's knowledge (Marcin, 2013; Yang & Shan, 2008).

At the turn of the century, organizations were forced to operate within a framework of accelerating change (Brown & Eisenhardt, 1999). As a result, discontinuous change began to challenge traditional change management approaches within "highly competitive, high-velocity oligopolies in which many [at that time] contemporary firms [were required to] compete" (Brown & Eisenhardt, 1999. p. 3). Yet, organizational change remained continuous in relation to incremental process and technology improvements.

Incremental organizational change remains a common and often necessary practice (Ravishankar & Pan, 2012). However, discontinuous change has become more prevalent with emerging technologies and emergent organizational structures that challenge traditional change management approaches (Bharadwaj, Sawy, Pavlou, & Venkatraman, 2013; Lee, Park, & Kim, 2014).

Organic organizations were viewed as adaptive systems surrounded by a complex convergence of three powerful general evolutionary forces that included biology, information, and business (Meyer & Davis, 2003). Meyer and Davis (2003) envisioned a future by 2013 that would link molecular and nano-technologies with self-combining information systems, further coupled to adaptively recombining organizational forms.

Organic and adaptive organizational systems viewed as inter- and intra-organizational activity systems often experienced continuous enabling technologies infusion within formal and informal organizational structures (Carter, & Zimud, 2005).

Knowledge-based organic organizations should embrace organic structures to better facilitate knowledge emergence and transfer (Kozlowski & Chao, 2012; Ramezan, 2011). New and informal organizational structures combined with formal structures to address the need for organizations to become more responsive and adaptive to market and environmental forces (Ahuja et al., 2012; Boisot & Sanchez, 2010)). Yet, the challenge remains to manage the truly organic learning organization (Argote, 2012).

At the biology, information, and business convergence point, the underlying management science should be premised on new management memes (Meyer & Davis, 2003). Within each meme, management should continue focusing on process and resource management, while concurrently expanding focus to practices more organic in nature. Specifically, new management memes should include practices fostering ICAS self-organization, selective recombination, and evolving adaptation based on organizational sensing (Bennet & Bennet, 2004). The combinations of formal and informal organizational structures have morphed into a complex of formal and informal networks, i.e., self-combining organizational elements (Dulipovici & Robey, 2012; Soda & Zaheer, 2012).

As a result, contemporary organizations continue to operate within a framework of ever accelerating change, while concurrently organizational structures often inhibit the developing an effective organizational knowledge ecosystem (Burford et al., 2012;

Linger, Hasan, & Burstein, 2007). Self-organizing, adaptive organizations require new communication forms as well as flexible organizational elements (De Toni, Biotto, & Battistella, 2012; Madden, Duchon, Madden, & Plowman, 2012).

A significant and flexible organizational element grants the work team with entrepreneurially innovative capability (Ahlstrom & Bruton, 2010; Ashoori & Burns, 2013; Kozlowski & Chao, 2012). Yet, breakdown in team member coordination activities often impedes collaboration within these complex sociotechnical subsystems (Ashoori & Burns, 2013). As a result, inter- and intra-organizational knowledge transfer becomes increasingly complex cognitive activities (Briggs & Reinig, 2010).

Conversely, increasingly complex sociotechnical subsystems create opportunities for knowledge to leak or spillover beyond desired organizational boundaries. In such cases, IC loss can significantly and negatively impact a firm’s value. However, for knowledge-based organizations, knowledge spillovers represent innovation opportunities, while creating additional challenges in managing knowledge-based transaction costs (Phene & Tallman, 2014).

Although knowledge spillovers were understood in context to localized work teams, understanding knowledge exchange mechanisms that related organizational dynamics spanning nearby firms remained significantly less understood (Ibrahim & Fallah, 2005). Spillovers were understood as transaction costs that extended beyond the original transaction while including reputation-impairing knowledge spillovers within outsourced relationships (Mayer, 2006). Knowledge spillovers in team-based learning activities remain conceptually complex and not clearly understood when viewing emergent knowledge networks (Nanclares, Rienties, & Bossche, 2012).

As knowledge networks increase within a complex network comprising various interorganizational elements, such as during firm mergers and acquisitions, additional emergent organizational dynamics create new knowledge transfer (KT) paradoxes (Reus, 2012). Historical paradoxes included understanding knowledge in terms of tacit and explicit, flow and object, and controlling knowledge flows in time and space (Chae, Paradice, Koch, & Huy, 2005). Contemporary KT paradoxes include understanding emergent organizational social networking dynamics (Ahuja, Soda, & Zaheer, 2012).

While understanding knowledge networks has improved since 2005, paradoxes in understanding knowledge continue to diminish KT effectiveness within organizational KM initiatives. Management remains challenged to maximize positive knowledge spillovers without concurrently increasing undesired knowledge spillover risks (Nanclares et al., 2012; Phene & Tallman, 2014; Reus, 2012). Understanding desired knowledge spillovers should emphasize organizational learning to potentially mitigate negative knowledge spillovers, premised upon KT effectiveness (Nanclares et al., 2012; Phene & Tallman, 2014).

KT effectiveness was viewed as an organizational capability that required a deeper understanding of any supporting information technology spiral-platform development life cycle (Younghong, Zigpang, & Kaijin, 2005). Additionally, enhanced KT capabilities were directly linked to enhanced KM practices within spiral-platform development life cycles (Van de Ven, 2005). As Van de Ven (2005) observed, “advances in information technology and the growth of a knowledge-based service economy [were] transforming the basis of technological innovation and corporate competition . . . requiring a broader, institutional, and political view of information technology and knowledge management" (p. 365).

A decade later, implementing information technologies to underpin organizational intelligence emergence still requires deeper understanding regarding organizational learning (Argote, 2012; Weichhart, 2013). Managing organizational learning within increasingly complex interorganizational dynamics requires organic organizational structures and adaptive management practices, as well as flexible underpinning technologies (Huggins, Johnston, & Thompson, 2012; Lyles, 2014). However, there remains a significant understanding deficit regarding ICAS emergence that continues to inhibit management's ability to consistently infuse an organization's culture over time with enhanced learning capabilities (Lawrence & Oivo, 2012; Lyles, 2014).

Three elements of a broader and institutionally systemic KM perspective could provide deeper understanding into organizational KT capabilities necessary to enhance organizational learning. These three elements include

- requirements for a deeper understanding of the social-technical knowledge dynamic (Hussin, Razak, & Assegaff, 2012);
- increased socio-cultural impact assessments (Jacks, Wallace, & Nemati, 2012); and
- shared social KT responsibility across the organization (Vo, 2012).

Within the confluence of the organization’s (a) social-technical knowledge dynamic, (b) emergent socio-cultural forces, and (c) organization-wide social KT, there emerges an increasingly complex knowledge network (Kozlowski & Chao, 2012).

I emphasized existing management and KM research premised upon historically relevant management theories and KMS design theories. Blending historical context with contemporary perspective is necessary to more meaningfully visualize key emergent characteristics and forces within intra- and interorganizational complex knowledge networks. Unanswered KM research questions stemming from historical contexts often remain unanswered or are only partially addressed when considering contemporary ICAS organizations. Therefore, I blended both historical context and contemporary perspective as I focus research on framing key relationships and topics in inter- and intra-organizational KT, organizational dynamics, and information systems ontology, discussed at length in depth in Chapter 2.

Problem Statement

The general problem, global in context, was organizations over time operating within a predominantly knowledge-based economy often lose IC requisite to sustainable innovation (Lin, Edvinsson, Chen, & Bedding, 2014; Marcin, 2013). The specific problem was that ineffective KM practices negatively influence knowledge flows within increasingly complex knowledge networks, often diminishing an organization’s capacity to refresh intellectual capital. There are many frameworks for conceptualizing KM and corresponding KMS designs, all referencing knowledge as emergent premised on some level of social interchange.

With an enhanced multidimensional knowledge management model, management could more clearly visualize the complex relationships between the organization's socially complex activity systems and surrounding emergent organizational forces. As a result, management potentially could assess more accurately organizational attributes and characteristics, as well as organic forces interplay surrounding these organizational characteristics. The end result could be more effective KM, including assessing specific ICAS emergent triggers directly influencing KT (Sharma & Good, 2013; Taylor, 2013).

Purpose of the Study

The purpose of this study was to propose an enhanced, multidimensional KM model to frame a more comprehensive KM methodology. I anticipated that an enhanced, multidimensional KM model could extend management's understanding of the systemic forces that emerge within an organization's knowledge ecosystem, specifically those forces that most directly influence KT. Subsequently, management potentially could shape organizational dynamics influencing KT to allow for more meaningful and consistent knowledge flows, resulting in more consistent and continuous innovation,(van Wijk et al., 2012; Weichhart, 2013).

I framed two goals contingent upon extending existing KMS theoretical design with historical insights. The first goal was to define more clearly emergent knowledge flows within organizational knowledge-work activity systems using a historically relevant IS ontological design construct (Ahuja et al., 2012; Alter, 2005; Boisot & Sanchez, 2010; Nissen, 2006). A second goal was to use this enhanced understanding of emergent knowledge flows to frame an organization's activity systems within the interplay of more clearly defined contemporary systemic and emergent organizational forces, such as ambient awareness (Kozlowski & Chao, 2012; Leonardi & Meyer, 2015; Rigaud-Tellez & Hernandez, 2012).

By achieving these two goals, management's control over organizational knowledge emergence could be enhanced. As an outcome, management could govern more effectively emergent forces around socially complex activity systems in motion within the macrolevel complex knowledge ecosystem, potentially increasing IC ROI over time.

Research Questions

The following primary research questions were considered:

RQ1: How can an enhanced ICAS model framing emergent system dynamics surrounding organizational knowledge flows between and within the organization's knowledge-work activity systems enhance management's understanding of organizational knowledge transfer?

RQ2: How can organizational theory, knowledge management system theory, and information system ontological design theory become infused more meaningfully to enhance management practices of the organization's knowledge ecosystem?

Organizational characteristics and surrounding emergent and environmental dynamics potentially trigger or enable KT (Kozlowski & Chao, 2012). When coupled with activity-based knowledge transfer capabilities, knowledge flows can be enhanced within organizational activity systems (Cavaliere & Lombardi, 2013). Understanding emergence dynamics and complex organizational activity systems surrounding knowledge flows requires integrating theoretical foundations spanning multiple disciplines, including management, sociology, psychology, and science. Therefore, the primary research questions required an inter-disciplinary study spanning multiple theories while concurrently crossing multiple disciplines to frame more effectively a sufficiently mature multidimensional KMS design.

Conceptual Framework

Sharing KT responsibility requires a deeper understanding of knowledge (Snowden, 2002). Networked knowledge is understood to be neither thing nor flow, yet paradoxically both, while remaining fundamental to the "ephemeral, active process of relating" (Snowden, 2002, p. 5). Additionally, understanding complex knowledge networks requires a deeper understanding of emergent organizational knowledge across organizational management levels (von Krogh, Nonaka, & Rechsteiner, 2012). Thus, emergent organizational knowledge can be viewed as an organization's shared responsibility (von Krogh et al., 2012).

Historically, complex knowledge was seen within a systems thinking complexity requiring a unique shift in management mindset (Senge et al., 1999). Conceptualizing complex knowledge required a deeper understanding of complex abstractions relating to socio-cultural contexts and sensemaking (SM) diversity over time and space (Snowden, 2002; Nissen, 2006). A key challenge inhibiting such a mindset shift was decision-making information overload, specifically information the creation beyond the any individual's capacity to absorb (Dalkir & Liebowitz, 2011; Senge, 1994).

Cognitive boundary breakdowns premised upon information overload were viewed as systemic breakdowns within many organizations' KM efforts (Eppler & Mengis, 2004; Senge et al., 1999). Conceptually, incomprehensibly large volumes of information have led to cognitive exhaustion resulting from, among other cognitive boundary dynamics, a natural attention boundary limitation, such as mental and emotional fatigue (Briggs & Reinig, 2010).

Within increasingly complex knowledge networks, work teams continue to experience group-level cognitive boundary breakdowns that inhibit consistent organizational learning (Ahuja et al., 2012; Briggs & Reinig, 2010; Kozlowski & Chao, 2012; Lyles, 2014). It is the art and practice of seeing such depth when viewing emergent system complexity that challenges KMS design, from both the historical as well as contemporary perspective.

As a result, a historically grounded and contemporarily relevant multidimensional KMS model should frame potential affects from emergent system complexity that might not surface for several years. A multidimensional KMS could relate and visualize more effectively the multiple organic and complex emergent organizational forces surrounding organizational knowledge. An inherently more adaptive methodology of managing knowledge should incorporate (a) localized organizational forces, (b) two-dimensional constructs defining an organization's KT attributes, and (c) key ICAS attribute relationships. Arguably, these fundamental perspectives predominate historical as well as contemporary KM frameworks.

Capturing emergent organizational dynamics surrounding these relationships requires deeper understanding of both systemic and emergent organizational forces as well as their resultant interplay. Partially adaptive KMS models have been developed that identify key emergent forces within the organization (Bennet & Bennet, 2004; Dalkir & Liebowitz, 2011). Yet, the dynamic interplay of these forces remains unclear and only partially understood (Anand et al., 2012; Lawrence & Oivo, 2012). Organic organizations with inherently complex knowledge networks mandate a more holistic understanding of knowledge dynamics for framing and forming knowledge systems that enhance contemporary organizational learning (Ahuja et al., 2012; Argote, 2012).

Scholars have reacted to three historical shifts in KM focus with corresponding shifts in theory research, developing new theories that corresponded to the KM emphasis within context to organizational needs. Professionals in industry have not reacted as quickly, but have struggled to adopt and adapt the previous generation's KM research. Organizations are still struggling to adapt second-generation KM constructs in relation to integrating organizational knowledge across structural boundaries, decision-making boundaries, cultural boundaries, social boundaries, and political boundaries while maintaining dynamic equilibrium between each.

Very few organizations have shifted focus to third generation KM theoretical frameworks where equilibrium is not the primary focal point. Third generation KM shifts focus to more adaptive and complex organizational change (Boxenbaum & Rouleau, 2011). Therefore, organizations should shift their strategic management theory focus to a systems thinking perspective where the organization is viewed as a complex and adaptive organic system (Lyles, 2014).

In concert with this shift in organizational strategic focus, research should provide practical frameworks that can readily transfer to these organically complex real-world business environments (Dalkir & Liebowitz, 2011; Lyles, 2014; Meyer & Davis, 2003). Accordingly, the KM focus should shift to organizational views premised on the ICAS model. Focus thus should emphasize the organizational knowledge ecosystem's socially complex work activity systems (Bennet & Bennet, 2004; Dalkir & Liebowitz, 2011; Linger et al., 2007; Yang & Shan, 2008).

Nature of the Study

The nature of this study will be qualitative, with a phenomenological emphasis. Qualitative study emphasizes research on how a phenomenon occurs, which tends less towards positivist or quantitative methodology. Qualitative research is consistent with understanding how organizational system dynamics, KMS theory, and information systems theory can be integrated to enhance our understanding of emergent organizational knowledge, the dissertation focus. Qualitative interpretive meta-synthesis (QIMS) was used as a foundation for initial data collection activity.

QIMS provides a unique framework for interpreting multiple studies for the purpose of discovering new meaning and understandings of shared experiences (Peterson, 2015). Creating new metaphors that frame new discoveries requires meaningful research synthesis spanning multiple contextual perspectives (Boxenbaum & Rouleau, 2011; Peterson, 2015). A contemporary data set was collected from within the past five years that provided a unique opportunity to explore KT experiences from new perspectives to create new meaning from existing data (Bahde, 2014).

The purposive and iterative strategies typically applied during original data collection are designed to create a unique set of shared experiences, focusing specifically on the experience under study. The sample group, therefore, are not simply comprised of people but rather represent a shared experience (Bahde, 2014). By necessity, a significant degree of latitude is required within the qualitative methodology to allow the researcher to creatively aggregate meaningful and relevant connections within and between historical data sets (Bahde, 2014; Polkinghorne, 2005). Creative aggregation potentially fosters new meanings of shared experiences from multiple organizational perspectives (Polkinghorne, 2005).

It was beyond the scope of available time and cost to conduct extensive field research that would encourage repeated iteration of qualitative data collection and analysis. Such would be the case with a grounded theory project where data is collected and analyzed through open coding, axial coding, and subsequent selective coding over extended periods of time. Although a pure grounded theory approach was a viable option, beyond time and cost constraints, my purpose was not to create a new theory or model, but integrate and extend existing models (Wagner, Lukassen, & Mahlendorf, 2010).

Therefore, a phenomenological approach was used to synthesize qualitative data from an existing data set comprised of participants representing various levels of activity influence, each potentially creating new insights and metaphors. A preliminary meta-synthesis of KM research allowed for new conceptualizations and operationalization of organizational perceptions relative to knowledge creation and transfer (Jacks et al., 2012; Singleton & Straits, 2010). The preliminary QIMS meta-synthesis emphasized recurring conceptualizations to reduce generalized themes to more meaningfully relate knowledge flow dynamics to organizational subsystem dynamics.

These conceptualizations were then combined with in-depth personalized context from original interview transcripts to further operationalize knowledge creation and KT dynamics within work activity system dynamics (Bahde, 2014). The resultant generalized themes further defined specific variables as metaphors for future analysis. Such an approach is consistent with research focusing on macrolevel structure and mechanisms, which are considered more abstract than concrete, as well as viewing multiple mechanisms concurrently within multiple structures (Boxenbaum & Rouleau, 2013; Sayer, 1992).

Definitions

Knowledge: An *ephemeral* and *active* process of relating a created perception, considered a knowledge object or *thing*, within a dynamic and transitive idea exchange continuum, termed a *flow* (Snowden, 2002).

Knowledge Ecosystem: An organizational capability conceptualized as knowledge both organic and emergent based on complex and dynamic organizational inter-relationships such that knowledge flows and stocks are equally integral to organizational knowledge-work activities (Linger et al., 2007; Nissen, 2006; Snowden, 2002).

Knowledge Flow: A dynamic representation of knowledge spanning four dimensions: (a) explicitness, corresponding to type of knowledge; (b) reach, a function of social aggregation; (c) life cycle, relating knowledge object to organization process dynamics, and; (d) flow time, a dynamic time relationship between knowledge objects and knowledge transfer rates (Nissen, 2006).

Knowledge Work: An organizational phenomenon framed by the relationship between individual and group-level cognition and organizational processes within formal work activities that require individualized complex judgments, expertise, and experience (Linger et al., 2007; Briggs & Reinig, 2010).

Organization Memory: Conceptualization of organizational explicit knowledge as relating to both a knowledge stock, in the form of knowledge inventory as well as a boundary object framing meaning inherently context sensitive at the individual level within any give work process (Ackerman & Halverson, 2000; Nissen, 2006). However, tacit-explicit knowledge differentiation becomes a blurred definition of knowledge. Organization memory thus defined will simply frame, versus explicitly define, touch-points for knowledge system feedback loops (Linger et al., 2007).

Organization Learning: Conceptualization of an organization's tacit knowledge as a knowledge flow, in the form of transfers, although tacit-explicit knowledge differentiation becomes blurred (Nissen, 2006). Organizational learning thus defined will support feedback loop structures in relation to knowledge SM enablers and sensegiving [*sic*] triggers (Linger et al., 2007; Sharma & Good, 2013).

Assumptions

I framed knowledge epistemology as a dual construct blurring and blending phenomenology and existentialism. I viewed epistemology as a dualistic concept of knowing something through an awareness of two foci, explicitly one focal point being the world of one's self and a second focal point being the outside world. The dualistic theme of epistemology thus framed can be understood perhaps most meaningfully from the following brief study of phenomenology and existentialism.

Phenomenology focuses on what appears to us through objective observation of our senses. Existentialism challenges the objectivity of the phenomenologist by taking more notice of the subjectivity of the world, asking what makes something known or real. Heidegger (2006) integrated both schools of thought when considering how we come to know a thing and to what extent this understanding ameliorates the split between the knowing mind and the outside world.

Descartes did not give credence to Plato's rationalism theory that sensual experiences alone were sufficient to explain how humans acquire and develop knowledge, such as is knowledge the logical truth or the essence of the truth (Descartes, 1879). Descartes believed that our senses alone can deceive or color the real truths because of previous afflictions (such as pain, bad experiences, or lack of experiences). Consequently, he advised us not to trust completely what appears to be real. Descartes philosophized that knowledge could be gained a priori independent of any sense experience a posteriori. Specifically, a truth that is real because it cannot be disputed, which unto itself was based on intuition and therefore should be doubted, demonstrates that it is true (Descartes, 1879).

Descartes argued "that in order to seek truth, it is necessary once in the course of our life, to bring to doubt, as far as possible all things" (Descartes, 1879, p. 193). Can we be sure that our senses are telling us the truth? Our senses reveal useful information but not scientifically accurate data. In this regard, Heidegger (2006) employed deduction and induction in describing a simple jug's thingness, for example.

Examination of the world makes a distinction between the objects of the physical world as well as the essence of those physical objects that exists only in the soul (Heidegger, 2006). Is it through the mortal's ability to experience that the object becomes a thing in the soul, and as a result the objects become visible to the knowing mind? In other words, it is not our outward appearance that makes us who we are, but what is inside.

Heidegger inferred this when he stated, "the vessel's *thingness* [*sic*] does not lie at all in the material of which it consists, but in the void that holds" [as] "the empty space, this nothing of the jug, is what the jug is as the holding vessel" (p. 169). This relates directly to the paradox of defining knowledge as both a thing and a flow where the flow more accurately perhaps represents the void or empty space between knowledge of the mind and knowledge of the soul versus knowledge as tacit and knowledge explicit (Chae et al., 2005; Nissen, 2006).

The soul, as created by the divinity, is a void that contains a priori reality that allows us to perceive the world and the objects in that world (Heidegger, 2006). However, it is the mortal's ability to experience that allows the individual to fill that void with the essence of the object. This filling of the created void has been termed the *thinging* [*sic*] of the thing (Heidegger, 2006). It is the process of thinging that causes the *nearing* [*sic*] of the world (Heidegger, 2006). Thus, nearing becomes the process by which the outside world is captured by the knowing mind. This philosophical construct becomes the foundation of an enhanced definition of knowledge flow.

What the soul and mind capture may be different. Objects are perceived by the mind; this perception is shaped by our personal experience with the object and seen through the filter of our culture and environment. Things are perceived by the soul as we come to understand the universal essence of the thing. Objects can be perceived as being close to us or far away, however it is the nearing of the thing that allows the thing to be visible to the soul – the knowing mind, the reservoir of tacit knowledge.

An example of this conceptualization of knowledge is the Al Gore movie, *An Inconvenient Truth* (David, Bender, Burns, & Guggenheim, 2006). The images of the movie shrink the time and space between us and the natural events; melting icebergs, floods, hurricanes, etc. The images do not bring us nearer to these events. They only provide us with a physical representation of the events as objects – white, blue, windy, wet, rising, falling, etc. It is the experience of the movie that blends sound, image, and word combined with our previous experiences that reveal to us the essence of the events. The essential nature of the event is brought to the knowing mind by the conjoining elements of earth, sky, mortality and divinity, referred to as the fourfold (Heidegger, 2006).

David et al. (2006) linked these seemingly isolated events (objects) to the essential life sustaining gifts of the earth, in effect showing us the events *presencing* [*sic*] (Heidegger, 2006). In essence, *An Inconvenient Truth* translated the events (objects) for the knowing mind. Thus, my research challenge was to capture individual participant understandings of knowledge with sensitivity to the nearness of experience that framed these individual perceptions according to Heidegger's notions.

A key epistemological assumption with framing a philosophical approach to knowledge in general is the unique perspective of individual reality being inherently fallible (Sayer, 1992). Sayer (1992) intuited that meaning becomes negotiated as a result of some social interaction or discourse. To conceptualize the individual meaning of knowledge and KT, therefore, the phenomenological nature of research should lend to necessary relationship-building between researcher and individuals interviewed. Concurrently, established researcher-subject trust relationship should allow for capturing nearness of subject in relation to observed, emergent organizational phenomena.

Beyond philosophical assumptions, certain specific assumptions were anticipated. Firstly, based on time constraints, I required a limited population sample size. I assumed that knowledge and knowledge flow within this limited population in a socio-cyber context would occur uniquely but in similar manner across other organizational entities in various markets and sectors dependent upon unique organizational dynamics.

Secondly, I assumed that some knowledge would always be transferred in any given organization's work flow dynamic. Regardless of organizational KT inhibitors, enablers, or enhancers, knowledge will emerge within and between an organization's work group activity systems (Kozlowski & Chao, 2012). My research challenge was not premised on the presence or absence of knowledge flow, but in understanding how ICAS forces most significantly influence and are influenced by knowledge flow.

Scope and Delimitations

Within a phenomenological study, anywhere from five to 25 purposeful samples should meet specific criteria, which for this study originally involved identifying specific organizational workflow dynamics and then mapping those dynamics across sectors to individual organizational stakeholders. Even with the limited sample size of 11 used for this study, the volume of data was significant. As a result, the sample population's perception of key knowledge-work dynamics identified as variables may not transfer to larger work groups spanning multiple levels of organization responsibility, from operational to senior-decision making levels.

An alternative to this limited population sample size with a potentially large volume of data would have been to move towards a larger, stratified purposeful population sample, but reduce the number of variables, therefore reducing the scope of data collected with a focus on maintaining an equivalent volume of data collected. The challenge or potential bias here would have been that of a reduced number of variables correlating to multiple organizational subsystem attributes.

A limited variable subset characterizing subsystem dynamics could potentially skew interpretation of the larger subsystem dynamics in context to knowledge transfer. I attempted to identify an optimum balance of ICAS emergent attributes to more effectively correlate potentially salient organizational subsystem attributes. Identifying the most salient ICAS organizational attributes could potentially reduce variables representative of overall subsystem dynamics, while maintaining a sufficient number of variables to capture emergent organizational dynamics.

A first phase data analysis included an equivalent of grounded theory open coding, where overarching meta-attributes were synthesized directly from existing research. I was not concerned at research design time with knowing exactly all facets of research design in terms of coding outcomes. I chose instead to focus on building meaningful context connections (Sayer, 1992).

My original intent in research design was to target an existing industry. Recently moving into my role as a full-time faculty member within a regional university, I had the opportunity to become a member of an information technology committee representing the University's home county. There were several multinational firms and dozens of regional businesses with home offices in Hancock County, Ohio represented on this region-based committee. These multi-national firms spanned a wide spectrum of industry that included health care, farm, transportation, and the oil industry, among others. This committee provided a unique opportunity for access to senior officers within each firm represented and I had previously established a professional relationship with many of these individuals, as a result.

During preliminary contact with several organizations via committee members, there was a strong resonance between research outcomes and current organizational strategic plans such that there appeared to be a viable opportunity to create meaningful research partnerships. However, 2 months of subsequent contact with senior management within each firm resulted in negative responses from each organization mitigating viable research partnerships.

There were two primary reasons provided. Either explicitly stated or implied, the current research involved too much time commitment from each organization based on each organization's current or planned operational activity tempos. A second rationale offered was the geographic proximity between corporate home office and a large number of regional higher education institutes made potential regional-based research partnership opportunities impractical and unfeasible. As a result, all multi-national firms had a common policy precluding organizational involvement in local or regional research partnerships.

Consequently, it became apparent that live interview subjects from active organizational research partnerships would not be viable. Live interview responses were subsequently emulated with historical subjects using carefully constructed NVivo® queries that simulated live interview questions. The advantages and disadvantages as well as additional definition of NVivo® query emulation, with unique potential benefits and outcomes from this approach, are further delineated in Chapter 3.

Limitations

There were several anticipated limitations. The original sample population was limited in quantity, based on time and other resource constraints, and originally targeted multiple sectors, including public, government, and military organizations concurrently. However, limited subjects spanning a single functional unit within a military organization could potentially create biased interpretations of knowledge-work events and activities dependent upon cultural norms unique to that functional area of the organization, and the industry itself, in this case a US military organizational element.

To overcome this potential bias based on limited population sample size, I framed emergent organizational dynamics that are independent of industry market and sector alignment within a series of organizational subsystem phenomenon, a benefit of organizational theory (Hatch & Cunliffe, 2012). Additionally, I qualified data analysis at individual and work team organization levels (micro) as well as at larger aggregate organization levels (macro) to allow for interpretation of data at the microlevel while providing meaningful correlation of data at the macrolevel.

An additional potential limitation was individual researcher bias in relation to both interview process emulated in NVivo® queries and data analysis. I have extensive military experience as a retired Master Sergeant from the Air Force Reserve having served 14 years of active duty with the United States Marine Corps and eight years reserve duty with the Air National Guard. Both military experiences, spanning 22 years, were related directly to information systems (IS), information technologies (IT), and deploying organizational improvements leveraging both IS and IT.

I have 5 years of consulting experience spanning multiple government organizations, including the Department of Defense (DoD), both Air Force Program Executive Offices (AFPEO) and Air National Guard (ANG) working directly with the ANG Chief Information Officer (CIO). As a result, I have extensive data and information quality management experience having supported contracts for the Defense Logistics Agency (DLA) data quality initiative and Department of Housing and Urban Development (HUD) information quality improvement initiative mandated by the

Government Accounting Office (GAO). Additionally, I have significant management experience in public sector firms, from business start-ups to Fortune 1000 firms.

As such, I am sensitive to cultural norms that exist in each sector, and have learned to accommodate my leadership and communication style to each. I originally perceived a potential bias existed in any interview process emulated in NVivo® queries in the form of adopting queries unique to each organization sector and individual, i.e., assuming co-identity with subject based on common shared experiences (Alvesson, 2003). This intense level of co-identity has been termed going native (Gioia, Corley, & Hamilton, 2013).

Without live interview subjects, however, the need to employ culturally neutral language including terms and constructs within informal probing questions in an interview process became irrelevant (Gioia et al., 2013). What I discovered was neutral language in context to historical subjects became inherent in query search design framed by common equivalent terms and metaphors in the form of NVivo® classification attributes. Accordingly, I was able to mitigate this potential bias.

Significance of the Study

This study was unique because it addressed an area of research that had yet to focus on the systemic and organic nature of knowledge utilizing multiple perspectives of a single organizational phenomenon within the organization's knowledge ecosystem. With multiple and concurrent perspectives of an organization's organic and systemic forces surrounding KT, management could improve framing key organizational dynamics to sustain organizational intelligence over increasingly longer intervals of time.

Knowledge flow time, to illustrate, was operationalized within a second-order analysis, the dynamic knowledge visualization, where increasing organizational reach and increasing duration of knowledge flow time resulted in more significant knowledge flow gaps, termed an empty space (Nissen, 2006).

Without a comprehensive, multiple lens perspective representing the dynamic interplay of single and multiple organizational events coupled with emergent single and multiple organizational dynamics surrounding these events, there remains no meaningful framework for defining more comprehensively the tensions surrounding these emergent knowledge flows in relation to specific empty spaces. And this emergent knowledge should be viewed in context to the organization's work-activity level, the locus of group-level social learning discourse, in relation to an organization's knowledge transfer enablers and triggers (Leonardi & Meyer, 2015; Linger et al., 2007; Maitlis & Lawrence, 2007).

Significance to Practice

Understanding organizational memory within a social learning discourse should include historical as well as current learning and knowledge exchanges. Knowledge exchanges are fundamental to creating an organization's identity, and organizational identity is foundational to improving organizational performance (Rowlinson et al., 2010). As a result, there remains many knowledge flow empty spaces where understanding emergent organizational dynamics remains incomplete (Kozlowski & Chao, 2012; Nissen, 2006).

Organizations comprise a network of knowledge objects where the system as a whole exceeds the sum of relevant knowledge (Ahuja et al., 2012; Borgo & Pozza, 2012). By defining a more comprehensive set of overlay lenses through which an organization's knowledge dynamics can be viewed, the potential was created to acquire deeper as well as more systemic insight into the organic interplay of networked knowledge objects that exist in current knowledge flow empty spaces (Ahuja et al., 2012; Nissen, 2006).

Significance to Theory

Networked knowledge as objects and flow potentially were postulated to become visible when viewed concurrently in relation to knowledge flows and ICAS flows (Bennet & Bennet, 2004; Borgo & Pozza, 2012; Nissen, 2006). Subsequently, emergent organizational attributes defining dynamic and organic relationships and tensions within knowledge networks have become partially understood (Ahuja, et al., 2012; Borgo & Pozza, 2012). More clearly defined attributes describing networked knowledge object relationships to dynamic and systemic organizational tensions has enhanced understanding of emergent organizational learning (Boisot & Sanchez, 2010; Louis-Sidney et al., 2012; Padova & Scarso, 2012).

As a practical outcome, management could perceive more clearly emergent knowledge within their organization. Additional clarity could provide sufficient definition to a degree where knowledge flow inhibitors, triggers, enablers, and enhancers could become a codified reality versus subjective assessment (Andersson, Gaur, Mudambi, & Persson, 2015; Sharma & Good, 2013).

Significance to Social Change

The collective social impact of multiple firm's combined IC within a geographic area and to a greater degree within any given nation has become increasingly significant. Economic transformation resulting from IC directly attributable to the knowledge-based firm both regionally and nationally will determine with increasing significance a nation's gross domestic product (GDP) (Lin et al., 2014). Improved GDP can be directly linked to improved social conditions (Marcin, 2013). However, becoming a knowledge-based organization remains problematic, as effectively applying existing knowledge and continuously creating new knowledge are two organizational activities that are less visible and concrete, not clearly understood, and often remain ineffectively managed (Zack, 2013).

Failure to consistently manage knowledge effectively has far deeper social implications than a nation's IC linked directly to GDP. The National Aeronautics and Space Administration's (NASA's) 113th space shuttle mission, named Columbia, began January 16, 2003 and lasted 16 days, successfully completing all mission activities. As the Columbia re-entered earth's atmosphere disaster struck. Damage received to the left wing during lift-off ultimately resulted in the death of all seven crew members. In essence, the Columbia space shuttle program became one of NASA's organizational learning defining moments (Madsen & Desai, 2010). Organizational learning is fundamental to sustaining knowledge creation and transfer, thus increasing IC (Zack, 2013). Perhaps more importantly, improved organizational learning could potentially save lives.

Like NASA, however, most organizations focus on their innovation and fail to recognize the larger systemic forces surrounding the knowledge-based activities foundational to innovation (Senge et al., 1999). Although most large US organizations currently have some form of KM initiative and/or system, as do many European and Asian firms, many of these firms consistently fail to create and transfer innovative organizational knowledge (Lopez-Nicholas & Merono-Cerdan, 2011). In an increasingly knowledge-based global society, failure to effectively create, transfer, and sustain organizational knowledge will continue to bring many forms of economic and social failure (Marcin, 2013).

Summary and Transition

Understanding the nature of knowledge in essence and form remains problematic. There exist many significant interpretations of knowledge, knowledge cycles and spirals, transition states, and flow dynamics. Even the seemingly simple conceptualization of knowledge flow should be qualified depending upon the specific theory that introduces different and sometimes unique constructs to capture the perceived nature of knowledge as a flow dynamic (Miranda et al., 2011; Smerek, 2011; van Wijk et al., 2012).

Yet, each historical theoretical perspective has value that should be factored into a holistic understanding of knowledge, KM, and the overarching knowledge ecosystem. I assimilated the strengths of historical and contemporary KMS theory into an enhanced multidimensional KMS framework. This framework enables deeper insights into various dynamic interplays of organizational forces impacting knowledge work, workflow activities, work groups, and ultimately individual cognition, such as SM and ideation.

The objective of this study was to add to existing KM literature a possible KMS design enhancement to frame deeper understandings of emergent organizational intelligence within an ICAS representing convergent as well as emergent organization forces. The proposed enhanced ICAS KM framework could begin to address KT problems many organizations experience over time that significantly impact sustained innovative and competitive advantage.

Specifically, organizations often fail to manage knowledge emergence consistently over time to sustain organizational learning leading to continuous innovation. Within a knowledge economy, therefore, collective organizational IC potentially fails over time to consistently contribute to a country's economic development (Lin et al., 2014; Marcin, 2013). Improving organizational IC over time with enhanced KM practices became the overarching objective of an enhanced ICAS KM framework.

Chapter 2 contains literature relating to knowledge management spanning the early 1990s to present. This literature review included scholarly information that outlines various KMS theoretical designs with perceived strengths and benefit of each with a focus on the interplay of various subsystem dynamics associated with each KMS design. Using a phenomenological philosophical approach, I endeavored to gain deeper understanding of a) various conceptualizations of knowledge, b) knowledge as a learning object, and c) knowledge as a flow.

I synthesized research that focused on organizational dynamics impacting emergence of one or more of these deeper understandings in relation to KMS as a type of information system (IS), inherent in all organizational activity systems. Thus, the literature review emphasizes key KM, organizational, and IS theoretical foundations to frame this deeper understanding.

Chapter 3 details the phenomenological qualitative methodology employed. A significant benefit of the qualitative method for this type of research was the potential to better understand a complex social phenomenon, specifically knowledge emergence within complex organizational knowledge networks. As an outcome of this research, addressing the research questions provided added insight towards the evolution of a KMS design that more clearly frames, with greater specificity, the confluence of emergent knowledge ecosystem dynamics.

Chapter 2: Literature Review

This research defines a multidimensional KM framework that visualizes hidden systemic organizational forces that enable, enhance, and/or inhibit the emergence of an organization's knowledge. In my literature review, I span a broad spectrum of knowledge and KM epistemology, to include a synthesis of positivism, nonpositivism, and pluralistic perspectives.

This literature review is divided into two main sections. The first section includes review of existing KM theories, models, and frameworks that are foundational to ICAS organizations. Subsequently, I focus on synthesizing each into a hybrid visualization based on two of the most relevant frameworks: (a) the intelligent, complex, and adaptive system (ICAS) organizational framework (Bennet & Bennet, 2004), and; (b) the Australian knowledge ecosystem framework (Linger et al., 2007).

Work activity dynamics, specifically task-based KM (TbKM) work activity from the Australian knowledge ecosystem, were merged into the ICAS framework to visualize an enhanced and multidimensional ICAS KM framework. Using the proposed multidimensional ICAS as a new foundation, the second section of this literature review discusses how organizational workflow dynamics and knowledge flow times could be infused into the multidimensional ICAS framework.

This final enhancement uniquely postures a KMS framework for visualizing knowledge emergence flow dynamics within activity systems. Consequently, management could acquire needed requisite understandings to:

- more effectively frame organizational knowledge-based activities;

- more consistently frame emergent organizational dynamics surrounding knowledge flows in flux; and
- maintain innovation viability by sustaining organizational IC over time.

As multiple organizations within a given geographic region foster learning organization characteristics, improved and sustainable innovation could lead to improved regional economic performance (Asheim, 2012; Marcin, 2013). Improved economic performance regionally could support improved social conditions in that same region (Ortega-Argiles, 2014).

In a knowledge-based economy, our current economy, creating, maintaining, and continuously improving IC across industries has the potential to significantly improve local, regional, and national economy (Lin et al., 2014; Ortega-Argiles, 2014). Multiple positive cascading benefits potentially could result from improved management of our nation's IC. Improved and sustainable collective organizational intelligence (OI) can directly and positively improve social change spanning multiple local, regional, and national services, subsequently improving every facet of national welfare and wellbeing (Ortega-Argiles, 2014).

A significant body of historical and contemporary literature emphasizes knowledge generation, KT, knowledge complexity, KM, and KMS design and deployment. Within this collective literature, contemporary research continues to emphasize organizational complexity, knowledge paradox, and knowledge complexity with an increased emphasis on the social-cultural dynamic of knowledge emergence. I focused therefore on synthesizing past and present research in knowledge generation, transfer, and complexity in context to knowledge emergence within a socio-technical and socio-cultural KM dynamic.

Literature Search Strategy

I began identifying sources for this study in 2003 while serving as the MIS faculty member at a small business college in New England. As a result, continuously scanning relevant sources has included changing qualifiers in search terms, as research shifted emphasis in terminology to embrace new conceptualizations for knowledge and knowledge management. However, common search terms have been found over time to remain relevant, and have been used to identify salient historical and current sources for this study, to include organization(al) knowledge, knowledge transfer, knowledge exchange, knowledge management, knowledge emergence, learning organization, organization(al) learning, knowledge management systems, organization(al) SM, organizational memory, emergence, and knowledge ecosystems.

There is no meaningful final scanning of Walden databases as well as Google Scholar searches to discover the most current peer-reviewed or published text sources. Each new scan of literature continuously provides some minimal yet perhaps significant value towards conceptualizing a next generation, holistic, multidimensional KMS framework. In this context, research saturation simply does not exist.

During formation of concluding thoughts, additional searches surrounding key search terms and corresponding themes continued to provide additional insights for next generation design. These additional insights typically emphasized characteristics present in one or both of the two key theoretical KM ecosystem perspectives foundational to my

KMS design (i.e., Bennet & Bennet's (2004) ICAS organizational knowledge framework and the Australian KM ecosystem (Linger et al., 2007)).

Only in this context has research saturation been achieved. Specifically, additional research has failed to yield significant structural change to the proposed multidimensional ICAS KM framework. As a result, this study blended contemporary and historical KMS and organizational theory with equivalent contemporary and historical organizational knowledge-based team activity research.

Thus, the proposed enhanced ICAS KM framework integrates research spanning 2010 to 2015, while emphasizing the value and relevance of key historical theoretical foundations developed since the mid-1990s. An epistemological overview focuses on research synthesis beginning with the early 1990s of KM research to gain a broad perspective of major contributions to the KM body of knowledge. As I synthesized this extensive body of knowledge, I identified various KM-related paradoxes and challenges while further framing key attributes of emergent knowledge and surrounding emergent ICAS forces within these paradoxes. Lastly, I researched the most current literature spanning 2010 to early 2015 within the KM body of knowledge with a focus towards interdisciplinary knowledge ecosystem design.

Theoretical Foundation

Four tightly coupled theoretical frameworks provide unique insights into knowledge ecosystems and their emergent characteristics. Each theoretical framework provides a unique perspective or set of lenses to view organizational dynamics and emergent organizational forces that influence KT. Subsequently, KT can be more meaningfully correlated to OI, essential to fostering continuous innovation. All theoretical foundations should be viewed collectively and not in autonomy. All four foundations should be understood as complementary theories, such that each theory is dynamically connected to and frames each of the other theoretical foundations.

The first complementary theory framed the organization as an ICAS, with knowledge activity outcome being emergent organizational learning (Bennet & Bennet, 2004). Although historical, this theory remains the most relevant KM framework representing the organization's emergent knowledge within intelligent, complex, and adaptive organizational dynamics (Bennet & Bennet, 2004).

The ICAS organization was viewed originally as a series of extensively defined organic relationships between emergent a) environment characteristics, b) self-organizing characteristics, c) knowledge generation, and d) resultant OI. From this perspective, the ICAS comprised of an emergent set of self-organized elements was recognized as not only valid, but the most relevant proposition for conceptualizing organizational organic complexity (Yang & Shan, 2008). Self-organizing elements in the knowledge-based organization additionally include complex and adaptive social networks (Soda & Zaheer, 2012).

Secondly, Sysperanto was used to define an information system as a discrete work activity system with unique knowledge dynamics (Alter, 2005). Sysperanto was a model-based ontology developed from a 13 year research project within the information systems (IS) body of knowledge (Alter, 2005). The term Sysperanto was simply a guiding metaphor and play on the word Esperanto; Esperanto being in essence a dead language

(Alter, 2005). Understanding the dynamics of the organization's work system activity is fundamental to understanding organizational characteristics surrounding emergent creativity, complexity, and change (Bennet & Bennet, 2004; Kozlowski & Chao, 2012).

The third theoretical framework for this study included a dynamic knowledge visualization (Nissen, 2006). Visualizing knowledge in flux over time provides unique ICAS flow and knowledge flow perspectives. Surrounding knowledge emergence and transfer, knowledge flows can be visualized in relation to IS design, information flows, work flows, and organizational performance. Organizational knowledge in flux thus surrounds an organization's knowledge-based activity systems (Linger et al., 2007; Nissen, 2006). Visualizing knowledge in flux within emergent ICAS flows surrounding SM and sensegiving (SG) provide unique KT insights (Sharma & Good, 2013).

Lastly, organizational theory was used to qualify the systemic and dynamic relationships between functional, informational, social, power, and cultural organizational phenomena as subsystem attributes surrounding the ICAS organization's activity systems (Hatch & Cunliffe, 2012; Narayanan & Nath, 1999). Key subsystem dynamics from the historical organizational contingency theory enhanced with a phenomena-infused organizational theory create a rich set of organizational subsystem metaphors (Boxenbaum & Rouleau, 2011; Hatch & Cunliffe, 2012).

Hatch and Cunliffe (2012) synthesized a collection of organizational theories to define an aggregate set of organizational subsystem phenomenon. I blended historical subsystem dynamic tensions with organizational subsystem phenomenon to discover relationships between work flow activities and emergent organizational subsystem dynamics using Sysperanto slices (Alter, 2005). Although explored briefly in this study, Sysperanto slices potentially could represent an organization's emergent subsystem macrodynamics within each of the ICAS organization's subsystem phenomenon (Alter, 2005; Hatch & Cunliffe, 2012; Linger et al., 2007).

I then synthesized the four foundational theoretical frameworks with existing KMS theoretical designs. Of the many KMS designs, several of the most historically significant that remain widely accepted include the:

- Wiig KM Model (1993),
- von Krogh and Roos Model of Organizational Epistemology (von Krogh & Roos, 1995),
- Nonaka and Takeuchi Knowledge Spiral Model (Nonaka & Takeuchi, 1995),
- Choo SM Model (Choo, 1998), and
- Boisot I-Space KM Model (Boisot, 1998).

As previously stated, a foundational ICAS construct included framing the organization as an organic system (Bennet & Bennet, 2004; Yang & Shan, 2008). Viewing the organization comprised of ICAS relationships perhaps remains the most adaptive KM foundation for enhanced KM framework design (Bennet & Bennet, 2004; Andersson, Gaur, Mudambi, & Persson, 2015).

Significant research exists to support a two-dimensional understanding of organizational characteristics that impact KT. Aspects of these two-dimensional understandings remain relevant and provided meaningful insights to better understand knowledge emergence. Several of these most significant understandings include an organization’s cultural attributes, social norms, leadership characteristics, and structural characteristics (Argote, 2012; Bennet & Bennet, 2004; Boisot, 1998; Choo, 1998; Nonaka & Takeuchi, 1995).

Yet, within the significant volume of KM research since 1993, links between tacit knowledge and KT to organizational learning remain unclear or not researched (Argote, 2012; Joia & Lemos, 2012). Additionally, many emergent ICAS organizational dynamics are multidimensional in this context and remain unclear, requiring additional research. Included in this category is research to better understand knowledge acquisition and depreciation, and perhaps most relevant, research surrounding dynamics of KT at both micro- and macro-organizational levels (Argote, 2012; Kozlowski & Chao, 2012).

Management should understand emergent organizational characteristics and forces directly influencing knowledge-work activity systems and KT (Kozlowski & Chao, 2012). Without this deeper understanding, management over time may continue to experience inconsistent emergence of organizational intelligence, culminating in a significant loss of IC (Argote, 2012; Lyles, 2014; Marcin, 2013).

Many emergent and systemic organizational forces surrounding and influencing socio-technically complex work teams and knowledge intensive activity systems have been defined since the turn of the century (Ahuja et al., 2014; Senge et al., 1999). These organizational forces have not changed over time and remain synergistically in motion as emergent characteristics of the organization’s intelligent, complex and adaptive knowledge ecosystem (Bennet & Bennet, 2004; Linger et al., 2007; Yang & Shan, 2008).

One such emergent force can be represented by the individual's perception and interpretation of an organizational phenomenon. Historically, with action being the focal point, SM was viewed as a foundational link between action(s) and decision(s) based on individual perceptions of organizational activities (Weick, 1995). SM thus became an outcome of "the interplay of action and interpretation rather than influence of evaluation on choice" (Weick, Sutcliffe, & Obstfeld, 2005). Subsequently, SG was defined as an individual's interpretation of an organizational phenomenon based upon a perceived gap in an organization's SM process (Maitlis & Lawrence, 2007).

Individual and group SM is always present in organizations (Choo, 1998). SM was understood as an interpretive and collective process involving all stakeholder's experience of an organizational phenomenon resulting in an individual's understanding or perception of the event (Maitlis & Lawrence, 2007). Considering organizational SM dynamics, focus in research has shifted from static variables to flow dynamics and emergent characteristics of any given phenomenon (Sharma & Good, 2013; Weick, 2012). SM is thus fundamental to an organization's knowing cycle, providing improved opportunities for sharing beliefs and interpretations through interdependent networks of social connections (von Krogh et al., 2012). Interestingly, the language of SM has not changed significantly over time, in this respect.

The interplay of an organization's routines, practices, and structures contributing to SG was viewed as either a hindrance or enabler of emergent SM premised upon specific SG triggers (Maitlis & Lawrence, 2007). Although all SG was understood to involve some form of direct influence upon another's SM, not all instances of individual SM resulted in some form of SG (Maitlis & Lawrence, 2007).

Subsequently, the interpretation of any organizational phenomenon was viewed as some collective SG and individual SM combination, framing an emergent perceived truth or reality (Smerek, 2010). Within and surrounding any SM activity are organizational forces that potentially shift a person's perception of reality, specifically how one makes sense of an experience (Sharma & Good, 2013; Weick, 2012). I view these as emergent ICAS forces and characteristics.

Although organizational SG triggers historically have been meaningfully aggregated, leaders or other stakeholders could potentially "work to minimize the triggers and enablers of SG to others" (Maitlis & Lawrence, 2007, p. 81). Organizational characteristics framing SG and SM have been interpreted as clearly defined (Smerek, 2011). Additionally, improved understanding of SM has provided additional clarity of the knowledge creation process (von Krogh, Nonaka, & Rechsteiner, 2012). However, organizational dynamics and emergent forces surrounding SM and SG activities that subsequently inhibit triggers for each remain unclear and ambiguous (Anand, Kant, Patel, & Singh, 2012; Lawrence & Oivo, 2012; Maitlis & Lawrence, 2007).

Although interpretations may have improved over time, ambiguities persist (Anand et al., 2012). As a result, consistent organizational SM and SG does not occur (Sharma & Good, 2013). Without consistent individual, group, and macro-organizational SM and SG, consistent organizational knowledge emergence may not occur, thus impeding continuous KT (Sharma & Good, 2013).

Organizational KT capabilities within complexly networked arrays of organizational activity systems potentially could be improved by understanding emergent and systemic organizational forces surrounding SM and SG (Kozlowski & Chao, 2012). Such understandings potentially could provide management with insights necessary to more effectively govern or frame consistent organizational SM and SG (Sharma & Good, 2013; Weick, 2012).

Therefore, consistent SM and SG could significantly improve the management of organizational knowledge. Although research has been conducted regarding group learning and conditions under which knowledge is exchanged within and between groups, additional research is required to better frame emergent organizational dynamics and forces surrounding group-level KT involving SM and SG (Argote, 2012; Kozlowski & Chao, 2012).

Understanding the interplay of organic knowledge ecosystem forces surrounding an organization’s activity systems, management potentially could improve consistent emergent individual, group, and organizational SM and SG. Consistent emergent SM and SG could improve organizational KT and subsequent emergent OI (Leonardi & Meyer, 2015; Taylor, 2013; Tortoriello, Reagans & McEvily, 2012). A comprehensive, multidimensional KM framework to more meaningfully visualize these systemic and organic forces has yet to be developed.

Arguably, no single historical or contemporary KM theory or model appears to address comprehensively the systemic and organic organizational forces that enable, enhance, or inhibit knowledge creation and knowledge flow (Argote, 2012; Maitlis &

Lawrence, 2007; Nissen, 2006; Soda & Zaheer, 2012). An enhanced KM ecosystem framework that potentially provides richer knowledge creation visualizations, therefore, could more effectively represent enabled, enhanced, or inhibited knowledge emergence.

Organizations should understand more completely the key relationships between a) emergent organizational characteristics, b) overarching knowledge ecosystem dynamics, and c) organic forces that frame ICAS emergent characteristics. Without these enhanced relationship understandings, potential KT breakdowns may continue impeding effective management of organizational knowledge (Lee, Gillespie, Mann, & Wearing, 2010).

Understanding ICAS systemic and organic forces could provide management insights necessary to more effectively control KT within the organization. More effective KT control potentially may foster continuous and innovative OI. Clarifying systemic organizational dynamics surrounding the knowledge ecosystem therefore remains an existing, multidisciplinary literature knowledge gap. As importantly, this research knowledge gap reflects a gap in management understanding that may directly correlate to management's diminished ability to foster consistent KT (Lee et al., 2010).

A key research challenge remains to specifically link our existing knowledge emergence and KT understanding concurrently to multiple systemic and organic organizational forces at any given point in time. This complex linkage should be understood organizationally while maintaining the perspective of the organization in motion by a single organizational participant (Kozlowski & Chao, 2012). Linking such complex motion-based relationships requires a multidimensional model to visualize emergent and dynamic forces in motion as a wave of interleaving and interacting activities. Concurrently, interleaving knowledge activities over time should be visualized at specific moments in time relative to individual SM and SG.

Thus, integrating knowledge within a working knowledge management cycle can be viewed through the lens of epistemology. The KM cycle outcome has been qualified as being an emergent OI appropriately applied to an organization’s product and service creation and delivery (Wiig, 1993). Each major subsequent contribution to KM theory has enhanced understanding of KM cycle outcomes (Dalkir & Liebowitz, 2011). And, with each major contribution to KM theoretical design, roots in the Wiig (1993) historical KM cycle construct continues to provide an equivalent epistemological understanding, specifically a KM cycle as an organic knowledge cycle where knowledge emerges (von Krogh et al., 2012).

The von Krogh and Roos KM model (1995) framed emergent organizational knowledge as an outcome of complex social dynamics associated with a network of loosely coupled organizational connections. The emergent characteristic of knowledge linked to organizational dynamics was subsequently framed as a complex and organic relationship merging biology, business, and information where both organization and knowledge are each uniquely organic, yet systemically connected in a symbiotic relationship (Meyer & Davis, 2003). Perspectives of both historical views have been infused into contemporary strategies linking complex interorganizational networks (Bharadwaj et al., 2013).

During the mid-1990s, the construct of knowledge forms as an epistemology and knowledge diffusion as an ontological perspective were blended in the Nonaka and Takeuchi Knowledge Spiral (Nonaka & Takeuchi, 1995). The relationship between knowledge epistemology and ontology was subsequently framed in relation to organic social spaces, a shared space where relationships emerge, such as the locus of emergent OI (Snowden, 2002).

Organizational memory plays a significant role in emergent OI and memories (Argote, 2012). As cognitive boundary objects become embedded in processes, unique SM meanings are transferred to each individual within a work activity's social dynamic (Briggs & Reinig, 2010; Kozlowski & Chao, 2012). Organizational memory, knowledge objects, and complex cyber-social spaces have conceptually evolved to embrace semantic linking in next generation complex cyber-physical-socio intelligence spaces (Zhuge, 2014; Zhuge, 2011).

The historical perspective of cognitive boundary framed by Ackerman and Halverson (2000) thus becomes integral to the contemporary evolution of a socio-technical organizational knowledge cycle. A socio-technical organizational knowledge cycle can be framed within *infrastructure, infostructure* [*sic*] and *infoculture* [*sic*] (Hussin, Razak, & Assegaff, 2012; Briggs & Reinig, 2010).

Linking individual and group cognitive activities to organizational infrastructure, infostructure and infoculture may provide unique understanding of organizational knowledge cycles. In a social-technical KMS

- infrastructure represents the information technology (IT) or technical aspects of any given KMS;
- infostructure represents organizational dynamics distinct from culture; and
- infoculture specifically relates to an organization's cultural characteristics (Hussin et al., 2012).

A socio-technical organizational knowledge cycle could be governed by a reflective KM approach resulting from an organizational attitude of shared knowledge responsibility (Vo, 2012). In both framed representations, infostructure or infoculture, there is implied or explicitly stated a set of organizational values directly linking knowledge emergence as a shared knowledge responsibility requiring applied OI (Hussin et al., 2012; Alavi, Kayworth, & Leidner, 2005).

Conceptual Framework

Organizational intelligence, fostered by organizational learning, occurs within the intelligent, complex and adaptive knowledge ecosystem. Each KMS design has been grounded on unique perspectives of this knowledge ecosystem, either explicitly defined or implied (Becker, 2007; Linger et al., 2007; Dalkir & Liebowitz, 2011). Each unique historical perspective was premised upon the designer's conceptualizations of knowledge type, knowledge flow dynamics, and/or KT controls (Dalkir & Liebowitz, 2011; Felin & Hesterly, 2007; Nissen, 2006; Turner & Makhija, 2006). As a result, a research challenge exists to synthesize all relevant characteristics of each historical perspective into a more robust contemporary framework.

Arguably, one of the more comprehensive historical knowledge ecosystem perspectives can be found within the Australian KMS ecosystem design (Linger et al., 2007). Even with significant theoretical maturity in bridging an organization’s complexity, emergent knowledge, and work activity systems, there was but one lens through which the knowledge dynamic was framed and visualized, specifically the discourse knowledge framework (Linger et al., 2007). The challenge remains for research to define a generalized or more multidimensional model that provides an adaptive set of lenses through which the organic knowledge ecosystem is perceived in context to multiple, concurrent, and systemic organizational dynamics (Huo, 2013).

Recent efforts to meaningfully frame a knowledge ecosystem fail to define and capture emergent organizational dynamics surrounding knowledge mechanisms with sufficient maturity to enhance organizational management practices. To illustrate, the enterprise knowledge ecosystem (EKE) has been visualized as an interlocking system of knowledge cycle spirals surrounding knowledge (Huo, 2013). Knowledge was viewed as some type of activity locus, although not clearly defined (Huo, 2013). The EKE was conceptualized as comprising two vectored mechanisms, specifically the knowledge acquisition mechanism and knowledge sharing mechanism.

However, each mechanism failed to account for SM, SG, and the emergent dynamics created from increasingly larger spheres of knowledge work activities (Amani, 2010; Kozlowski & Chao, 2012). As a result, neither EKE knowledge mechanism is framed in terms of complex and emergent organizational dynamics that ultimately shape knowledge in flux, knowledge flows, and perhaps more importantly, organizational ICAS flows (Bennet & Bennet, 2004; Huo, 2013; Leonardi & Meyer, 2015).

A second less recent approach to understanding knowledge ecosystems included a comparison between business ecosystems and knowledge ecosystems in a comprehensive analysis of 138 innovative startups in the Flanders region (Clarrysee, Wright, Brunnel & Mahajan, 2014). Detailed statistical analysis identified a powerful relationship between knowledge ecosystems and business ecosystems in terms of specific business ecosystem focal points within complexly meshed business networks (Clarrysee et al., 2014).

However, neither ecosystem was detailed with sufficient specificity to develop a management strategy to guide the emergence of complex organizational knowledge dynamics. In the case of the Flanders region knowledge ecosystem, the emphasis of key ecosystem relationships remained at the organizational policy level (Clarrysee et al., 2014). As a result, the Australian KM ecosystem remains perhaps the most significant foundation for understanding and maturing the organizational ICAS as an emergent knowledge ecosystem (Bennet & Bennet, 2004; Linger et al., 2007).

One view, or set of lenses, representing multiple and concurrent organizational dynamics surrounding knowledge emergence could be derived from a contingency theory of the organization. Organizational contingency theory described the organization as five dynamically interconnected subsystems (Narayanan & Nath, 1999). Within this historical framework, the social, political, functional and informational subsystems surround the organization’s central and fifth cultural subsystem (Narayanan & Nath, 1999). Each subsystem connects and influences emergent organizational forces, such as trust, SM, and SG (Narayanan & Nath, 1999; Sanda & Johansson, 2011).

Subsequently, organizational theory described the organization as comprised of similar interlocking subsystem dynamics, but referenced each corresponding subsystem's dynamics as phenomena (Hatch & Cunliffe, 2012). Comparing subsystem and phenomena conceptualizations, culture phenomena effectively relate to cultural subsystem dynamics (Hatch & Cunliffe, 2012; Narayanan & Nath, 1999). Similarly, social structure phenomena relate to emergent social subsystem dynamics; physical structure phenomena align with functional subsystem dynamics, and; technology phenomena bridge historical informational subsystem dynamics (Hatch & Cunliffe, 2012).

A significant difference between contemporary organizational theory and historical organizational contingency theory is the four organizational phenomenon, i.e., culture, physical structure, technology, and social structure, are surrounded by and immersed within a fifth organizational phenomenon, specifically the power phenomenon (Hatch & Cunliffe, 2012). Interestingly, a sixth phenomenon, comprised of environment phenomena, surrounds the other five phenomenon (Hatch & Cunliffe, 2012). The power phenomena effectively capture the historical perspective of the organization's political subsystem dynamics (Hatch & Cunliffe, 2012; Narayanan & Nath, 1999). Additionally, the environment phenomenon captures unique aspects of the ICAS organization's emergent environment, specifically change, complexity, and uncertainty (Hatch & Cunliffe, 2012; Bennet & Bennet, 2004).

I have adopted subsystem language, and will emphasize organizational subsystem dynamics within the ICAS organization (Narayanan & Nath, 1999). However, I have enhanced subsystem as a metaphor to represent a blend of both historical context and contemporary perspective (Boxenbaum & Rouleau, 2011; Hatch & Cunliffe, 2012). I will maintain the perspective of emergent cultural dynamics within the organization as a central locus of emergent ICAS influence. Organizational culture represents a significant ICAS force for shaping organizational knowledge-work activity (Jacks et al., 2012; Taylor, 2013; Thompson & Gregory, 2012; Yu, He, & Liu, 2014).

Concurrently, I have integrated emergent organizational phenomenon perspectives specifically in context to power phenomena infused throughout all organizational subsystem dynamics, including the emergent organizational environment (Hatch & Cunliffe, 2012). Enhancing subsystem dynamic conceptualizations provide for emergent ICAS flow phenomena visualization (Bennet & Bennet, 2004; Hatch & Cunliffe, 2012).

SG and SM can be correlated directly to emergent social dynamics including identity perception and formation, as social subsystem phenomena (Hatch & Cunliffe, 2012; Sanda & Johansson, 2011). Sanda and Johansson (2011) framed the organization as a complex activity system surrounded by a series of vertices, where each vertex represented a unique set of organizational characteristics in relation to organizational elements, such as institutional rules, community, work organization, instrument, i.e., IT, and human subjects.

However, organizational dynamics thus framed were seen as connected touch points in the work activity system, versus inherently complex and infused subsystem dynamics (Hatch & Cunliffe, 2012). A subsystem metaphor representing the organization's complex activity systems provides a more relevant context for understanding emergent forces within the ICAS organization (Bennet & Bennet, 2004; Hatch & Cunliffe, 2012; Linger et al., 2007). With a hybrid historical and contemporary organizational subsystem dynamics perspective, unique organizational ICAS forces become visible.

Utilizing an adaptive set of lenses representing organizational subsystem dynamics, an individual lens could represent any view of an organization's cultural subsystem phenomena, not just attributes, but further frame (a) social dynamics, (b) political subsystem dynamics as a power phenomenon, (c) functional design dynamics, and (d) emergent forces represented by information subsystems, both formal and informal, all in relation to (e) specific characteristics of any given organization's activity system (Alter, 2005; Hatch & Cunliffe, 2012; Linger et al., 2007). Such lens visualizations could extend existing theoretical KMS designs currently conceptualized within a two-dimensional framework.

Existing two-dimension KMS conceptualizations explicitly frame the organization's knowledge ecosystem characteristics, whether inherent and/or emergent. In a multidimensional model, various lenses representing organizational systemic and organic forces could potentially provide unique insight into an organization's knowledge ecosystem dynamics surrounding knowledge emergence.

To illustrate, one set of lenses could represent SM and SG dynamics (Sharma & Good, 2013). Another lens set could represent aspects of the organization's subsystems representing social, cultural, functional, informational, and power phenomena (Hatch & Cunliffe, 2012). Yet another lens set could represent knowledge types (Borgo & Pozza, 2012; van Wijk et al., 2012). An additional seven lenses could represent uniquely the seven emergent forces defined within the ICAS organization (Bennet & Bennet, 2004).

The enhanced ICAS knowledge ecosystem could be visualized when overlaying an individual lens representing the functional characteristics of the organization with any other defined lens, such as SM, and/or emergent ICAS cultural characteristics. Each overlay could provide potentially a unique insight into the dynamic relationships between corresponding organizational attributes. Attributes linked to dynamic subsystem characteristics could potentially reveal emergent organizational forces surrounding that unique KT dynamic perspective.

Additionally, knowledge evolution and knowledge flow perspectives could be directly related to specific convergence points representing the intersection or overlap of two or more organic forces (Nissen, 2006). Organic forces surround and shape knowledge flows within and around the organization's work activity systems (Kozlowski & Chao, 2012; Nissen, 2006). Each of these emergent and organic forces could be visualized as a lens. Five of the lenses in this adaptive lens set could represent key organizational subsystem dynamics, including power, social, cultural, functional and informational phenomenon as subsystems, directly linked to specific knowledge-based activity systems (Alter 2005; Hatch & Cunliffe, 2012; Linger et al., 2007).

The organization’s functional, social, power, informational, and cultural subsystem phenomenon convergence points could be understood more deeply, for example, by overlaying one or more subsystem convergence points with a lens representing knowledge flow (Nissen, 2006; van Wijk et al., 2012). That same combination of five lenses could be overlaid with two lenses, one representing SM and another SG, to more meaningfully conceptualize ambient awareness (Leonardi & Meyer, 2015; Maitlis & Lawrence, 2007; Sharma & Good, 2013). Contemporary organizational theory includes the organic nature of emergent organizational characteristics where culture is an integral shaping force for all emergent characteristics (Charles, Drenth & Henk, 2013; Hatch & Cunliffe, 2012).

Yet, currently defined functional relationships fail to address interleaved macrolevel subsystem forces framing emergent characteristics surrounding KT (Charles et al., 2013). Over time, organizations often fail to consistently foster KT, diminishing continuous evolution of emergent OI. As a consequence, organizational dynamics and emergent organic forces create altered individual and group level SM and SG that remain unclear and not fully understood (Sharma & Good, 2013).

I define an organization’s subsystem phenomenon as a set of ICAS forces within an organic knowledge ecosystem in relation to KT (Hatch & Cunliffe, 2012). Consequently, each emergent subsystem phenomenon becomes integral to understanding how organizational knowledge-work activity systems flow knowledge across the organization (Kozlowski & Chao, 2012). A multidimensional KMS model therefore requires a series of adaptive ICAS organizational-subsystem lenses to more meaningfully visualize complex knowledge network flows (Ahuja et al., 2012; Hatch & Cunliffe, 2012; Linger et al., 2007).

The resultant design could potentially provide organizational leadership new perspectives of KT within their organization. Subsequently, new perspectives could provide management the opportunity to more effectively control and frame the organization’s dynamics that enable, enhance, and/or inhibit knowledge emergence and knowledge flow (Hussin, Razak, & Assegaff, 2012).

The proposed model does not represent all facets of organizational dynamics and emergent organizational forces surrounding an organization’s knowledge. The primary objective was to demonstrate the multidimensional knowledge ecosystem model potential to more meaningfully represent key emergent and organic organizational forces surrounding knowledge emergence. New interpretations could improve management’s control of KT and subsequently improve the consistent emergence of innovative OI. The potential end result would be reduced loss of IC over time.

The ICAS therefore provides the most relevant theoretical framework for developing an enhanced multidimensional KM perspective to illustrate the organization’s knowledge ecosystem (Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Linger et al., 2007). Reinforcing action learning loops connecting multiple activity systems spanning all levels of the organization can be viewed from the perspective of an organization’s subsystem dynamics (Hatch & Cunliffe, 2012; Linger et al., 2007).

Existing KMS theoretical design could be enhanced with each set of additional multidimensional perspectives, i.e., *lenses* (Ashoori & Burns, 2013; Choi, 2014; Lyles, 2014). Each lens would thus represent varying interplays of organizational subsystem dynamics, dynamics that are inherently complex and organic (Ahuja et al., 2012; Hatch & Cunliffe, 2012; Kozlowski & Chao, 2012).

Such an enhanced ICAS model could also provide new insight into the knowledge creation focal point, specifically the individual ideation locus. The individual cognitive boundary has been framed within a larger group level cognitive boundary, thereby linking optimum idea generation directly to activity system workflows (Briggs & Reinig, 2012). Framing cognitive boundary ideation can also be seen within an organization-level adaptive social context (Hussin et al., 2012; Jacks et al., 2012). Individual and group ideation has been linked directly to an organization's learning capabilities (Argote, 2012).

Historically, an organization's learning capabilities were conceptualized as five distinct organizational values inherently linked to knowledge emergence (Alavi et al., 2005). These values included a) expertise, b) formalization, and c) innovativeness at the macro-organizational level. Macro-organizational values were viewed in dynamic tension with a) collaboration and b) autonomy at a more localized or micro-organizational level. The macro-organizational value innovativeness was framed in context to a nonstatic state of becoming (Alavi et al., 2005).

Finding roots in Nonaka and Takeuchi's (1995) historical Knowledge Spiral, Choo's historical SM KM Model linked decision making and creating knowledge to explicit shared social spaces (Choo, 1998). Emergent shared meanings linked to organizational values fostered knowledge created within these shared social spaces

(Choo, 1998). Choo's SM construct was interpreted in this context as a loose coupling process (Dalkir & Liebowitz, 2011).

Loosely coupled SM processes were further differentiated in terms of SM and SG by specific organizational leadership characteristics (Dalkir & Liebowitz, 2011; Maitlis & Lawrence, 2007). Organizational leadership SG was framed within shared learning spaces to create specific individual SM outcomes (Maitlis & Lawrence, 2007; Sharma & Good, 2013).

Shifting forward into more contemporary KM theoretical design, the Information Space (I-Space) KM Model viewed knowledge as a function of senders and receivers sharing common contexts and coding schemas (Boisot et al., 2007). An Information Space (I-Space) knowledge cycle could be viewed as a series of social cognitive activities coupling prior knowledge, such as organizational memory, with shared contexts to create emergent, social, organizational learning (Ackerman & Halverson, 2000; Boisot et al., 2007). SG can be viewed in an SG–SM function containing congruent messages within a rhetorical process between sender and receiver, socially connected in a shared learning space (Boisot & Sanchez, 2010; Maitlis & Lawrence, 2007; Sillince, 2005).

A similar epistemological perspective emerges in complex semantic space visualizations linking both human and cyber senders and receivers within socially complex knowledge networks (Ahuja et al., 2012; Boisot & Sanchez, 2010; Zhuge, 2014). Accordingly, an organization's KM governance should include various information flow controls as foundational to nurturing sender-receiver interpretations.

Information flow controls could enhance SG–SM congruence spanning increasingly complex knowledge networks (Boisot & Sanchez, 2010; Smerek, 2012; Zhuge, 2014).

Literature Review

Each major KM theoretical design or model discussed was based on knowledge as emergent within a knowledge life cycle (Dalkir & Liebowitz, 2011). Historically, KM implementations framed knowledge for efficient decision making and effective process control. Yet, not until recent third age KM design has changing paradigms within academia and industry shifted scholar's research and practitioner's focus beyond process control.

Conceptually, KT now includes adaptive organizational structures framed by complex social networks, i.e., the emergent knowledge flow epicenter (Ahuja et al., 2012; Dulipovici & Robey, 2012; von Krogh et al., 2013). Practically, emergent organizational characteristics underpin knowledge flow dynamics that commonly span interorganizational relationships (Choi, 2014). Within the current age of KM, however, management requires new and more comprehensive perspectives of their organization's knowledge cycle (von Krogh et al., 2012).

Knowledge cycles represent emergent knowledge becoming explicit when creating organizational learning (Argote, 2012; von Krogh et al., 2012). Viewing knowledge as an emergent social phenomena, the ICAS organization perspective still provides a context-rich framework for integrating organizational emergent activities with SM behaviors (Bennet & Bennet, 2004) (See Figure 1).

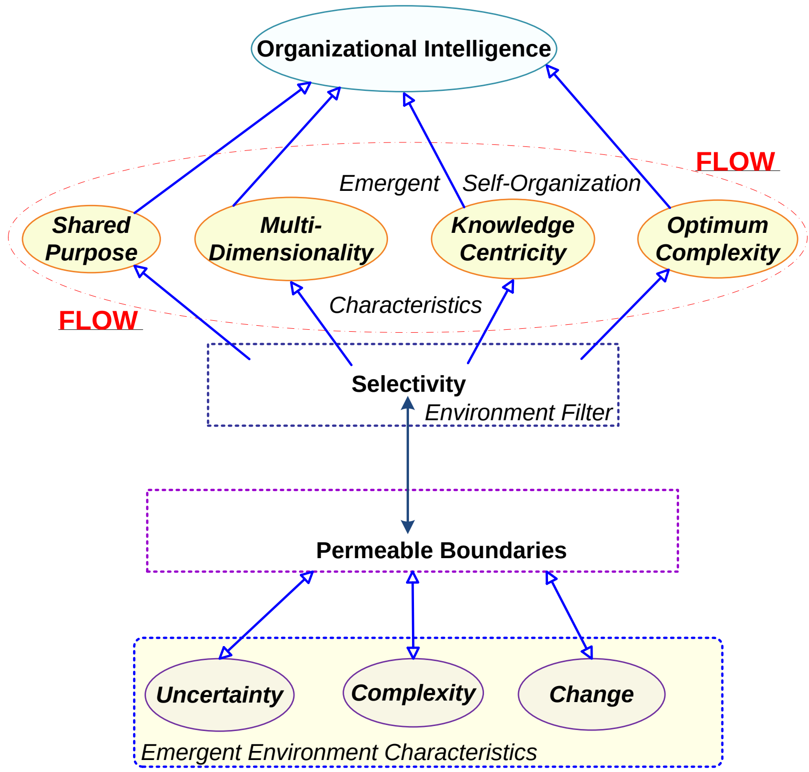


Figure 1. Organizational ICAS KM dynamic (Bennet & Bennet, 2004, pp. 28-32).

The ICAS thus becomes an appropriate foundation for extending a KMS design infused with enhanced understandings visualizing the organization's emergent knowledge ecosystem (Bennet & Bennet, 2004; Linger et al., 2007). Enhanced understandings merged into an extended ICAS design include

- action-learning feedback loops (Linger et al., 2007);
- organizational work systems as foundational to all information systems (Alter, 2005);

- knowledge exchange governance and control structures spanning increasingly complex organizational work activities within expanding social contexts (Borgo & Pozza, 2012; Flaherty & Pappas, 2012; Turner & Makhija, 2007);
- increasingly complex cognitive boundary alignments premised on individual and organizational memory (Ackerman & Halverson, 2000; Briggs & Reinig, 2010; Jackson, 2012; Padova & Scarso, 2012; Rowlinson et al., 2012);
- activity and informational SG and SM (Choo, 1998; Sharma & Good, 2013); and
- organizational knowledge flows spanning time, distance, and increasingly larger structural contexts, representing an emergent knowledge flow continuum (Lipparini et al., 2013; Miranda et al., 2011; Nissen, 2006; van Wijk et al., 2012; von Krogh et al., 2012).

Each enhanced understanding can be viewed through one or more lenses representing organizational subsystem phenomena, where social, political, structural, and informational subsystem phenomena blur within cultural subsystem phenomena (Hatch & Cunliffe, 2012). Culture, when viewed through organizational theory, becomes a force nucleus significantly impacting knowledge emergence, regardless of visual representation (Hatch & Cunliffe, 2012; Jacks et al., 2012). Consequently, each organizational subsystem phenomenon provides unique cultural attributes as well as dynamic and systemic tensions surrounding those attributes for enhancing knowledge emergence understandings (Chowdhury, 2005; Hatch & Cunliffe, 2012; Jacks et al., 2012; Leidner & Kayworth, 2006).

Change, complexity, and uncertainty, the three emergent environment ICAS forces, directly impact the remaining ICAS organization’s emergent forces. OI was visualized as the apex emergent ICAS characteristic, a prerequisite for optimal organizational performance (Bennet & Bennet, 2004). Optimal organization performance included creativity and problem solving directly affecting right decisions, in turn affecting right actions (Bennet & Bennet, 2004). Optimal performance was conceptualized therefore as the target OI outcome or goal. ICAS Permeable boundaries and selectivity bridged emergent organizational characteristics from the environment with the four emergent and self-organizing ICAS forces that included shared purpose, multidimensionality, knowledge centricity, and optimum complexity (Bennet & Bennet, 2004).

The three emergent characteristics stemming from environmental conditions, as well as the four emergent self-organizing ICAS forces, collectively underpinned right decisions and right actions. Right actions and right decisions provided strong influence upon subsequent SM and emergent OI via information feedback loops, providing enhanced understanding (Bennet & Bennet, 2004). Information-based feedback loops infused with meaningful information-based governance controls thus become integral to a more comprehensive or enhanced KMS design (Linger et al., 2007; Turner & Makhija, 2006).

The Knowledge Ecosystem

The knowledge ecosystem evolved from mapping grounded KM academic theory with contemporary KM industry best-practice, resulting in the Australian KM Standard

(AS5037-2005) (Linger et al., 2007). The Australian KMS ecosystem design was strongly influenced by Nonaka and Takeuchi's (2005) knowledge spiral as well as Snowden's (2002) complexity theory (Linger et al., 2007). Three cyclic foundational KM phases included mapping, building, and operationalizing. The cyclical visualization emphasized that any KM process is organizationally context unique, and as such organic and emergent. Thus, the KM process should be viewed as a set of knowledge mechanisms to be controlled directly (Linger et al., 2007; Weichhart, 2013).

SM and SG organizational enhancers and enablers should become integral to each increasingly complex level of an organization's socialization (van Wijk et al., 2012; von Krogh et al., 2012). Within these increasingly complex socialization dynamics, organizational knowledge flow-controls directly impact knowledge flow times (Ahuja et al., 2012; Nissen, 2006; Turner & Makhija, 2006). Linger et al. (2007) synthesized two commonly acknowledged theoretical frameworks for approaching these increasingly complex levels representing organizational socialization. Each was dynamically linked within an emergent knowledge locus.

The first theoretical framework was the activity-based framework stemming from the Cultural-Historical Activity Theory, or simply Activity Theory, where dialectic social relationships extended individual thinking and doing towards an experiential and social outcome (Linger et al., 2007). Secondly, the Task-based Knowledge Management (TbKM) framework defined knowledge work in terms of thinking and doing. Knowledge work versus knowledge objects and subjects became the management focal point (Linger et al., 2007). The Australian KM Standard appropriately incorporated elements, enablers, and drivers with boundary-spanning forces surrounding each unique KM culture and organizational KM capability. Collectively, these dynamic relationships were visualized within the Australian KM Standard as a KM Ecosystem (Linger et al., 2007) (See Figure 2).

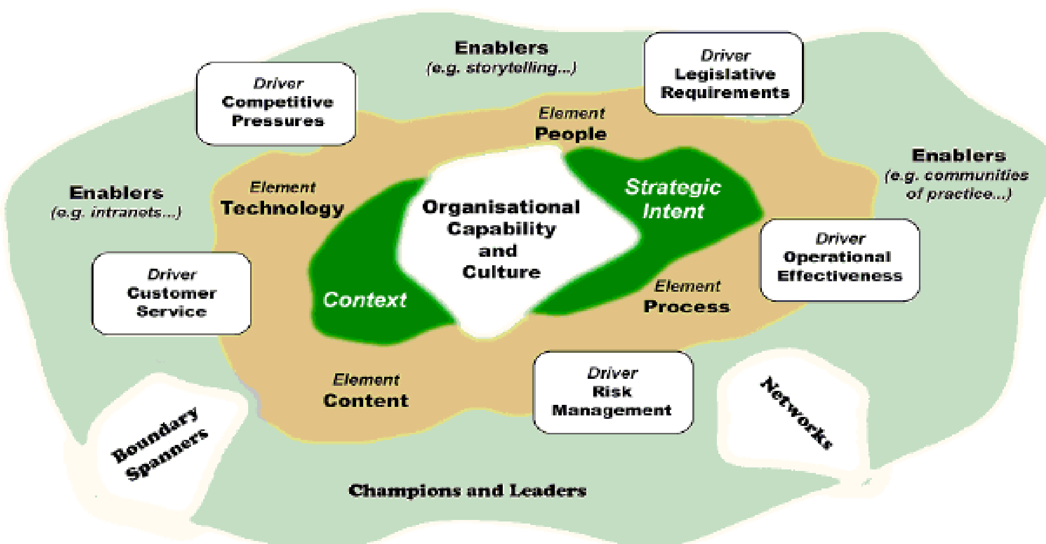


Figure 2. Australian KM ecosystem visualization (Linger, Hasan, & Burstein, 2007, p.65).

The TbKM framework was modeled as two nested and interrelated layers, a doing layer and a thinking layer (Linger et al., 2007). The pragmatic layer (doing) focused on the organizational task, the process of activities with associated outcomes, nested within the conceptual (thinking) layer. The conceptual layer involved knowledge processes and structures connected in dyadic relationship with pragmatic activity in the form of tasks moderating knowledge process. Knowledge structure further moderated pragmatic activity (Linger et al., 2007).

A resultant knowledge work concept mapped TbKM to Activity Theory, framing a central discourse of knowledge work that bridges a) Activity Theory objects, b) cultural-historical artifacts, and c) knowledge to a) TbKM decisions, b) memory, and c) management. Emergent learning and organizational performance, unique to any given knowledge work discourse, become the two primary discourse outcomes (Linger et al., 2007) (See Figure 3).

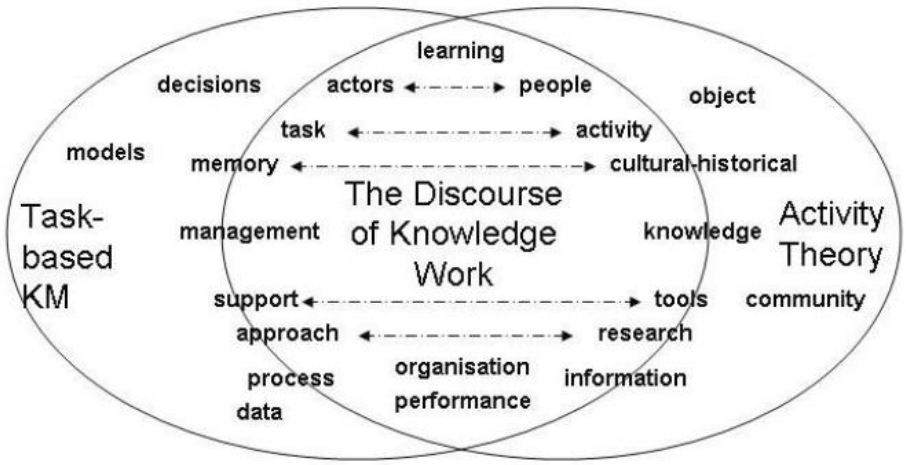


Figure 3. Discourse of knowledge work (Linger, Hasan, & Burstein, 2007, p.72).

The Australian KM ecosystem design included six key KM cultural attributes that positively influenced organizational learning within diverse organizational networks, including a) empowerment, b) cultural cohesiveness, c) trust, d) forgiveness, e) commitment, and f) decision-making openness (Linger et al., 2007). Additionally, key social learning enablers had to be present for effective social learning. Enablers included a) satisfactory work force policies, b) supporting capabilities, and c) team building as well as d) professional development competencies (Linger et al., 2007). Linking these dynamically inter-related organizational learning influencers and enablers created three concurrent levels of KM approach to foster a learning organization (Linger et al., 2007).

At the macrolevel, the KM ecosystem knowledge discourse mapping aggregated external forces and organizational readiness assessment (Linger et al., 2007). From an activity-based perspective (Activity Theory), three interacting layers including culture, capability, and pragmatics created a context for goal-specific actions resulting in organizational learning. Motivators, enablers, challengers, and inhibitors were visualized as moderators of goals and specific actions. Within specific actions, key operational conditions moderated organizational culture, capability, and pragmatics. Of significance, the unit of analysis was always the activity (Linger et al., 2007).

Activity Theory, in context to an activity system, identified KM tools and community structure conducive to the core KM activity, i.e., organizational learning. In light of complexity theory, attractors and boundaries should be established to allow a fertile social learning environment to emerge. Establishing organic processes around boundaries and attractors should foster a fertile social learning environment rich for creating a cultural change locus, subsequently positively influencing KT (Amani, 2010; Blumer, 2011; Choi, 2014; Zhuge, 2011).

At the most granular Australian KM ecosystem level was the TbKM activity system (Linger et al., 2007). Organizational, group level, and individual perspective each represented a unique TbKM activity system (Linger et al., 2007). This organizational activity system collective moderated organizational goal achievement (Linger et al., 2007). Each TbKM activity system had its own unique KM discourse, from production at the individual perspective to collaboration at the group perspective, culminating in capability at the organization's perspective.

Organizational learning-related tasking and structure were viewed as necessary at each activity system level in a formal knowledge discourse (Linger et al., 2007). Each formal knowledge discourse provided a downward looping flow of learning coordination and control with a corresponding and countervailing upward feedback loop. The upward feedback loops included updated standard operating procedures with inherent SM (Linger et al., 2007). Creating SM enablers and enhancers while diminishing SG inhibitors within each countervailing discourse feedback loop should thus become an organizational control best practice.

Knowledge discourse was but one side of organizational learning. On the TbKM activity systems social learning side was a dynamic feedback looping system closely aligned with cultural SM and SG (Linger et al., 2007; Maitlis & Lawrence, 2007). Nonaka and Takeuchi (1995) represented this construct as tacit knowledge socialization and internalization. Choo (1998) subsequently conceptualized this construct within a cultural knowledge creation dynamic connecting SM and decision making.

In all perspectives, social learning was more organic and less process oriented. An enhanced KMS design framing organic ICAS emergent knowledge should infuse SM and SG within both knowledge flow controls, the knowledge discourse, as well as the knowledge perspective, the domain of tacit-explicit flux knowledge. At the learning feedback loop's center, whether perspective or discourse, was organizational culture and values (Linger et al., 2007) (See Figure 4). SM and SG information coordination and control remains essential within both learning feedback loop structures, the task-related process learning side and the social learning side, (Linger et al., 2007; Sharma & Good; 2013; Smerek, 2011).

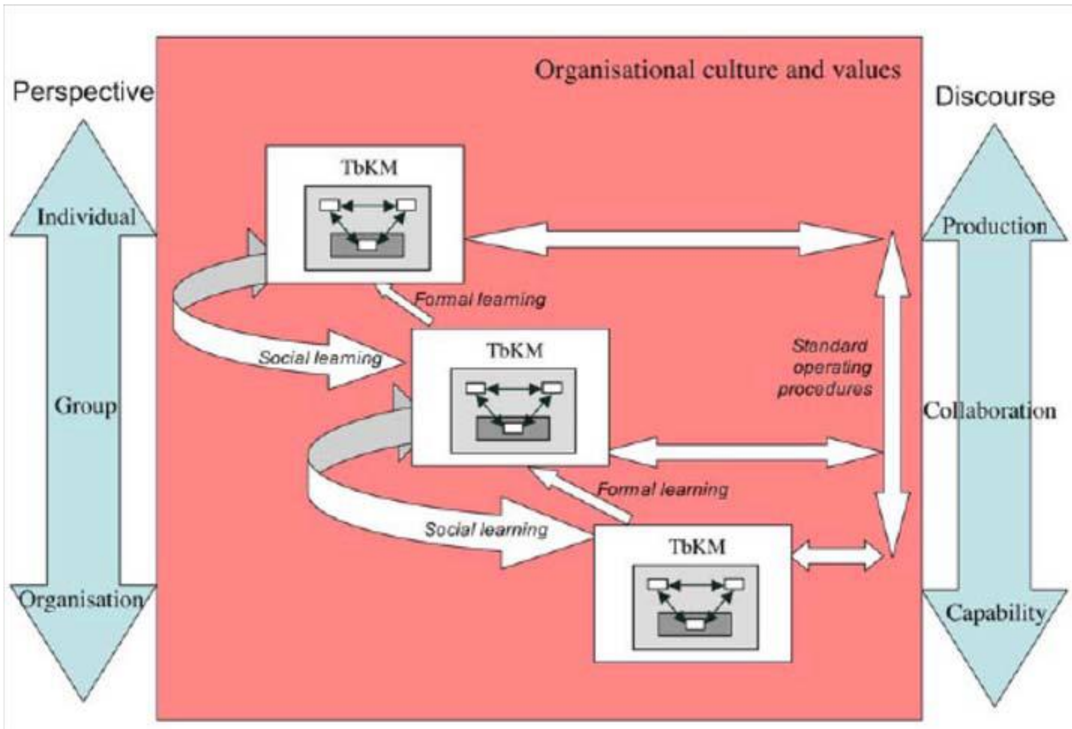


Figure 4. Learning organization KM architecture (Linger, Hasan, & Burstein, 2007, p. 80).

Cognitively Demanding Knowledge Work

Within the KM ecosystem, cognitively demanding knowledge work requires complex technical judgments premised on high degrees of professional and personal expertise and experience (Linger et al., 2007). Expertise and experience frame individual cognitive capabilities (Briggs & Reinig, 2010; Ackerman & Halverson, 2000). Additionally, cognitive capabilities also emerge as group-level knowledge, i.e., transactive memory (Kozlowski & Chao, 2012). Transactive memory can be correlated to an optimum team-based ideation function (Briggs & Reinig, 2012).

However, any ICAS emergent knowledge characteristic “is assumed theoretically, but is not directly observed” (Kozlowski & Chao, 2012, p. 340). As a result, directly observing knowledge in various emergent contexts and forms remains elusive. As a result, KT is typically measured in some form of outcome measurement (Andersson et al., 2015). An enhanced ICAS KM framework should include more direct visualization capability for all individual and group-level emergent knowledge. Direct visibility into ICAS knowledge flow potentially could reveal knowledge emergence surrounding an optimum problem-solving ideation solution set, the quintessential objective of optimized Bounded Ideation Theory (BIT) boundaries (Briggs & Reinig, 2010).

Firstly, Briggs and Reinig (2010) graphed cognitively demanding knowledge-work as an ogive, or bridging arch that linked six distinct cognition boundaries. The cumulative ideas on an x-axis were moderated by five cognition boundaries, resulting in cumulative good ideas on the y-axis. This relationship was strongly influenced by Osborn’s Conjecture (Briggs & Reinig, 2010). Between individual cognitive ability as the reference point, the first ideation boundary, and a resultant group-level ratio of good ideas to total ideas as the end point, the five moderating factors represented by the remaining five ideation boundaries collectively shaped the resultant ideation function (Briggs & Reinig, 2010, p. 127).

The individual *ability boundary*, the ideation starting point, defines ability as a function of intelligence, domain-relevant expertise, and working memory management, including the memory activity construct in relation to forming complex concepts (Briggs & Reining, 2010). At each increasingly complex socialization level, memory as an artifact maintains its state while being simultaneously embedded in many social processes (Huang, Fan, Chern, & Yen, 2012; Jackson, 2012). This individual and organizational memory in flux construct could be applied uniquely to the five remaining moderating ideation boundaries to further qualify knowledge enablers, enhancers, and inhibitors (Huang et al., 2012; Sharma & Good, 2013).

Secondly, the *solution space boundary*, the first boundary moderating individual ability, is a function of maximum potential ideas (Briggs & Reinig, 2010). Within this boundary domain, *open-ended* and *closed-ended* tasks each uniquely qualify the possible number of total ideas (Briggs & Reinig, 2010). Open-ended tasks can be viewed from a task-based theoretical perspective in context to organizational memory and decision complexity. Decision complexity and resultant transactive memory interacts with closed-ended tasks directly relating to very specific activities within a TbKM knowledge discourse (Briggs & Reinig, 2010; Linger et al., 2007; Padova & Scarso, 2012).

Open-ended tasks represent an “unlimited number of workable solutions” (Briggs & Reinig, 2010, p. 128). Additionally, implied open-ended tasks also represent tasks that require complex organizational memories to be managed as memory boundary objects (Ackerman & Halverson, 2000; Jackson, 2012; Rowlinson et al., 2010). Within the knowledge cycle, regardless of cycle conceptualization and knowledge creation construct, ideation boundaries surround organizational memories, specifically in relation to memory boundary objects (Ackerman & Halverson, 2000; Briggs & Reinig, 2010; Choi, 2014).

Closed-ended tasks relate directly to discrete TbKM activities where information and tools could be applied to effectively identify the optimum solution space within a small, finite set of alternatives (Briggs & Reinig, 2010; Linger et al., 2007). Open-ended and closed-ended tasks can thus be correlated to task-based knowledge management (TbKM) theory and Activity Theory, respectively (Briggs & Reinig, 2010; Linger et al., 2007). Each represents a counter-point in the knowledge work discourse (Linger et al., 2007).

Thirdly, the *understanding boundary*, regardless of cognitive ability, represents good idea generation as directly proportional to understanding the defined problem (Briggs & Reining, 2010). An optimum good idea solution set requires sufficient understanding of any given problem surrounded by organizational events, collectively viewed as an organization phenomenon. In this context, framing appropriate understandings can be viewed most meaningfully through the SM and SG ICAS lenses (Sharma & Good, 2013; Smerek, 2011).

Therefore, individual SM directly relates to individual SG, subsequently directly moderating group SM (Maitlis & Lawrence, 2007; Smerek, 2011; Weick, 2012). However, not all instances of SM involve this additional level of group SG (Flaherty & Pappas, 2012). Accordingly, SM was understood to be an organizational outcome whereas SG was viewed as both an individual and group facilitating process emerging from an understanding gap, triggered to facilitate appropriate levels of individual and group SM (Maitlis & Lawrence, 2007; Smerek, 2011; Weick, 2012).

From a knowledge discourse perspective, SG information at the individual activity and decision-making level can thus augment organizational SM task guidance at a process level (Linger et al., 2007; Turner & Makhija, 2006). SG and SM can correlate directly to work system activities, more precisely processes that contribute to any given information system success (Sharma & Good, 2013; Smerek, 2011; Weick, 2012).

Historically, information systems were understood to be comprised of work system activities as excluding communication, social relationships, and thinking *not* directly related to the processing of information (Alter, 2005). Within any given knowledge cycle, therefore, SG and SM information related to social relationships and cognitive boundary alignments can be seen to represent critical information system activities as a function of the organizational information subsystem phenomena (Alter, 2005; Briggs & Reinig, 2010; Hatch & Cunliffe, 2012; Sharma & Good, 2013).

Consequently, SG and SM information transfer within an ICAS KM framework significantly contributes to emergent knowledge self-organization (Bennet & Bennet, 2004; Sharma & Good, 2013). Perhaps more importantly, our understanding of emergent self-organization within the ICAS can be viewed most meaningfully within empty flow spaces requiring specific information-based control structures (Nissen, 2006; Turner & Makhija, 2006).

Fourthly, the *attention boundary* is premised on the limits of working memory (Briggs & Reinig, 2010). Briggs and Reinig (2010) defined a set of four cognition dynamics which collectively frame the optimum idea solution set:

- Sequential concept generation, such as spreading activation based on available stimuli to activate additional knowledge.
- Lack of additional stimuli, specifically cognitive inertia as a function of stimuli saturation.
- Solution space complexity or ambiguity as a function of the problem space, where increasingly complex problems create increasingly complex solution spaces.
- Knowledge work activities consuming limited attention resources such as those imposing cognitive load.

Each cognition dynamic impacts the number of good ideas an individual generates, in turn directly impacting an individual's SM and subsequent SG. As the attention boundary reaches a saturation point, an individual's SM was seen to diminish, further inhibiting group-level SG (Briggs & Reinig, 2010). As a result, the challenge with SM framed by appropriate SG information is to ensure appropriate member and leader SG enablers are present in the problem space to minimize attention boundary saturation (Maitlis & Lawrence, 2007; Sharma & Good, 2013).

Interestingly, these specific enablers, including leadership legitimacy and member expertise can be enhanced with specific rhetorically congruent messages spanning four rhetorical processes, each becoming effective contingent upon organizational structure, routines, and practices (Sillince, 2005; Smerek, 2011). As such, SG enablers spanning discursive abilities and process facilitators should become attributes of any rhetorically congruent process to enhance leadership SM controls within a complex problem space (Briggs & Reining, 2010; Lyles, 2014; Taylor, 2013; Weick, 2012).

Fifthly, the *goal congruence boundary*, premised on social factors, assumes that social factors and individual goal congruence moderate individual and group-level knowledge work ability, dependent on perceived benefit created by additional contributions (Briggs & Reinig, 2010). Goal congruence is thus directly linked to social and cultural values, integral to TbKM knowledge work infoculture, and further linked systemically to surrounding group-level and organizational-level goals (Hussin et al., 2012; Rigaud-Tellez & Hernandez, 2012).

Organization-level controls could be viewed as outcome controls, as well as process and group level moderating controls, more specifically *clan controls* that collectively link organization-level controls with knowledge (Turner & Makhija, 2006). Interestingly, outcome control could correlate directly to specific work outcomes within discrete work activities for any given knowledge discourse (Linger et al., 2007; Flaherty & Pappas, 2012).

Yet, the imperfect knowledge domain where the understanding boundary is governed primarily by individual SG and individual SM represents the problem space where the most direct, individual-level SM controls are required, precisely the objective of clan controls (Briggs & Reinig, 2010; Maitlis & Lawrence, 2007; Turner & Makhija, 2006). Clan controls uniquely represent very specific *micro-meso* knowledge flow-control dynamics around an individual's unique understanding boundary (Kozlowski & Chao, 2012; Turner & Makhija, 2006).

At the intersection of imperfect organizational-outcome knowledge and imperfect individual process-related knowledge, tacit knowledge (TaK) predominates SG at the individual level (Turner & Makhija, 2006). Concurrently, TaK predominates SM at the individual and micro-meso organizational level, i.e., the microTbKM activity system level (Kozlowski & Chao, 2012; Turner & Makhija, 2006).

Within this tacit-dominant problem space, cultural and social values that are both organizational, i.e., macro-meso, and local or micro-meso should transfer therefore into the problem space to augment individual SG (Alavi et al., 2006; Kozlowski & Chao, 2012; Maitlis & Lawrence, 2007). Thus, within the tacit-dominant problem space clan controls can most effectively facilitate goal congruence between organizational knowledge emergence outcomes and individual SM activities (Briggs & Reinig, 2010; Sharma & Good, 2013; Turner & Makhija, 2006).

Yet, in problem spaces where explicit knowledge (ExK) predominates or is more readily available, process and outcome controls can positively augment the ideation goal congruence boundary (Briggs & Reinig, 2010; Flaherty & Pappas, 2012; Lyles, 2014). Knowledge within a work activity system is an emergent social dynamic. Controls within complex social dynamics should span an organization's structural boundaries as well as underpin affective and cognitive aspects of key social relations (Kang, Morris, & Snell, 2007; Kozlowski & Chao, 2012). Such organizational structural boundaries should become more fluid or organic as the problem space shifts to more complex and tacit-dominant problem spaces (Leonardi & Meyer, 2015; Lyles, 2014; Soda & Zaheer, 2012).

Lastly, the *exhaustion boundary* simply correlates mental and physical fatigue with reduced quality idea generation (Briggs & Reinig, 2010). Of significance, however, is the relationship between mental fatigue and reduced workplace performance. The root cause of reduced workplace performance was linked to a significantly reduced good idea solution set, further linked directly to lack of consistent and effective knowledge emergence (Briggs & Reining, 2010).

Bounded ideation theory thus directly correlates SG and SM with increased number of quality ideas (Briggs & Reinig, 2010; Sharma & Good, 2013; Weick, 2012). Six possible organizational intervention points provide opportunity for improving the ratio of good ideas to total ideas (Briggs & Reinig, 2010).

From an ideation process design perspective within an enhanced ICAS KM design, five organizational intervention points remain most significant and include

- moving to an open-ended task framework;
- testing sense making early to accelerate towards shared understanding;
- exploring methods addressing attention boundary saturation, such as reducing load on working memory;
- increasing stimuli diversity to think outside the box by reducing cognitive inertia, i.e., thinking inside the box; and

- avoiding physical and mental exhaustion to degree possible, recognizing exhaustion impact on additional good idea generation (Briggs & Reinig, 2010).

However, these represent only a subset of possible interventions (Briggs & Reinig, 2010). The ICAS selectivity dynamic within an enhanced ICAS KM design could include and expand upon the above intervention points thereby more tightly coupling organizational ICAS permeable boundaries and selectivity with environmentally emergent creativity, complexity, and change dynamics, linking interventions directly to organizational subsystem attributes (Bennet & Bennet, 2004; Hatch & Cunliffe, 2012).

The Australian KM ecosystem locus of social learning was viewed as organizational capability and culture bounded by organizational context and strategic intent influenced directly by organizational elements (Linger et al., 2007). The social learning locus represented by the convergence of knowledge doing and cognitively intense activities within a specific work context could become a meaningful intervention target point (Briggs & Reinig, 2010; Linger et al., 2007).

At the convergence point or locus of social learning, from a knowledge-work system perspective, ICAS selectivity can be directly linked to permeable boundaries through the ICAS organization's subsystem phenomenon (Alter, 2005; Bennet & Bennet, 2004; Hatch & Cunliffe, 2012). Accordingly, rhetorically congruent SG processes in the form of organizational outcome, process, and clan controls should become integral to SM and SG within a TbKM work space (Maitlis & Lawrence, 2007; Sillince, 2005; Turner & Makhija, 2006; Weick, 2012).

Collectively, these dynamic and systemic relationships can be visualized in a proposed workflow enhanced ICAS KM design (See Figure 5). Organizational ICAS Flow in this enhanced representation aggregates knowledge, activity, and resource flows.

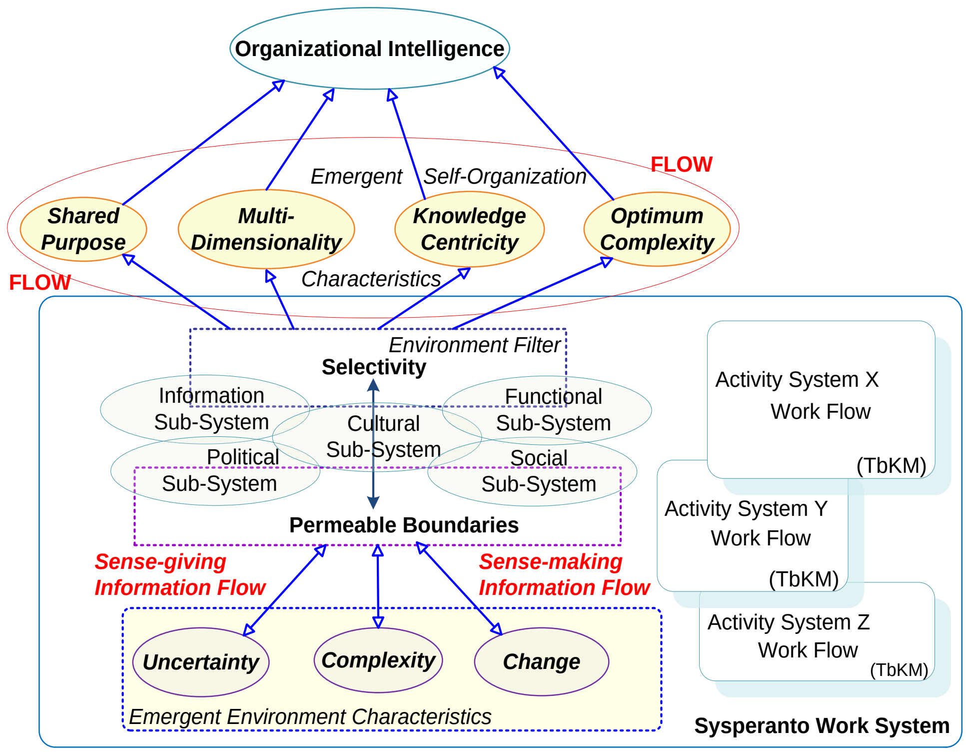


Figure 5. Enhanced ICAS KM theoretical framework.

Within the proposed enhanced KMS design, ideation interventions and knowledge flow can be dynamically linked to qualify ideation efficiency within any given activity system instantiation (Briggs & Reinig, 2010; Linger et al., 2007; Nissen, 2006). The value of ideation efficiency was postulated from two perspectives. Firstly, groups will not have to expend as much time and effort to find their good ideas, and; secondly, during follow-on ideas less cognitive effort will be required to extract a given set of good ideas (Briggs & Reinig, 2010).

From a rhetorical congruence theory perspective, SM information linked to an organization's success requires managing change in terms of creating shared purpose (Bennet & Bennet, 2004; Sharma & Good, 2013; Sillince, 2005). Representing this activity as a discourse function, ICAS Flow (IFlow) control dynamics directly moderate emergent social subsystem characteristics (Bennet & Bennet, 2004; Linger et al., 2007; Nissen, 2006; Sharma & Good, 2013; Sillince, 2005; Turner & Makhija, 2006).

Clan controls as the moderating force infused in specific SM flow controls could become a key connecting construct throughout all TbKM discourse activities within an enhanced ICAS KM framework. For example, bridging emergent ICAS characteristic relationships, such as ICAS shared purpose and knowledge centricity with TbKM discourse activities, requires specific micro-meso KT controls, the domain of clan controls (Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Turner & Makhija, 2006).

Dependent upon the problem space complexity, as a function of available tacit (TaK) and explicit knowledge (ExK), specific controls can be applied to frame shared understandings (Mangia et al., 2013; Minbaeva et al., 2012; Sharma & Good, 2013; von Krogh et al., 2012). Controlling rhetorically congruent SG messages and knowledge flow times against ideation process interventions could potentially frame a related set of ideation moderating boundaries for each of the organizational subsystem dynamics within a workflow enhanced ICAS KM design.

A key assumption is that individual and organizational knowledge can be viewed as both object and continuum of flow, able to be captured in some explicit form at some point in time within this continuum. Yet, a strong argument has been created framing knowledge as emergent in neither static state nor form, yet exists as both in a dynamic, non-static relationship; a result of an “ephemeral, active process of relating” (Snowden, 2002, p.5). In this context, knowledge can be viewed as a paradox when attempting to frame and control knowledge emergence and transfer within any given knowledge ecosystem. Thus, the construct of a governed knowledge mechanism in any KMS design becomes problematic.

Knowledge Management Paradoxes

As a result, persistent KM paradoxes directly impact our understanding of knowledge and knowledge cycles (Chae et al., 2005; Langley et al., 2013). Although not termed a paradox, organizational knowledge creation was perceived historically as a “continuous and dynamic interaction between tacit and explicit knowledge” (Nonaka & Takeuchi, 1995, p. 70). Subsequently, Snowden (2002) visualized knowledge as simultaneously a thing and a flow where knowledge is in flux between these two nonstatic knowledge characteristics, thus a paradox. Knowledge emergence is knowledge in flux, i.e., a knowledge paradox within organizational *Ba*, the organizational locus of knowledge meaning-making (Von Krogh et al., 2012).

Nissen (2006) visualized dynamic knowledge as both thing and flow as knowledge flow time empty spaces. Thus, knowledge as a paradox requires deeper insight into three key KM heuristics to more effectively manage organizational knowledge in flux:

- knowledge can only be volunteered, not conscripted;

- individuals and groups always know more than they can tell, and will always tell more than they can write; and
- individuals know what they know but only when need arises, as knowledge is triggered within the experienced situation (Snowden, 2002).

Consequently, Snowden's three KM heuristics underpin the fundamental knowledge paradox as a social phenomenon of relating, triggered by situational context, and therefore neither completely tacit nor completely explicit in any given situation (Chae et al., 2005; von Krogh et al., 2012). Social network theory and actor network theory (ANT) collectively frame complex social phenomena relating individual and group behaviors and knowledge emergence (Chae et al., 2005).

Premised on a pluralistic view of knowledge, organizational behaviors within social networks concurrently create five related KM paradoxes, including paradoxes of a) belonging, b) knowledge, c) organizing, d) networking, and e) KM systems in general (Chae et al., 2005). Understanding these historical knowledge paradoxes remains relevant for enhancing contemporary ICAS KM design.

To illustrate, the *belonging paradox* spans organizational dynamics relating to boundaries, cooperation, and interests (Chae et al., 2005). Although currently distinct and clearly bounded in an organizational perspective, the belonging paradox focusing on individuals, work groups, and organizations remain blurred in context to organizational learning (Kozlowski & Chao, 2012; Lyles, 2013).

Within the dynamic organizational learning continuum, tensions in the form of a paradox arise in three contexts: (a) between fixed organizational boundaries and lack of boundary; (b) cooperation at the organization level and inherent individual competition regarding knowledge sharing, and; (c) community interest versus self-interest as learning focus shifts from organization to individual (Minbaeva, Mäkelä, & Rabbiosi, 2012; Chae et al., 2005).

Of significance, this set of paradox dynamics when framed in relation to transactive memory (Kozlowski & Chao, 2012), being neither explicit nor tacit, relates directly to

- knowledge about who within the organization is performing what task;
- who knows what about individual performance and task; and
- what are the social connections involved in that knowledge (Ahuja et al., 2012; Jackson, 2012; Rowlinson et al., 2010).

As a result, the dynamic interplay between social network type and knowledge was found to be too complex to fully operationalize (Chae et al., 2005; Huggins, Johnston, & Thompson, 2012; Lipparini, Lorenzoni, & Ferriani, 2013). Decision complexity was conceptualized within the ICAS organization as requiring unique cohesion management, remaining not clearly understood in relation to micro-meso compilation and composition emergence (Bennet & Bennet, 2004; Kozlowski & Chao, 2012).

The systems thinking model, however, although capturing the very essence of feedback loops, addressed only three dynamic feedback loops balanced with decision-complexity (Bennet & Bennet, 2004; Senge, 1994). By leveraging the enhanced dynamic relationships framed within a workflow-enhanced ICAS, key cultural and social organizational dynamics within a social network could be more effectively operationalized (Ahuja et al, 2012). Social networks are inherent to any organization's workflow, and the root challenge of the belonging paradox (Ahuja et al., 2012; Bennet & Bennet, 2004; Chae et al., 2005; Kozlowski & Chao, 2012).

Enhanced learning feedback loops should be coupled within complex social networks. Concurrently, complex socially-networked feedback loops should be coupled with knowledge flow controls. The resultant couplings potentially could provide additional insights into SG and individual SM message influence on KT, currently not clearly understood (Sharma & Good, 2013). Consequently, it may be possible to more meaningfully define the dynamic interplay between social network type and knowledge creation in the form of transactive memory, also not clearly understood (Jackson, 2012; Kozlowski & Chao, 2012; Rowlinson et al., 2010; Sharma & Good, 2013).

The key to operationalizing social and cultural organizational dynamics is maintaining links to all other subsystem forces at work in the organization, to include the power, functional, and informational subsystem phenomenon that collectively create unique and unexpected emergent behaviors (Hatch & Cunliffe, 2012). Emergent behaviors resulting from organizational subsystem dynamics could effectively be related to emergent self-organization characteristics within the ICAS. Such relationships could bridge organization theory and systems theory within a workflow enhanced ICAS KM design (Bennet & Bennet, 2004; Linger et al., 2007; Kozlowski & Chao, 2012).

Bridging organization theory and systems theory requires the power of the Sysperanto slice (Alter, 2005). A slice, although overlapping, provides a unique perspective of a particular set of "concepts, associations, and understandings" (Alter, 2005, p. 11). Bridging organizational dynamics from any unique organizational subsystem perspective to workflows within a TbKM activity system, the locus of knowledge emergence, can be accomplished by creating a unique Sysperanto slice relating to each uniquely defined organizational subsystem dynamic tension.

A Sysperanto work system is categorized by type in relation to nine elements, where each element represents a particular type of slice (Alter, 2005). Within Sysperanto, one or more slices may be subordinate to a specific work system element, or may apply to the entire work system type within the work system framework (Alter, 2005) (See Figure 6).

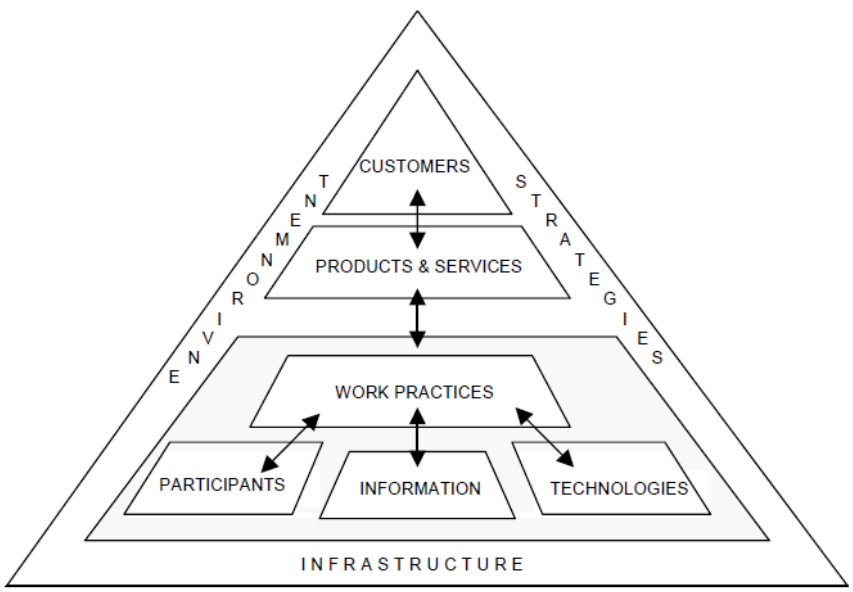


Figure 6. Sysperanto work system framework (Alter, 2005, p.12).

Within Sysperanto, a series of uniquely defined slices was framed as relevant to each of the nine work system elements within the work system framework, or pyramid (Alter, 2005). Of significance to mapping organizational subsystem dynamics to an enhanced ICAS KM design, relevant work practice slices could include communications, SM, coordination, and cognition activities (Briggs & Reining, 2010; Linger et al., 2007; Sharma & Good, 2013; Turner & Makhija, 2006).

Participant slices could potentially relate to activity based work levels, i.e., individual, micro-meso, and macro-meso TbKM activity systems (Kozlowski & Chao, 2012; Linger et al., 2007). Of the six slices related to the information element of a Sysperanto work system, workspace signals and cues are most significant in context to social norms and values associated with enhancing knowledge flows (Cavaliere & Lombardi, 2013; Lipparini et al., 2013; Nanclares et al., 2012).

The focus of this mapping exercise is to demonstrate the effectiveness of the Sysperanto workflow enhanced ICAS KM design to potentially mitigate the ambiguities found within the belonging paradox (Alter, 2005; Chae et al., 2005). The objective is not attempting to further define paradoxical transactive memory (Kozlowski & Chao, 2012; Choi, 2014). However, such mappings provide opportunity to frame the dynamics surrounding transactive memory. Framing emergence surrounding transactive memory could provide more meaningful understanding of how relevant dynamic forces impact timely transactive memory emergence and flow (Jackson, 2012).

Using Sysperanto slices within an activity-system enhanced ICAS KM creates a powerful multidimensional set of lenses through which to view the ICAS organization, and more precisely paradoxical transactive memory. Thus, the focus in operationalizing social norms and complex social networks associated with an organization’s emergent knowledge is simply to demystify the organization’s social network dynamics that surround transactive memory, currently not clearly defined (Ahuja et al., 2012; Lee et al., 2010).

The *knowledge paradox* was defined as an extension, in essence, of the belonging paradox (Chae et al., 2005). There are two foci for this paradox. The first focal point was represented by the dynamic tension between know-how and know-what, "where know-how is necessary for acquiring and utilizing know-what [and] know-what is a precondition for developing know-how" (Chae et al., 2005, p. 68). The second focal point, previously discussed in the belonging paradox, related to the dynamic tension between TaK and ExK in the form of transactive memory (Chae et al., 2005). At the root of this paradox was the issue of trust where a direct correlation existed between greater trust and increasingly complex knowledge (Chae et al., 2005).

From a historical perspective, increasingly complex knowledge was viewed within a distributed knowledge perspective in context to asymmetries in information distribution and information processing (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007). Synthesizing social combination models, transactive memory systems theory, group polarization theory, and persuasive arguments theory, the individual asymmetric information set contained unique decision-making benefits (Brodbeck et al., 2007).

Asymmetric information sets when distributed or shared, provided positive group decision-making influences and when not distributed inhibited group decision-making (Brodbeck et al., 2007). Any given information set was considered asymmetric when it was unique from the group-level information set. An information set was defined as being the decision-making information, such as transactive memory made available prior to as well as during the group decision-making process (Brodbeck et al., 2007; Jackson, 2012).

The dynamic link between transactive memory in relation to group diversity and group member expertise in resolving issues relating to hidden profiles remains relevant. Unshared and hidden profiles relate to asymmetric information sets, seen to create bias in decision-making outcome (Brodbeck et al., 2007). Trust was found to foster asymmetric information set sharing, as asymmetric information set distribution was defined as a function of confidence levels shared within the group regarding any given member's know-how and know-what. Perceived high-value now-how and know-what, more precisely expertise, related to greater confidence in the source asymmetric information set (Chae et al., 2005; Brodbeck et al., 2007). The significant and relevant connection is that asymmetric information set sharing in this context could also be viewed as a function of the BIT understanding boundary (Briggs & Reining, 2010).

BIT theory thus provides a reference set of individual cognitive boundaries and group-level cognitive boundary alignments directly relating to motivation levels and cognitive processes associated with asymmetric information set sharing, considered a future research area within the information asymmetries model (Briggs & Reinig, 2010; Brodbeck et al., 2007). At the intersection of blended SM and ideation, "unique knowledge from each individual [coupled with] SM is critical to success" (Briggs & Reining, 2010, p. 136).

The key is SM. Although SG triggers and SM enablers were postulated, the organizational forces surrounding SG and SM at any given point in time remained areas for additional research (Maitlis & Lawrence, 2007). More recently, SM in group decision-making remained not clearly understood in context to the many dynamic forces surrounding an organization's group-level and micro-meso SM (Briggs & Reinig, 2010; Kozlowski & Chao, 2012).

KT was modeled as a dyadic exchange where an organization's structural characteristics, relational characteristics, and knowledge characteristics were considered inter-related and foundational to understanding the mediating force of trust within the knowledge exchange (KE) process (Levin & Cross, 2004). Within a workflow enhanced ICAS, organizational subsystem dynamics can be bridged with work system slices into the ICAS environment's emergent characteristics as they intersect with the ICAS emergent self-organization characteristics.

Emergent characteristics visualized through an enhanced ICAS KM selectivity filtering process could more clearly frame organizational dynamics surrounding SG and SM (Sharma & Good, 2013; Weick, 2012). Trust is the KT mechanism epicenter surrounding SG and SM (Chowdhury, 2005; Jacks et al., 2012; Levin & Cross, 2004; von Krogh et al., 2012).

Openness is but one of many trust attributes within an ICAS organization's emergent social subsystem characteristics, requiring individual maturity level in awareness and knowledge (Briggs & Reinig, 2010; Fowers & Davidov, 2006; Jacks et al., 2012). Types of knowledge, such as TaK and ExK, were identified as a contingency within a model where TaK required greater degrees of competence-based trust (Levin & Cross, 2004). Competence-based trust can be directly related to cognition-based trust premised on cognitive reasoning, defined by antecedent terms of a) qualifications, b) special training, and c) successful experiences, collectively considered aspects of perceived expertise (Chowdhury, 2005).

Cognition-based trust has been directly related to an optimum solution set of ideas generated by individuals and work groups, especially within the understanding boundary (Briggs & Reinig, 2010). In socialized contexts supporting SM and SG, a shared mental model framework should become fundamental to optimum individual and group ideation (Briggs & Reinig, 2010; Kozlowski & Chao, 2012; Senge, 1994; Sharma & Good, 2013).

Revealing the complex dynamics surrounding ideation could be facilitated by applying relevant Sysperanto slices relating to work practices that include coordination, control, communication, and physical actions, collectively fostering trust (Alter, 2005). Slices relating to group participant roles and individual participant roles for capturing attributes of SM and SG could be linked directly to clan controls (Sharma & Good, 2012; Turner & Makhija, 2006).

Alternatively, or in conjunction with the above slices, various SG control levels could be associated with key SM activities and SG communications within a work practice slice, specifically representing management controls surrounding KT (Alter, 2005; Turner & Makhija, 2006). Sysperanto slices relating to information could potentially include speech, knowledge, and workspace signals and cues, collectively influencing openness (Argote, 2012; Fowers & Davidov, 2006; Hatch & Cunliffe, 2012).

Each of these slices discussed contains attributes relating to cognition-based trust or affect-based trust, i.e., trust based on emotional bonds. Collectively affect-based trust and cognition-based trust relate to the organizational trust dynamic as just one facet of the cultural subsystem emergent force surrounding a TbKM activity workflow (Jacks et al., 2012). Surrounding and within activity system workflows, knowledge emergence occurs in concert with emergent organizational behaviors, such as trust (Argote, 2012; Chowdhury, 2005; Jacks et al., 2012).

As previously mentioned, at the root of the knowledge paradox is trust (Chae et al., 2005). Yet, trust remains but one of many key emergent forces in motion within a work activity system that fosters emergent knowledge

- linked to cognitive boundaries (Ackerman & Halverson, 2000; Briggs & Reining, 2010);
- further linked to SG and SM (Jacks et al., 2012; Maitlis & Lawrence, 2007); and
- concurrently linked to all other systemic organizational forces surrounding a work activity system at any moment in time (Bennet & Bennet, 2004; Hatch & Cunliffe, 2012; Linger et al., 2007).

It is beyond the scope of this research to explore each of these additional cultural variables and their systemic and dynamic linkages within a workflow enhanced ICAS KM model. Yet, for each there exists a similar dynamic bridge established through a Sysperanto slice, where remaining KT paradoxes could be potentially at least partially resolved in terms of understanding an organization’s key dynamic forces at work within varying levels of an organization's TbKM activity systems (Chae et al., 2005; Bennet & Bennet, 2004; Linger et al., 2007). The same would be true for functional characteristics, social characteristics, as well as political and structural characteristics of the organization that relate to KT within any given organizational ICAS moment in time.

The potential visualization power and interpretation value-add from the Sysperanto work system synthesized into an enhanced organizational ICAS conceptualization has been demonstrated with very specific organizational attribute mappings within a work system slice. The key outcome is the IS ontological perspective applied to KMS design as a specialized type of IS meaningfully and visually links key KT enablers and triggers directly to emergent organizational ICAS forces (Alter, 2005; Bennet & Bennet, 2004; Maitlis & Lawrence, 2007).

Knowledge Flow Dynamics within Organizational Workflows

Theoretical contributions relating knowledge as a flow dynamic within organizational activity-based workflows can also be linked to a workflow enhanced ICAS design (Bennet & Bennet, 2004; Linger et al., 2007; Nissen, 2006). Key knowledge attributes are linked to organizational subsystems surrounding an organization's workflow dynamics, establishing key organizational attributes framing knowledge emergence, knowledge flow, and knowledge feedback loops (Kozlowski & Chao, 2012; Linger et al., 2007; Nissen, 2006; Snowden, 2000).

Knowledge, historically conceptualized as existing in constant flux, remains perhaps best understood in terms of flux (Fahey & Prusak, 1998; Langley et al., 2013; Snowden, 2002). As such, the organization's over emphasis of knowledge as a stock without careful consideration to the knowledge flow dynamics, requiring continuous recreation to maintain current value, can potentially result in knowledge systems that are little more than information repositories. Over emphasizing knowledge stocks was interpreted historically as the second deadly KM sin (Fahey & Prusak, 1998).

Accordingly, over emphasizing knowledge stocks represents a deep rooted paradigm reaching into the fabric of corporate structure where knowledge, reduced to information, was captured, stored, retrieved, and transmitted by pervasive technology. Creating and balancing distinct and unique knowledge stocks at varying organizational activity levels was found to foster innovation and competitive advantage without a direct correlation to vertical knowledge inflows (van Wijk et al., 2012).

However, when considered across a regulated time flow continuum via internal and external learning processes linked to vertical institutional capabilities, the equivalent of vertical knowledge flows, the performance outcomes relating to firm efficiency and value creation were seen as both positive and negative effects against these two outcomes, respectively (Miranda et al., 2011). The challenge remains then to balance knowledge stocks with appropriate and meaningful knowledge flows.

Balancing knowledge stocks and flows is necessary to optimize organizational learning fostering firm efficiency concurrently with longer-term value creation, fundamental to continuous innovation. Optimized organizational learning should occur without over emphasizing the value of knowledge stocks independent of the multiple emergent forces surrounding associated supporting knowledge flows. This balancing activity could be significant in context to mitigating negative knowledge spillovers while enhancing positive knowledge spillovers.

Consistent knowledge creation and transfer requires the human agent within a complex social network where social network theory and actor network theory (ANT) frame a unique set of knowledge paradoxes (Chae et al., 2005). From a historical perspective, organizations were challenged to leverage enabling technologies not to disseminate knowledge as information, but rather to create powerful local connections over distance within a federation of loosely coupled virtual work teams (Davenport & Prusak, 2000). Complex social systems are now understood to contain emergent complex networks of information and knowledge exchange that are loosely coupled and cannot be clearly understood, yet should be managed effectively (Amini, 2010; Zhuge, 2014).

The concept of loosely coupled in both contexts has evolved within a more complex social networking perspective (Ahuja et al., 2012; Dalkir & Liebowitz, 2011). At the heart of these emergent complex social networks is a requirement to balance or co-evolve an ambidextrous innovation capability with an organization's culture transformation directly linking culture and technologies capability development (Yu, He, & Liu, 2014). This perhaps represents one of the most significant challenges facing knowledge managers in the current century of the ICAS organization, specifically managing complex emergent organizational phenomena. Addressing this issue, managers may yet find the requisite practices necessary to manage more effectively organizational knowledge resulting in sustainable IC over time.

This challenge has been understood at least in part since the 1990s. To meet the challenge of managing complex and emergent organizational dynamics, “capitalizing on this dynamic [knowledge] resource for enterprise performance depends upon its rapid and reliable flows across people, organizations, locations, and *times* [emphasis added] of application” (Nissen, 2006, p. 226). This significant observation contains four critical dimensions of knowledge flow that was understood to be foundational to any meaningful KT within an extreme organization (Nissen, 2006). The fourth dimension in particular, flow time, explicitly addresses the flux nature of knowledge over time across people, organizations, and locations within complex emergent social networks (Amini, 2010; Nissen, 2006).

Various knowledge types require various social aggregation levels as well as varying flow time rates (Ahuja et al., 2012; Nissen, 2006; Yu et al., 2014). Within a second-order analysis visualizing knowledge flow, dynamic knowledge was defined across three dimensions: flow time along the x-axis plane; reach along the y-axis plane, and; explicitness moving vertical along the z-axis plane (Nissen, 2006) (See Figure 7).

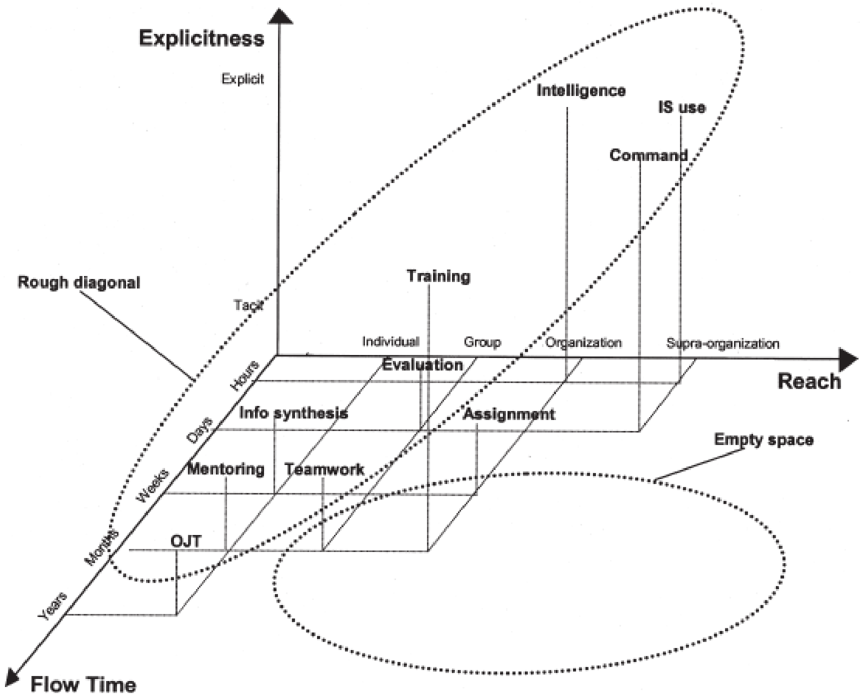


Figure 7. Second-order analysis--dynamic knowledge visualization (Nissen, 2006, p. 234).

Within this grid, Nissen (2006) identified the various knowledge stock locations. Of all the dimensions discussed, the knowledge flow time dimension was found to be inherently continuous. As such, knowledge flow (KFlow) was uniquely defined to capture perhaps the most meaningful visualization of knowledge in flux by differentiating KFlow attributes across three concurrent dimensions (Nissen, 2006).

Interestingly, in light of flux knowledge nature and requirements for inherently continuous knowledge stock flows, the contingency theory of rhetorical congruence could provide new insights into key organizational attributes defining cohesion within social aggregations (Leonardi & Meyer, 2015; Sillince, 2005). Rhetorically congruent messages could potentially create relevant and time-focused organizational SG message flows (Leonardi & Meyer, 2015; Nissen, 2006; Sillince, 2005; Turner & Makhija, 2006).

Premised on the knowledge-based theory of the firm, management control systems were found to enhance idea (knowledge) transfer where output controls moderated individual level idea transfer (Flaherty & Pappas, 2012; Briggs & Reinig, 2010). Within the above management control system, self-control directly governs individual attitudes, professional control corresponds to group feedback dynamics, and output control is in essence performance-based assessment feedback (Flaherty & Pappas, 2012).

The management control system surrounding idea generation as defined by Flaherty and Pappas (2012), however, failed to operationalize these controls based on knowledge type. A similar, yet significantly more comprehensive conceptualization of an organization's control system for governing knowledge exchange (KE) identified three controls premised on knowledge type, to include outcome controls, process controls, and clan controls (Turner & Makhija, 2006) (See Figure 8).

	Knowledge related to processes: Perfect	Knowledge related to processes: Imperfect
Knowledge related to outcomes: Perfect	**Outcome/process control[a]** **Process-related knowledge:** Explicit, Complete, Nondiverse **Outcome-related knowledge:** Explicit, Complete, Nondiverse	**Outcome control** **Process-related knowledge:** Tacit, Incomplete, Diverse **Outcome-related knowledge:** Explicit, Complete, Nondiverse
Knowledge related to outcomes: Imperfect	**Process control** **Process-related knowledge:** Explicit, Complete, Nondiverse **Outcome-related knowledge:** Tacit, Incomplete, Nondiverse	**Clan control** **Process-related knowledge:** Tacit, Mostly complete, Diverse **Outcome-related knowledge:** Tacit, Complete, Diverse

Adapted from Ouchi (1979) and Eisenhardt (1985).

[a] The decision situation is likely to be simple when knowledge of both the process and outcome is perfect. In such cases, both process and outcome knowledge are characterized as being complete, codifiable, and nondiverse.

Figure 8. Relationship between controls and the firm’s knowledge (Turner & Makhija, 2006, p. 203).

By comparison, outcome controls within Turner and Makhija’s framework encompass output controls defined by Flaherty and Pappas, but with greater granularity when viewing specific kinds and types of knowledge, as well as including process-related knowledge types requiring process-level controls (Flaherty & Pappas, 2012; Turner & Makhija, 2006). Turner and Makhija (2006) defined process controls that encompass professional controls as defined by Flaherty and Pappas, but added knowledge complexity dimensions related to specialized tasks by defining appropriate control engagement for organizational KT. Clan controls, not addressed in any capacity directly by Flaherty and Pappas, were defined by Turner & Makhija as “informal socialization mechanisms” (p. 210).

Whereas self-control focuses on an individual's perspective of their perceived value, moderated by output controls to foster SG, clan controls provide richer socialization contexts. Richer socialization context is necessary for framing individual ideation value within any given idea exchange, more effectively releasing asymmetric information sets within hidden profiles (Briggs & Reinig, 2010; Brodbeck et al., 2007; Turner & Makhija, 2006).

KT controls governing individual SG directly relate knowledge type and form to knowledge complexity and TaK–ExK flux knowledge (Argote, 2012; Turner & Makhija, 2006). Accordingly, a knowledge-type–KT process, outcome, and clan control framework remains the most meaningful KT control framework for visualizing an organization's structural and emergent forces surrounding knowledge work (Alter, 2005; Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Turner & Makhija, 2006).

To illustrate, consider human resource management systems that should support individual microlevel controls that mediate intrinsic motivation to foster social interactions, fundamental to improving knowledge sharing (Minbaeva et al., 2012). Consistent meanings should span multiple organizational message mechanisms, specifically training, performance systems, and reward mechanisms (Minbaeva et al., 2012; Sillince, 2005).

In this context, individual knowledge-sharing behaviors are critical to knowledge transfer success in the form of idea exchange and require explicit micro-meso controls to motivate idea exchange (Briggs & Reinig, 2010; Kozlowski & Chao, 2012; Minbaeva et al., 2012; Turner & Makhija, 2006). Conceptualizing the relationship between micro-meso controls and motivation, the expectation to measure outcomes should be clearly defined in the case of self-controls, moderated by output controls (Kozlowski & Chao, 2012; Turner & Makhija, 2006).

Yet, in many cases the ability to measure performance outcomes is low and knowledge surrounding ideation is not clearly understood, as is the case where the situational context is complex and/or the ideation solution space boundary is extremely complex (Briggs & Reinig, 2010; Turner & Makhija, 2006). In such a case, moderating self-control with output control becomes less effective (Flaherty & Pappas, 2012). However, in this same situation, clan controls were expressly defined to address ideation boundaries involving highly tacit asymmetric information sets within work activity contexts where both process and output understandings are complex or not clearly defined (Turner & Makhija, 2006).

In these complex ideation contexts, therefore, rhetorically congruent messages flowing within clan controls could provide organizations the capability to be more adaptive and more effective in controlling KT (Sillince, 2005; Turner & Makhija, 2006). By framing KT control mechanisms at the clan level with clearly defined processes governing context SG, SG guidance could potentially foster enhanced individual and group SM of organizational contexts surrounding KFlows in continuous flux (Maitlis & Lawrence, 2007; Nissen, 2006; Sillince, 2005; Turner & Makhija, 2006; Weick 2012). The KT management key perhaps rests in establishing a KFlow framing construct, not governing a knowledge mechanism.

Although in context to designing information system interfaces with capability to adapt to users, the need for event-based and clock-based context collection could readily be applied to feedback loops (Byun & Cheverst, 2004; Linger et al., 2007). This approach to interface design within a workflow enhanced ICAS KM filtering mechanism could be tailored at the individual SM level for customizing rhetorically congruent messages with spanning KT mechanisms. The result would be specifically tailored KT framing controls bridging people, organizational units, organizational contexts, and work team locations, thereby significantly improving organizational SG and individual SM (Ahuja et al., 2012; Maitlis & Lawrence, 2007; Minbaeva et al., 2012).

Improved SM and SG potentially could foster emergent ICAS knowledge sharing as knowledge in flux through tailored KT framing mechanisms (Maitlis & Lawrence, 2007; Turner & Makhija, 2006). Thus, emergent knowledge sharing can be defined as SG and SM information flows that surround the activity systems at various organizational levels (Kozlowski & Chao, 2012; Maitlis & Lawrence, 2007; Turner & Makhija, 2006).

These added channel design attributes for shaping and coordinating KFlow could be used to customize a KT mechanism with high degrees of rhetorically congruent messages that are more consistently context sensitive. Context sensitive and rhetorically congruent messages could very well begin to address the persistent historical challenge of leveraging information technology beyond simply being a pipeline and storage system for KE (Dalkir & Liebowitz, 2011). Carefully constructed KFlow shaping mechanisms could potentially allow ubiquitous information technology to become much more than a passive participant within the contemporary KT dynamic, beyond simply linking people, organization, and location (Yu et al., 2014).

As importantly, within increasingly complex social networks, meaningfully designed IT-enabled KT mechanisms could potentially enhance knowledge-sharing relationships emergent within human dialogues, most specifically "conversations for understanding" (Emmons, 2013, p. 64). Such conversations were argued to be fundamental for fostering key elements of agility, alignment, and shared-purpose (Emmons, 2013). Intra-unit and inter-unit communications in the form of both horizontal and vertical information should flow across complex organizational structures, i.e., complex social networks, both internal to the organization as well as external (Amini, 2010; Boisot & Sanchez, 2010; Theodore, 2014).

Coevolution of culture change conducive to knowledge sharing with enabling technologies can thus be viewed as foundational to contemporary KFlow framing mechanisms (Boisot & Sanchez, 2010; Theodore, 2014; Turner & Makhija, 2006; Yu et al., 2014). Such KFlow framing mechanisms should support therefore various types of knowledge, spanning varying KFlow times beyond just linear duration. A KFlow framing mechanism should support flow times in terms of transfer rates where *short* (fast) and *long* (slow) KT coexist in any given TbKM knowledge work activity (Linger et al., 2007; Nissen, 2006).

A key challenge previously discussed is understanding constantly fluxing and transactive knowledge, fluid in nature, within belonging and knowledge paradoxes when relating KT to individuals in a work system (Chae et al., 2005; Snowden, 2002).

Considering transactive knowledge within a flow continuum, knowledge flow empty spaces appear where TaK sharing broadly or quickly was not clearly understood (Nissen, 2006). Nissen (2006) identified at least "240 theoretically distinct [KFlow] segments across its four-dimensional space (i.e., 2 categories of explicitness × 4 categories of reach × 6 categories of life cycle × 5 orders of magnitude in terms of flow time)" (p. 253).

Within a resultant dynamic knowledge visualization, dynamic knowledge *patterns* relating to sticky versus fluid, for example, become most visible. But it was within the third-order analysis visualizing KFlows linked to work flows that mediating factors were seen to enhance traditional information flows, enabling *emergent* KFlows (Nissen, 2006). Herein manifests one of several unique insights provided by Nissen's historical research that remains inherently fundamental to a contemporary enhanced ICAS KM design. Factors extending IS design to reinforce workflows within an activity system became clearly defined, based on interpretations of various categorizations of the minimum 240 theoretically distinct knowledge flow segments (Nissen, 2006) (See Figure 9).

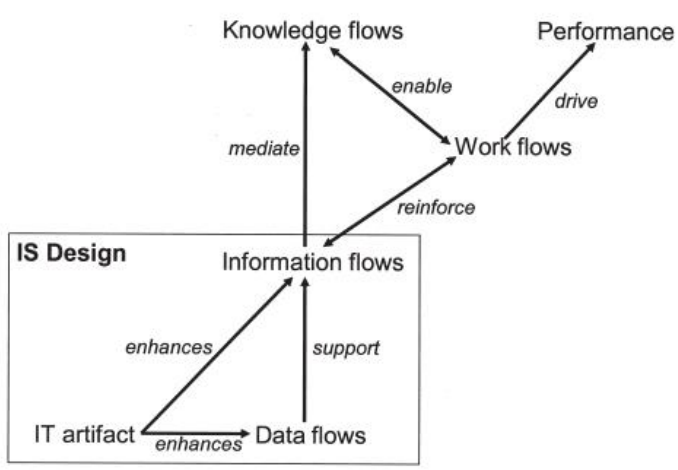


Figure 9. Propositional dynamic knowledge model (Nissen, 2006, p. 255).

A second contribution significant to this historical study is a third theme derived from interpreting KFlow segments that included flow linkages representing various connections between different kinds of flows, to include dynamic knowledge, information, data, and work (Nissen, 2006). Perhaps most significant, KFlows were found to be prerequisite to work flows to resolve tensions between exploration and exploitation, where learning to acquire new knowledge exists in dynamic tension with working with existing knowledge (Nissen, 2006; van Wijk et al., 2012).

Linking KFlows and work flows, exploration and exploitation potentially could be related to SM and SG visualized by specific Sysperanto slices. SM–SG as visualized slices could then be moderated by various organizational KT framing mechanisms uniquely within varying levels of work activity systems (Emmons, 2013; Miranda et al., 2011).

However, the root problem in creating a model representing emergent organizational ICAS characteristics rests with creating IS designs to enhance knowledge flows, requiring new understandings (Nissen, 2006). Often, insufficient IS and KMS design associating KT with KM processes precluded the development of needed research that potentially could provide deeper insights into key KT dynamics (Flaherty & Pappas, 2010; Nissen, 2006; Rigaud-Téllez & Hernández, 2012). When viewing strategic alignments of KMS implementations, obscured multilevel KM dynamics precluded transferring research findings to industry settings (Dulipovici & Robey, 2012). Enhancing organizational KM thus remains problematic at the organization's knowledge ecosystem level (Dulipovici & Robey, 2012; Linger et al., 2007).

Various Sysperanto slices could represent complex KFlows and thus link knowledge type and flow times to an ICAS organization's emergent IFlow surrounding TbKM work activity. Emergent social discourse and resultant knowledge work within any given knowledge-based activity system could then be bridged to cognitive boundary alignments and KT controls through additional Sysperanto slice visualizations. Visualizing relationships influencing emergent ICAS organizational KT characteristics could become key KMS design requirements necessary to target the many unexplored knowledge flow empty spaces, currently obscured or hidden behind ICAS complexity (Boisot & Sanchez, 2010; Briggs & Reinig, 2010; Emmons, 2013; Lee et al., 2010; Leonardi & Meyer, 2015; Nissen, 2006).

Summary and Conclusions

In this literature review, I blended contemporary KM research with scholarly, historical writings in KMS design. My review of contemporary and historical scholarly research focused on the nature of knowledge from both epistemological and ontological perspectives, bridging KM, KT, organization memory, and organizational subsystem dynamics within an ICAS view of the organization (ICAS) (Bennet & Bennet, 2004; Linger et al., 2007).

I found direct linkages between cognitive boundaries at individual and group-levels, with social-networked KFlows that foster SM and SG (Briggs & Reining, 2010; Nissen, 2006; Weick, 2012). Incorporating complexity theory within a contingency theory of the organization, the contingency theory of the organization remains relevant for framing macrolevel, organizational subsystem dynamics enriched as subsystem phenomena metaphors (Boxenbaum & Rouleau, 2011; Charles, Drenth, & Henk, 2013; Hatch & Cunliffe, 2012).

To address the enhanced KT conceptualization challenge that includes systemic forces spanning multiple complex activity system levels within the ICAS organization, I have extended existing ICAS theory to propose a work-system enhanced ICAS KM framework. Management methodologies have been embedded in this framework.

Sysperanto slices representing intersections of knowledge, situational complexity, TbKM systems within complex and emergent social networks, as well as organizational subsystem dynamics have been meaningfully bridged within KFlow. KFlow mechanisms, SM and SG can be more effectively operationalized, and subsequently more effectively monitored, understood, and framed within an emergent and complex SM–SG dynamic.

I employed a hermeneutical phenomenological approach using an existing dataset that included participants’ perceptions of KT that was subsequently coded to ICAS dynamics. Chapter 3 includes methodology premised on works by leading researchers in the qualitative research tradition. Sayer (1992) provided rich insight into understanding the dynamics of research conducted against quasi-closed social systems. Additionally, Boxenbaum and Rouleau (2011), Gioia, Corley, and Hamilton (2013); Hutchison, Johnston, & Breckon (2010), Myers and Klein (2011), and Podsakoff, MacKenzie, and Podsakoff (2011) provided relevant understanding of appropriate research methodology.

Chapter 3: Research Method

My purpose for this study was to propose an enhanced, multidimensional KM model to frame a more comprehensive KM methodology. I framed the ICAS organization’s emergent forces within an organic knowledge ecosystem in relation to KT. I found KT to be integral to TbKM work activities. Subsequently, I constructed a multidimensional KMS model using a series of Sysperanto slices as unique lenses to represent ICAS forces surrounding TbKM activities (Alter, 2005; Bennet & Bennet, 2004; Hatch & Cunliffe, 2012; Linger et al., 2007). The resultant design could potentially provide ICAS organizational leadership more clearly defined KT framing controls.

This chapter introduces design rationale surrounding the proposed research methodology. The most common qualitative social science research methods are reviewed. Discussion continues with an overview of the researcher’s role in data collection and data analysis. A concise presentation of the selected methodology includes participation selection logic, instrumentation, and plan utilized for comprehensive data analysis. All research should address issues of trustworthiness. Therefore, I finalize the proposed research methodology by defining trustworthiness in terms of credibility, transferability, dependability, and confirmability.

Research Design and Rationale

There have been several ontological frameworks developed for classifying social science research approaches (Moon & Blackman, 2014; Moustakas, 2001; Ruppert, Law, & Savage, 2013; Sayer, 1992). Most commonly accepted approaches to social science research share a common understanding of research problem definition (Podsakoff et al., 2012). There are several possible reasons for conducting a qualitative study: (a) filling or bridging gaps in existing research; (b) laying a foundation for new lines of thought, such as with new models, theories, or by extending existing theories or models, or; (c) studying a population demographic that has yet to be comprehensively researched.

I am proposing an extension to existing ICAS theory to fill a void in existing literature while concurrently establishing a new line of thinking to satisfy a persistent organizational management challenge, specifically the challenge to maintain organizational IC over time (Marcin, 2013). When encoding a purpose statement to clarify the research problem, the narrative, phenomenological, grounded theory, ethnographic, and case study approaches each have a unique set of encoding terms (Myers & Klein, 2011).

Narrative research emphasizes lived experiences, stories, and chronologies (Paschen & Ison, 2014). Ethnographic research approach focuses on cultural themes and portraits of groups sharing a common culture (Gioia et al., 2013). Neither approach was relevant to describing meaning and essence of organizational phenomena spanning multiple organizational cultures.

The case study approach has been used effectively for single environments to create significant new insights while proposing theoretical relationships (Nissen, 2006). Yet, case studies are typically bound to a single or collective set of comparative cases, focusing on events, processes, and programs or individuals (Barratt, Choi, & Li, 2011). The case study research approach, therefore, does not lend towards understanding of multiple organizational settings required to describe more generalized experiences, a realm of abstract research (Barratt et al., 2011; Sayer, 1992).

Although grounded theory could be employed to generate an entirely new theoretical framework, results from literature review indicate existing theoretical frameworks are sufficient as a foundation for understanding emergent organizational intelligence (Argote, 2012; Bennet & Bennet, 2004; Linger et al., 2007). The challenge was to meaningfully extend and synthesize existing theory, not create new theory. I focused the research problem towards discovering deeper insights and more descriptive meaning regarding emergent phenomena as related to organizational intelligence. The phenomenology research approach therefore most closely aligns with the purpose statement.

Social science research can be viewed from the perspective of three levels of abstraction, as any given organizational phenomena is regressed “from actions through reasons to rules [mechanisms] and thence to structures” (Sayer, 1992, p. 112). Research shifts focus from concrete observed events or actions to abstract structures (Sayer, 1992). Mechanisms provide a meaningful analysis framework for linking overarching systemic forces within broader structures to concrete event outcomes (Sayer, 1992). To visualize the transition in research focus from concrete to abstract, research can be viewed as either intensive or extensive (Sayer, 1992). Intensive research, termed concrete, focuses on very specific structures, typically one, and links a specific structure to very specific mechanisms associate with one or more specific epochal events.

In this context the focus is the one specific structure (Sayer, 1992). Extensive research, more granular and focusing specifically on commonalities and/or differences between specific similar epochal events spanning multiple times and places, is used to establish generalizations that can be applied to most similar events (Sayer, 1992). A resultant research typology visualizing both intensive and concrete research with extensive and generalized research results in four specific research approaches as intensive and concrete, abstract, extensive and generalized, or some form of synthesis of the previous three approaches (Sayer, 1992) (See Figure 10).

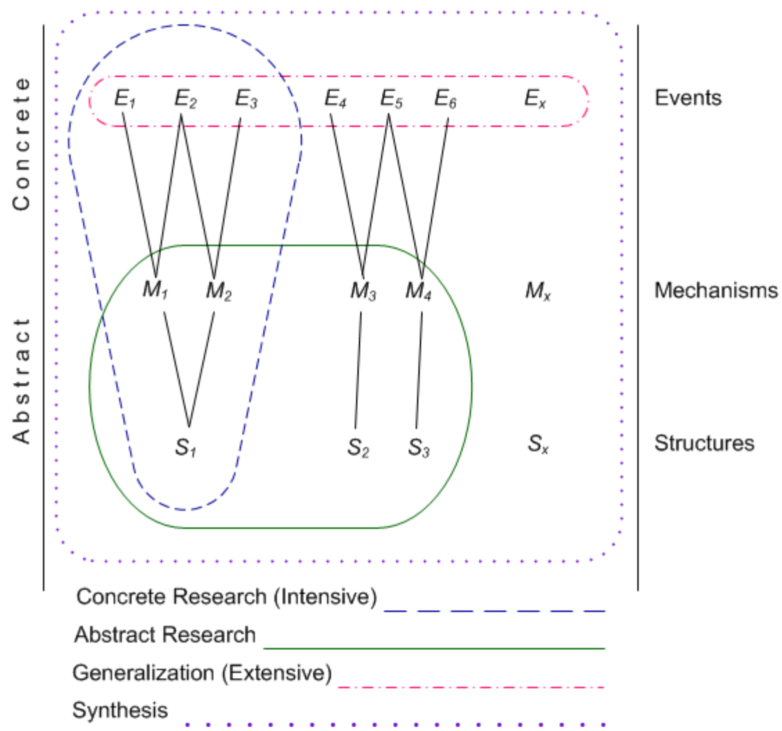


Figure 10. Types of Research (Sayer, 1992, p. 237).

I focused on extending management understanding of dynamic organizational forces emergent around the organization's set of concurrent activity systems in relation to the organization's knowledge ecosystem. The two foci goals—concurrent organizational activity systems and emergent knowledge ecosystem forces—were developed to extend our understanding of emergent phenomena common to organizational knowledge creation. Both goals emphasize emergent organizational dynamics, requiring a significant level of abstraction to better understand the interplay of multiple organizational mechanisms within the knowledge ecosystem, such as the organization's emergent knowledge ecosystem macro structures currently under study.

The challenge was to develop an enhanced KMS approach that frames appropriate emergent knowledge micro-meso structures within each organization (S_1, S_2, S_3… S_X), with meaningfully defined emergent knowledge flow mechanisms (M_1, M_2, M_3, M_4… M_X), while finding common structural attributes of each spanning multiple organizational dynamics. This represents the abstract research domain (area within the solid green line surrounding mechanisms and structures only) (Figure 10).

The abstract research domain represents an extremely difficult challenge to model a common KMS approach, as multiple knowledge microstructures with complex KFlow mechanisms exist within unique emergent organizational dynamics. Yet, an organizationally independent enhanced ICAS model representing a common KM approach is necessary to more meaningfully frame emergent organizational knowledge and KT controls, prerequisite to continuous organizational learning (Argote, 2012).

The hermeneutic research approach provides "interpretation of meaning" to social phenomenon (Sayer, 1992, p. 35). As an interpretive phenomenology approach to research outcome, hermeneutic phenomenology avoids methodology challenges associated with interpretive phenomenological analysis (IPA) and template analysis (Blumer, 2011). Additionally, a more reflective heuristic phenomenological context requires immersion of self into the research context, involving self-search, self-dialogue, and self-discovery (Moustakas, 2001).

Each alternative phenomenological approach, IPA, template analysis, or heuristic, requires significant additional self-immersion into research phenomena beyond the scope of the current research project based on time constraints. However, the heuristic phenomenological approach does provide for unique additional node classifications. This represents a significant additional research opportunity post publication.

By taking a hermeneutic phenomenological approach I interpreted the meaning of KFlow mechanisms and knowledge microstructure relationships within an enhanced understanding of the organization's knowledge ecosystem. The emphasis on approach vs. method provided opportunity for evolution of a double hermeneutic where knowledge and potential practical applications were co-developed by researcher and participant, albeit conceptually vs. physically (McKemmish et al., 2012).

Although historical subjects precluded live interactions, I was able to link the researched organization's practice with specific emergent KT capabilities and emergent organizational phenomena surrounding unique KFlows. The double hermeneutic approach provided me a unique opportunity to further data mine and interpret the existing data set to additionally identify potentially unique ICAS metaphor relationships (Boxenbaum & Rouleau, 2011).

As stated previously, a key epistemological assumption framing any philosophical approach to knowledge in general is the unique perspective of individual reality being inherently fallible (Sayer, 1992). To conceptualize the individual meaning of knowledge and KT, therefore, the phenomenological nature of this study required meaningful relationship-building between researcher and research participants spanning three phases of analysis (McKemmish et al., 2012). Although historical research participants were studied, for a hermeneutical phenomenological study, I found meaningful relationship-building between myself and each participant fundamental to evolving a double hermeneutic.

Preliminary data analysis in any phenomenological study requires the interview process that should include narrative and dialogue between researcher and subject to establish common perceptions and semantic references for knowledge emergence within the subject's organization dynamics. The benefit of using an existing data set included a unique opportunity to engage in an asynchronous and simulated dialogue with prior research subjects, in context to unique node creation representing complex emergent activities beyond the scope of the original research. At any given point in time, I needed only create an additional NVivo® query, visualization, or classification matrix report to explore a simulated additional open-ended question.

This unique relationship building activity began by establishing the first hermeneutic that shaped my understanding of natural objects such as organizational structures surrounding the interview subject (Sayer, 1992, p. 35). The initial interview questions applied to each of the existing data set's historical interview transcripts created an initial understanding of interview subject's inherent conceptualization of natural objects.

I emulated a shared understanding within a double hermeneutic approach by understanding research participant's interpretation of KT and organizational structures interpolated from existing transcripts. Perceived organizational practice, from my perspective and research participant perspective relative to KT further developed semantic congruence between myself and research participant (McKemmish et al., 2012).

With original meaning becoming negotiated, I was challenged to frame my research design in terms of intensive or extensive research (Sayer, 1992, p. 242). Intensive research considers causal process between structure, mechanism(s), and event(s) while extensive research tends to focus on general patterns across larger populations without considering larger macrolevel organizational structures and mechanisms surrounding those events (Sayer, 1992). Although extensive research is more common, lending to large-scale surveys, the result is limited explanatory power in defining why these events occurred.

The research design for this hermeneutical phenomenological study emphasized intensive research characteristics as I endeavored to understand causal group dynamics within KT mechanisms, mechanisms that are contained within an organization's activity system structures (Sayer, 1992). Originally, I anticipated investigating multiple instances of similar or related mechanisms across multiple structures, i.e., multiple organizations. Intensive research design potentially could provide deeper understanding required to address research questions attempting to relate emergent organizational dynamics (mechanisms) within emergent organizational structures as part of an ICAS knowledge ecosystem super-structure. Although beyond the scope of this research to scale out emergent organizational dynamics into broader interorganizational contexts, specifically knowledge ecosystem super-structures, the multidimensional KMS framework proposed was specifically designed for exactly such super-structure ecosystem scaling.

Role of the Researcher

I recently became a full-time faculty member within a regional University. As an MIS faculty member, I had opportunity to join a civic information technology committee representing the University's home county. As previously stated, multi-national firms and small regional businesses are represented on this region-based committee, spanning a wide spectrum of industry that includes health care, farm, transportation, and the oil industry, among others. However, premised upon reasons provided, no regionally-based organizations became viable research partners.

As a result, I leveraged the accessibility of existing data that most meaningfully aligned with current research design and objectives. My subsequent proposed approach targeted prior researchers to supply their original research data sets. Ultimately, a single research data set became available, with the goal to share research outcomes with a tailored set of recommendations focused on enhancing research design and methodology for future KMS research, while potentially also providing unique opportunities for tailoring KMS improvements within the original researched organization. I received IRB approval (IRB reference number: 03-04-15-0042654) prior to data analysis.

Potential firm-specific recommendations will be a post-publication effort and will represent a research outcome desired from all Walden University doctoral studies. Post-publication recommendations will be based on a) research outcomes; b) relationships established during the research process with the partner scholar-practitioner, and; c) shared understandings of original researched organization-specific knowledge transfer capabilities. I anticipate providing a generalized set of knowledge transfer enhancement recommendations specific to Dr. Deville's researched organization.

I am an observer of organizational events captured in previously transcribed interviews. However, my objective was to become more than simply an observer. Based on proposed research methodology, I created the equivalent of a researcher-participant dialogue to frame shared understandings between a) participants' original perceptions, b) common research terms, c) equivalent organizational terms, and d) my enhanced metaphors. These common terms and metaphors were then coded into NVivo® Nodes representative of the collective understanding representing all research participants, although their original terms varied and/or were at times industry unique.

There were no relevant researcher biases or power relationships between historical participant and researcher. In this context, there were no relevant ethical issues as would be associated with a live subject, such as a) conducting this study within my own work environment, b) mitigating potential conflicts of interest, and/or c) eliminating potential pressures resulting from use of incentives.

Methodology

An original design challenge was controlled separation between concrete events or knowledge-work activities and more abstract KT mechanisms (Sayer, 1992). A meaningful degree of separation between events and mechanisms allowed for deeper understanding of the macrolevel knowledge ecosystem structure. During each phase of data analysis interpretation and final chapter interpretations, I constructed meaningful connections between organizational knowledge ecosystem, KT mechanisms, and specific participant knowledge-work activities and perceptions, ensuring abstract research and metaphors had more concrete organizational application.

The first phase of data capture from existing data culminated with a first-order analysis identifying key organizational dynamics surrounding described organizational KT events. A key preliminary component of first phase data analysis included significant QIMS coding (Peterson, 2015). A second phase of data capture with a corresponding second-order data analysis further refined QIMS resultant conceptualizations within ICAS themes. ICAS themes were used to frame KT dynamics within discrete mechanisms, mechanisms potentially representing an ICAS organization's unique emergent characteristics.

In the second-order analysis, multiple views of the original KT event were created. I applied one or more Sysperanto slice lenses to each mechanism identified to create a filter or focal point specifically capturing dynamics involving key organizational subsystem phenomena relationships (Alter, 2005, Hatch & Cunliffe, 2012). This was accomplished through NVivo® Node coding Deville's (2012) participant transcripts against relevant ICAS Nodes with specifically defined tensions and relationships.

Subsequently, a third phase data analysis provided more meaningful understanding of macro-meso social structures, such as the organization's TbKM activity systems within increasingly larger social network contexts (Ahuja et al., 2012; Linger et al., 2007). Macro-meso complex social networking structures ultimately shape the emergent characteristics of specific KT mechanisms (Ahuja et al., 2012; Kozlowski & Chao, 2012).

What became most interesting during third phase coding, equivalent to grounded theory selective coding, was the transition from dichotomous representations to more fluid continuums (Snowden, 2002). The dichotomy of knowledge as TaK or ExK, or SM and SG information, each with inherent knowledge paradox, merged into a more fluid representation of a continuous SG–SM process linked to KT–KE dynamics. The result was a set of visualizations representing a continuum between historical paradoxes.

Depending upon IFlows and certain characteristics of emergent KFlows embedded within the IFlow dynamic, TaK–ExK, KT–KE, and SG–SM relationships were seen to juxtapose within each continuum pair. Paradoxes of each were more clearly visualized based on NVivo® classification coding representing various knowledge flow times along a KFlow and IFlow continuum. This in essence proved to be one of the anticipated benefits of various lens overlays using Sysperanto architecture, albeit a historical and perhaps considered obsolete research foundation.

The third phase of data collection and analysis included a third-order data analysis to further operationalize key emergent organizational dynamics. ICAS metaphors representing the ICAS organization’s emergent characteristics provided new insights. New KM insights were required to address the research questions. ICAS force relationships identified are not quantified as vectors, requiring more extensive statistical analysis associated with grounded theory coding, for example. Rather, identified ICAS relationships emphasize complex ICAS emergent force tensions in relation to triggering, enabling, or enhancing knowledge emergence.

Research design thus remained consistent with intensive research practice and focusing on connection relations versus relations of similarity (Sayer, 1992). Intensive research focus is on social groups analyzed in terms of actual connections between members and between similar social groups, such as within and between increasingly larger TbKM work activity systems (Sayer, 1992).

Participation Selection Logic

I used an existing data set from previous KMS research collected within Walden University, representing 11 participants spanning a single organization (Deville, 2012). My original proposed design included multiple organizations each representing a unique segment or industry, such as health care industry, energy industry, higher education, and/or a branch of the armed forces. However, a single data set became far more practical as I moved into third phase coding. Using existing Walden University research data ensured a highly reputable data set as a foundation.

Originally, a preliminary purposive quota sampling was intended to target two to three key executives and managers within each data set representing a unique organization. My objective was to identify key knowledge ecosystem characteristics that conceptually surrounded specific organizational KT events. Purposive quota sampling became irrelevant with one historical dataset.

A second and required data capture in the form of additional interview questions was then anticipated to target two or three additional individuals identified from preliminary interviews. I anticipated employing NVivo® filtering to capture mid-management and operational level team member responses via specific question and answer dialogues in the form of NVivo® queries. However, based on QIMS and preliminary NVivo® ICAS Node structure design, I did not explicitly filter demographically manager and operational level participants.

Originally, I anticipated additional interview questions to emerge from the first order analysis that would then have shaped the second order analysis interview process. Fifteen original research questions were developed by Deville (2012). Deville's coded NVivo® database included six KT themes. I used Deville's original research questions, his interpretations of participant responses, and resultant set of six themes as a foundation for preliminary second-phase data analysis. The result was a set of second order interview questions emulated in the form of NVivo® equivalent queries within my revised research design.

I envisioned research group aggregations could potentially grow rapidly beyond the defined limitations of this research, based on the relational power of NVivo®

database, compounded by inherent complexity created from information patterns. Without considering NVivo® ICAS Node design with 57 defined ICAS Nodes and approximately 350 NVivo® second phase preliminary classification attributes, 27,225 patterns could potentially be formed based simply on 11 participant responses to 15 original research questions. I needed to control the number of anticipated initial first order and second order interview questions. Transcripts from the one historical data set were thus found to be more than sufficient for purposes of this study.

The minimum sample size from each organization was anticipated to be two individuals for first phase data capture and two additional individuals for second phase data capture, resulting in a minimum 16 member sample set. This minimum sample size would have been within the higher end of reasonable sample sizes for phenomenological studies ranging from five to 25 subjects (Marshall, Cardon, Poddar, & Fontenot, 2013). However, based on my three-phased coding that paralleled grounded theory open, axial, and selective coding, 11 participants quickly exceeded a reasonable coding sample size.

I created my NVivo® database importing Deville's preliminary NVivo® KT theme Node coding using his 11 research participants. As I transferred Deville's (2012) historical data set, I recoded his original theme coding to my multidimensional KMS design NVivo® Nodes. As a result, the originally proposed individual knowledge worker demographic filtering was not meaningful. The construct of a purposeful sampling in this context seemed extraneous to overall research goals based on preliminary NVivo® Node coding and subsequent first phase queries.

Ultimately, the objective was to validate a conceptual enhancement to existing KMS theoretical designs, thereby allowing greater insights into KT characteristics within the ICAS organization. With conceptual framework validity established simply by second phase coding, I was able to meaningfully target a single respondent for third phase selective coding. A single participant, third phase coding iteration provided approximately 300-500 final classification attribute assignments per reference spanning most of the 57 NVivo® Nodes to 28 coded participant references, representing an enhanced ICAS KM framework.

This single participant coding activity created approximately 812,250,000 potential ICAS Node classification attribute patterns. I explored less than 50 of the resultant pattern relationships. Attribute pattern sets typically ranged from 30 to 75 attribute relationships to create a minimal meaningful ICAS visualization.

The current research design required significant coherence be established between connection relations within TbKM micro-meso work systems, viewed as social groups networked within increasingly larger macro-meso TbKM activity systems (Ahuja et al., 2012; Kozlowski & Chao, 2012). Therefore, randomized sampling in general or in cluster form that negates required connections relations was inappropriate to this type of study (Singleton & Straits, 2010). Convenience sampling that tends to be more haphazard would likewise have proved inappropriate (Singleton & Straits, 2010).

Purposive sampling allows for selective, targeted population sampling focusing on specific group connections or communities (Singleton & Straits, 2010). Explicit coherence was established inherently within the original data set that included 11 participant interview transcripts and audio recordings (Deville, 2012). Participants represented various levels of organizational decision-making, based on very specific knowledge-work connections, further linked in terms of a single work group mission within the original research organization (Deville, 2012).

As such, relationships surrounding knowledge work activity systems were not intended to be directional, specifically not quantitatively causal, but more qualitatively relational in terms of influence. Appropriately, I emphasized organizational dynamics and emergent force relationships in terms of triggering, enabling, or enhancing knowledge emergence. Typically, mid-level managers in most organizations represent a level of maturity and situational awareness with meaningful work experience that includes appreciation of organizational dynamics involving social, cultural, and political norms within the organization (DeLong, 2004).

Middle managers, including operational supervisors who possess requisite situational awareness and work experience maturity therefore represent one possible optimum TaK-rich group for defining an initial purposive sample quota for this research. However, it is not only the middle manager identified in a first order analysis that should provide understanding of organizational phenomena surrounding KT events. All organizational members, regardless of level, influence organizational ICAS emergent characteristics (Jacks et al., 2012).

Appropriately, it was imperative in the original research design that causal groups from different levels of organizational activity be identified in an evolving, less explicit context such that focus was not attempting to identify in advance the entire research design (Sayer, 1992). In this context, defining a concrete and formal design that included pre-constructed surveys for live subjects or queries for historical subjects was not appropriate for this study. Building causal connections and link attributes during data collection was a primary concern during evolving interviews, within the original research design, in essence building a “picture of structures and causal groups of which they are a part” (Sayer, 1992, p. 244).

However, within the historical data set context, i.e., using NVivo® Node classifications, appropriate causal connections emerged during second and third phase NVivo® coding. The specific work group represented by subjects in the original research uniquely qualified inherent participant maturity and organizational relationships necessary for all phases of coding and analysis to meaningfully capture the desired relationship connections deemed necessary from the original research design.

Instrumentation

No direct interviews took place. Nevertheless, interview questions were used to guide NVivo® query and filtering design to specific classification schema attributes for historical participants. Research interview question translated into equivalent NVivo® queries provided unique opportunities to meaningfully view and interpret related concepts and metaphors. Additionally, because I had no live interaction with historical participants, it became impossible for me to influence or bias original participant responses.

Conversely, it was possible to discover additional relationships and concepts not explored by original researcher. This section will outline use of NVivo® software to a) support concept operationalization, b) provide meaningful analysis of interview data in a social research context, and c) demonstrate NVivo® relational database power during data collection using historical subject data points (Hutchison et al., 2010; Johnston, 2006).

Over the past decade, Qualitative Solutions and Research® (QSR) software has proved of significant benefit within qualitative research projects, and more importantly to grounded theory research as a research tool specifically involving complex coding (Hutchison et al., 2010). A key benefit of QSR software includes providing additional relational coding beyond the ability of a researcher to conceptualize (Bazeley & Jackson, 2013). The same benefit provided for grounded theory open, axial, and selective coding benefited this research where three orders of analysis involved three levels of similar coding.

One of the early adoption challenges with QSR software included the use of node trees to categorize or hierarchically structure conceptualizations (Crowley, Harre, & Tagg, 2002). However, the use of the node tree as a tool allows meaningful restructuring of node relationships at any point in time (Crowley et al., 2002; Hutchison et al., 2010). This represented a significant and unique opportunity to capture secondary research and begin coding concepts that linked to existing interview data. A key outcome included effectively creating flexible node structures and relationships within an NVivo® relational database.

From inception and deployment of NVivo®, a robust relational database design allowed analysis to move “beyond thick description of studied phenomena, to an explanatory model grounded in the data" (Crowley et al., 2002). This represented a significant positive and beneficial shift in coding capability, especially during third phase coding where visualization of Node relationships could be more meaningfully presented within NVivo® modeling capabilities.

At least as importantly, the tool itself provided opportunity to fully exploit the iterative process of grounded theory research coding (Hutchison et al., 2010). Although not specifically using a grounded theory approach to research, a similar type of iterative coding process took place during the first-order and second-order analysis. I found NVivo® software provided significant transparency for communicating qualitative research findings (Hutchison et al., 2010). I discovered multiple opportunities to restructure node trees within NVivo® and each had a rationale, captured and communicated in Chapter 4.

As perceptions about the reality of specific organizational phenomenon were studied in context to knowledge flows, the emphasis was on finding common or shared understandings of specific organizational dynamics in motion around and within any given work activity system. Outliers in this context represented unique perceptions providing opportunity for new understandings relating to specific emergent organizational phenomena, potentially relating to optimum complexity, knowledge centricity, multidimensionality, and shared purpose (Bennet & Bennet, 2004; Emmons, 2013).

The challenge was to meaningfully engage in an equivalent open-ended dialogue to allow common understanding between researcher and participant to evolve into a place of sensible meaning (Laverty, 2003). I needed to find touch points within a shared understanding of a common KT mechanism representing one or more aspects of the organization's emergent characteristics (Laverty, 2003). I used Sysperanto slices to effectively relate, among other views, organizational subsystem views that allowed an iterative spiral dialogue (Hutchison et al., 2010).

I created a meaningful evolution of NVivo® queries linking coded secondary research terms relating to the a) organization's structure, b) culture, c) social norms and behaviors, d) political and power dynamics, and e) information sharing capabilities to interview subject coded responses. Specific classifications for specific Nodes emerged during initial second-phase axial coding specific to a Sysperanto slice (Alter, 2005). As a result, I was able to focus on metaphor development using Sysperanto slices to begin conceptualizing emergent organizational dynamics (Boxenbaum & Rouleau, 2011).

Although a controversial component of organizational theories, metaphors represent "a core component of cognitive processing" (Boxenbaum & Rouleau, 2011, p. 275). The opportunity to capture metaphors during early discussions provided a rich context for creating alternate perceptions and new insights (Boxenbaum & Rouleau, 2011). New insights generated through the more abstract language of metaphors from SM and storytelling has been directly linked to deeper understandings of emergent organizational forces surrounding any given organizational phenomena (Boxenbaum & Rouleau, 2011; Weick, 2012).

An example of metaphors creating new insight became evidenced in relation to the metaphor KFlow. SG and SM ICAS Node relationships shifted between different

KFlow segments in the same ICAS instance. During NVivo® queries, correlations between each were seen as separate forces during certain points of KT or KE. Depending upon ICAS slice lens applied, relationships between the above shifted to an embedded relationship vs. a more clearly defined KT–KE continuum with both KT and KE visible as continuum end states.

SG was seen to be more integral or embedded within the SM process as KFlow shifted from KT to KE, a knowledge flux dynamic. This type of emergent dynamic represented a SM–SG continuum providing unique insights into emergent forces surrounding KE, KT, and KFlow in relation to SM and SG, previously shrouded in research. Several of these unique insights are further discussed in Chapters 4 and 5.

Consequently, the proposed research design specifically incorporating research metaphors provided rich opportunity to find meaningful inclusion of all respondent data within a social dynamic. Each participant uniquely shaped emergent organizational intelligence within the respondent’s sphere of activity. Because the hermeneutic phenomenological approach to research is premised upon a social constructivist perspective, finding an individual’s meaning within organizational complexity is a key outcome that can optimally be achieved by meaningful and genuine dialogue (Simpson, Large, & O’Brien, 2004).

The power of NVivo® Node coding includes flexibility to reconfigure Node structures and relationships with unique classifications at the Node and Source interview levels (Bazeley & Jackson, 2013). As a result, NVivo® is an extremely powerful interpretive engine, especially for grounded theory studies or phenomenological studies of a hermeneutic nature. The full potential of NVivo® perhaps becomes most apparent when NVivo® Nodes represent metaphors surrounded by classification attributes which represent traditional research terms.

The foundation for genuine dialogue requires a strong bond or reciprocal relationship premised upon full and uninhibited disclosure (Simpson et al., 2004). I originally anticipated that the full potential for this relationship would be lost to some degree within an asynchronous dialogue via queries with historical subjects. I believed existing transcripts would represent a more finite disclosure.

To the contrary, lost relationship potential was not realized, but increased potential became evident. The opportunity to code source research into NVivo® Nodes representing specific ICAS dynamics, while classifying source interviews into the same Nodes with unique classification attributes exploited potentials I had not anticipated. I found that equivalent full and uninhibited disclosure occurred through coding participant responses with classification schemas with very specific attributes assigned to multiple NVivo® Nodes concurrently. This coding exercise at times required multiple field note entries spanning multiple journals, i.e., NVivo® memos, for a single coding exercise.

I reviewed existing literature to include models representing knowledge dynamics perhaps unique to a specific industry. Industry specific models provided deeper insight into ICAS organizational forces surrounding aspects of each industry organization's emergent knowledge ecosystem characteristics. As a result, unique insights and perspectives were developed as I researched unique organizational KM challenges spanning multiple industries, such as health care, energy, armed forces, and higher education.

KM research tends to be inherently esoteric. Consequently, a meaningful set of exploratory questions capturing aspects of adaptive knowledge management should bridge common KT dynamics spanning multiple organizational contexts. Additionally, exploratory questions should also capture data relative to emergent organizational ICAS forces surrounding knowledge creation and flow, again common to all organizations.

Typically, to mitigate identified potential biases the researcher would confirm research subject's value in terms of a very specific and limited sample group, to which the participant is a member. Previously discussed, the researcher would confirm that the subject's selection was premised on senior and middle manager's confidence in respondent's ability to contribute meaningfully to the research dialogue.

Preliminary interview questions would then be framed in a specific sequence to carefully engage live respondent's in a dialogue to conceptualize terms and definitions, create shared meanings and metaphors, mitigate subject apprehensions, and explore possible common themes. As the dialogue progresses, the questions would become increasingly complex. A reasonable expectation would be that respondent's will increase cognitive activity appropriately as the dialogue progresses.

However, as a result of the asynchronous nature of the current researcher-research participant dialogue via NVivo® queries, I surmised the evolution of more complex themes and metaphors with increasingly complex queries would not be feasible for all transcripts, or feasible for only some. Feasibility would be dependent therefore upon the nature of the original research and type of original research interview questions created by Deville (2012).

As a result, inclusion or exclusion of an NVivo® equivalent cognitively demanding activity with corresponding content creation could not be determined at original design time, but was discovered during the coding process. Discovery occurred within an evolving double hermeneutic experience at time of data analysis within each phase of coding. NVivo® provided for extremely complex theme and metaphor relationship coding as a means of discovery (Hutchison et al., 2010).

Originally, I determined there were simply too many unknown variables relative to a) existing data set creation, b) historical and current research content, c) my research relevance to initial research purpose, and d) applicability of initial research to my current research purpose to effectively design a comprehensive data collection strategy. All these design decision-making factors were unavailable until after first order data analysis.

As a result, comprehensive design that included an unbiased assessment without the actual data sets to inform that decision-making process was simply not feasible. Designing for potential bias as well as potential benefit regarding advanced metaphor and theme discovery using NVivo® coding and query, equivalent to increasingly cognitively demanding responses in a multiple interview sequence, simply became an unnecessary exercise. Although meaningful for live participant data collection, comprehensive design in this context became less relevant.

As a result of extended Node coding and source classification coding with tailored attributes within NVivo® relational database, I have discovered that NVivo® actually provides an extremely rich exploratory capability for modeling unique instances of organizational activities within an organizational state and between state changes (Kozlowski & Chao, 2012). I found the key to be research design flexibility that allowed metaphor relationships to emerge, and not necessarily be comprehensively pre-defined (Boxenbaum & Rouleau, 2011).

Following the tradition of intensive research design, research questions may change during the study to frame more meaningful questions to more precisely address the primary research question(s) (Boxenbaum & Rouleau, 2011; Hutchison et al., 2010; Myers & Klein, 2011). I anticipated during original research design the emergence of additional interview questions that would be translated into additional queries as well as the modification of existing questions during the data collection process.

Flexibility in data capture is essential to more effectively capture individual perceptions in the form of metaphors, within a hermeneutical phenomenological study (Boxenbaum & Rouleau, 2011). NVivo® provided this rich flexibility with unique Node and source classification schemas and complex search and query capabilities. As a result, I was able to construct unique queries to represent new questions and metaphor relationships, in essence extrapolating existing data into extremely meaningful and increasingly complex relationships, while maintaining statistically meaningful integrity.

Organizational improvements fostering positive social change represent a significant research outcome objective, which includes positive social change fostered within organizational boundaries that spill over into a nation’s economic vitality (Marcin, 2013). Research that explores enhancing existing organizational and management theories while qualifying potential positive social change can be enhanced with elements of design-based research (DBR) methodology (Anderson & Shattuck, 2012). The emphasis is not to quantify what actually works, but rather to frame "rich descriptions of the context in which the study occurred" (Anderson & Shattuck, 2012, p. 17).

Genuine dialogue provided a meaningful framework for fostering metaphors to better capture these rich contextual descriptions. The key was letting metaphors emerge as part of a collaborative partnership to better frame meaningful variable relationships, or metaphor relationships with NVivo® coded participant classification attributes. I thus framed rich contexts for additional emergent metaphors within a collaborative partnership construct as a foundation to my data collection strategy. As a result, emergent metaphors could be further explored and quantitatively evaluated in future research projects, resulting in possible future organizational interventions (Anderson & Shattuck, 2012; Boxenbaum & Rouleau, 2011).

Additionally, genuine dialogue created opportunity to explore action-based alternate outcomes of any given perceived knowledge-based activity (Maurer & Githens, 2010). These subsequent explorations of possible alternate outcomes could also provide deeper understanding of emergent organizational forces influencing individual and collective SM (Cunliffe & Coupland, 2012; Weick, 2012). Although intensive phenomenological research is not necessarily design-based research (DBR) with roots in action-based research (ABR), genuine dialogue as a key element of both DBR and ABR in this context provided the opportunity for organizational members and researcher to collectively explore possible organizational improvements (Anderson & Shattuck, 2012).

I was able to meaningfully emulate a form of genuine dialogue via NVivo® queries, and the outcome has potential significant benefit for future KMS research utilizing historical data sets. I used common literature terms such as interviews, interview questions, dialogue, or some variant of each. Each term was emulated to the degree possible against historical subjects represented within existing data sets by creating NVivo® Nodes, coding schemas, and complex queries. Emulation in this context could be defined as interpretation, translation, and resultant transformation from term to NVivo® query.

As such, I will continue to emphasize the translation of each commonly accepted research term to an NVivo® equivalent query(s) or filtering activity(s) are emulating the live subject-researcher relational activity associated with the common term. A common challenge within higher education includes the use of NVivo® to represent complex grounded theory coding as well as other inherently complex research associated with hybrid methodologies. The purpose of this translation exercise then is to begin a common dialog between historical term-based research activities and more sophisticated NVivo®-based equivalent research activities. The deficiency is not within NVivo® software, but in the translation of research activity to NVivo® design and coding activity.

Procedures for Recruitment, Participation, and Data Collection

I anticipated beginning first phase data collection with a series of open-ended questions coded into queries designed to illicit a story from which metaphors could potentially emerge. The translation to query from question could not be determined prior to preliminary analysis of data set, transcripts, and original research questions. However, first phase data collection requirements necessitated I establish an extremely complex set of NVivo® Node structure definitions with explicit descriptions and nested relationships.

Subsequent to that preliminary Node coding and structuring, I created a series of initial Node Cluster reports by word similarity to validate key Node relationships that aligned with key word relationships identified in existing research and theory. The outcome of these preliminary reports was an evolving Node restructuring activity necessary for more meaningful coding to create metaphor linkages between Deville's (2012) research data set and the first phase Node structures (Boxenbaum & Rouleau, 2011; Hutchison et al., 2010).

Initial classification coding thus allowed for meaningful creation of a dialogue space of rich context meaning within the Node structure itself (Anderson & Shattuck, 2012). The initial discovery process for first phase data analysis was anticipated to begin with a set of preliminary questions translated into NVivo® queries based on the following sequence of original research design questions:

Q1. "When you think about knowledge in general, what comes to mind? Try to think in general terms." Follow on questions translated into equivalent queries during this initial dialogue were anticipated to hopefully create a shared understanding of key operationalized characteristics qualifying knowledge, to be further linked to a set of generalized metaphors. The shared understanding in this asynchronous context was specifically researcher-centric, yet included a cognitive connection between original subject and researcher to degree possible within a transcript context. Cognitive connection simply implies a common representation of a term between researcher and subject.

Q2. “How do you relate your perception of knowledge to organizational activities? In other words, when and how do you see knowledge becoming action in this work place?” These questions were designed to establish a shared understanding of subject’s perception of how knowledge and activities link together in the work place. I anticipated they would provide a foundation for moving into a deeper conversation regarding specific KE activities within significant organizational events. Deeper conversations thus generated a set of meaningful metaphors to frame emergent organizational dynamics.

Queries in this context should first identify the common terms that can then be tailored into specific equivalent queries for each subject, as there is no opportunity to evolve a common language for subsequent questions. The researcher, therefore, has to emulate this common language as subject-centric, or unique to each subject, and ultimately culminated in this research in the form of an emergent classification schema beginning during first phase coding and matured during second phase coding.

One such metaphor, by way of illustration, represented the link between creativity resulting from applied analytical knowledge to emergent organizational or corporate knowledge to better capture dynamics of KFlows over time (Huang, Fan, Chern, & Yen, 2012; Nissen, 2006). Interestingly, creativity is an emergent organizational phenomena directly related to optimal organizational performance resulting from innovative organizational intelligence (Bennet & Bennet, 2004).

Organizational design drivers that enable emergent creativity have been directly linked to the organization's self-organizing processes that involve elements of reconfiguration, redundancy, interconnection, and sharing (De Toni et al., 2012). A key attribute of reconfiguration includes dynamic social network connections to enhance organizational KFlows (Lipparini et al., 2013). These relationships were effectively captured in a complex knowledge network classification schema assigned to specific ICAS nodes.

Each of these terms has synonyms and equivalent terms that could be used to explore existing data sets via queries. A possible outcome from this effort would be an enhanced conceptualization or understanding of an organization's common language and social dynamics represented by similar or same terms spanning multiple subjects within a single data set, while also capturing same or similar terms spanning multiple organizations. Common terms representing specific emergent characteristics of an organization related to specific metaphors could provide significant new insights into various unique, as well as common, attributes or emergent organizational forces surrounding organizational knowledge creation. The asynchronous nature of this study did not diminish this opportunity, but in reality created a very meaningful framework for such follow-on research.

Self-organizing attributes of the organization's activity systems were linked directly to the organization's culture (Jacks et al., 2012). As critical elements of the learning organization's culture, trust and openness were found to contribute directly and most significantly to knowledge-sharing (Argote, 2012; Jacks et al., 2012). Research focus on power distributions during KMS implementations implies or explicitly frames shifts in organizational structures to accommodate corresponding power shifts (Hatch & Cunliffe, 2012).

A key organizational challenge in this context is reframing the organization's functional characteristics to support internal power structure changes (Lyles, 2014). Shifting organizational structures represent an element of the functional subsystem characteristics which should include less structured hierarchy within a complexly and socially networked organizational structure, specifically to enhance KT and information exchange (Sanda & Johansson, 2011; Soda & Zaheer, 2012).

Collectively, ICAS creativity represents one of several complex emergent organizational phenomena as a force that requires deeper understanding in relation to complex organizational subsystem dynamics (Argote, 2012). However, I did not qualify every aspect of all complex emergent organizational forces surrounding OI resulting from continuous and effective knowledge creation and transfer. Therefore, creativity as metaphor represents but one of many possible emergent concepts that could evolve from a genuine dialogue with subjects. I did discover common conceptualizations in the form of similar metaphors to better frame specific research variables captured during second phase coding. This approach remained true to the hermeneutical phenomenological research approach (Moustakas, 2001).

Q3. "Reflect on your work experience in this organization and describe an experience where you were directly involved in creating and sharing new knowledge within the organization." At this point in the dialogue, I originally anticipated discovering the subject's involvement in group or team-based organizational events.

Macro-meso organizational TbKM events include, but are not limited to, major project or transformation initiatives where multiple levels of organizational leadership and activities directly surrounded the participant's experience (Kozlowski & Chao, 2012; Linger et al., 2007). I had hoped originally to capture participant perceptions of activities and emergent organizational phenomena, such as emergent cultural attributions relating to trust and motivation as well as embedded social norms and values that played into knowledge sharing experience at the group level.

I did not anticipate a researcher-participant shared discovery of perceptions regarding a) key relationships between organizational structures and subsystem dynamics, b) both formal and informal structures concurrently, and c) organizational power bases surrounding the observed phenomenon provided by synchronous dialogue. I did anticipate, however, personal discovery of these same relationships. Interestingly, within the double-hermeneutic created by listening to original transcripts at different intervals, reviewing Deville's original transcript notes, and continuous reflection during each phase of coding, I did in fact experience a sense of shared discovery. I discuss this in more depth in open and axial coding analysis and interpretation.

The opportunity to explore with the participant's and Deville's shared understandings actually resulted from the evolution of Node structure formation based on a) an intensive meta-synthesis (QIMS) of research, b) second phase coding of participant responses to defined ICAS Nodes, and c) the evolutionary emergence of a meaningfully complex yet reasonable set of NVivo® classification schemas. There were times it was as if I could actually envision dialogs referenced by participants between themselves and other members of their organization.

These first three questions were designed to relate directly to the first research question. The first research question specifically addressed the potential of an enhanced ICAS framework to provide clearer visibility into the dynamic relationships between multiple emergent organizational ICAS forces directly impacting KT. What I discovered was that by careful translation of research terms and concepts into ICAS Nodes as metaphors during first phase coding, preliminary Pearson correlations in fact revealed significant ICAS relationships previously considered obscure and not clearly understood by recent research. By the end of second phase coding, additional complex relationships emerged, some anticipated, some not.

The potential of the ICAS NVivo® Node structure representing key elements of my enhanced KMS framework demonstrated sufficient structural integrity to effectively address my first research question. I was able to meaningfully correlate and validate key anticipated relationships, while meaningfully discovering new relationships either alluded to in prior research or previously undiscovered.

Q4. “What do you feel contributed most significantly to the success of knowledge creation and sharing in the experience you described?” I had hoped originally through this dialogue with live subjects that I would be able to link perceptions regarding KT success factors directly to SM and SG activities. Using a historical data set, I anticipated

NVivo® queries would include synonyms related to organizational success factors relating to ICAS complexity and uncertainty, as well as meaningful knowledge transfer.

What I discovered were key conversation points between Deville and original participants, not necessarily within the same original interview questions for all participants. I then translated these overlapping conversation points into classification attributes across multiple ICAS Nodes, in effect framing several significant enabling and enhancing KT and KE factors within a complex socially networked dynamic (Ahuja et al., 2012; Boisot & Sanchez, 2010).

Q5. “What were the most significant deterrents or inhibitors to creating and sharing this knowledge?” This was originally designed to be the counterpoint to Q4. The objective in this shift was intended to explore the countervailing forces at work impeding change specifically in context to knowledge creation and sharing. Systemically, organizations experience two concurrent and countervailing spiral forces at work surrounding any given organizational event that could potentially result in significant change (Bennet & Bennet, 2004; Senge, 1994).

Organizational members put one set of forces in motion to bring about positive change, while a second set of organizational members put a second set of forces in motion working counter to the first, in an attempt to maintain equilibrium (Senge et al., 1998). These forces can be directly linked to SM inhibitors, enhancers, and enablers (Maitlis & Lawrence, 2007).

Deville (2012) asked very similar questions directly to his research participants, although originally designed to target KT enhancers and inhibitors within the organization. However, at various times during the interview process, as mentioned with Question 4, participants and Deville engaged in a meaningful dialog that identified organizational inhibitors. I coded organizational inhibitors to IFlow, KFlow, SM, and SG, as well as KT and KE, each uniquely coded by very specific classification attributes. As several classification schemas were shared across multiple ICAS Nodes, I was able to effectively visualize in a flow continuum how a specific organizational inhibitor impacted and ultimately shaped emergent IFlow.

Q6. “Where these deterrents or inhibitors overcome (Yes/No); if so (Yes), how, or; if not (No), what do you feel could have been accomplished to overcome these impediments?” Although the later three interview questions were originally designed to focus specifically on the second research question, I anticipated there would be a continued focus as with the first three interview questions to build meaningful metaphor and variable relationships for further exploration.

Appropriately, I anticipated exploration would continue into originally planned second phase data collection involving additional questions. The second research question specially established a research focus on discovering the potential to blend multiple theoretical foundations spanning interdisciplinary studies to better conceptualize the organization’s ICAS knowledge ecosystem.

What I discovered was that due to the evolution of a meaningfully complex classification coding schema that evolved through the first two phases of coding, inherent in phase three coding of the first participant’s responses to specific response Nodes, further coded to specific ICAS Nodes with applied classification schemas, answers to this question manifest most meaningfully in third phase queries. I had not anticipated this level of discovery.

In reality, the design of Node structure and classification schema provided a far richer research framework than originally anticipated. Although participants were not necessarily able to understand and therefore articulate explicitly the complexities of ICAS emergent forces, I discovered inherent relationships created with the ICAS Node structure with preliminary classification schemas provided significant additional insight into many characteristics of the organization's KFlow dynamics that quite simply were beyond the visibility of the participant.

These questions were originally designed to represent an opening dialogue to be translated into a meaningful set of initial NVivo® queries tailored to each organization and subsequently tailored to each subject, as appropriate to create meaningful links between organization, individual perceptions and terms, organizational norms, and the original interview question. I had anticipated these initial questions would be represented by a carefully constructed set of initial queries that would lead to follow on questions during participant dialogues. Subsequently, these additional emergent interview questions would frame the second phase of data collection, more specifically the second phase of query generation.

I originally anticipated I would discover key elements of knowledge activities in the subject's organization and begin to operationalize SM and SG activities in context to organizational subsystem characteristics. This anticipation was realized with just first phase coding. In reality, if this project had been a QIMS with one phase of coding I would have met both research question objectives.

Unstructured, open-ended questions typically evolve during the interview process to create a meaningful trust relationship with intent to shape a dialogue space where full and uninhibited disclosure can emerge. This was accomplished in NVivo® using attribute characteristics assigned within classifications that "facilitate[d] future analytical procedures, such as asking questions of the data and making constant comparisons" (Hutchison et al., 2010, p.289).

As discussed, full disclosure was not possible in a historical context. The proposed outcome within first-order and second-order analysis was originally designed, therefore, to include with meaningful intentionality all seemingly apparent outlier data points, as each and every subject's reference and perception of any given organizational phenomenon should find relevant meaning within emergent organizational dynamics.

The underpinning rationale was premised on each participant as a stakeholder in forming and/or additionally shaping any given emergent organizational dynamic involving that individual. Each organizational member thus remains an active participant in both understanding and contributing to the emergent organizational dynamics surrounding knowledge flows and subsequent OI. Therefore, every participant and organizational voice should become inclusive in all phases of data analysis and coding, first-order, second-order, and to the degree possible third-order.

NVivo® characteristics assigned within classifications that could subsequently be linked to unique Node structure relationships provides an equivalent of the individual voice remaining visible throughout data analysis to the degree deemed appropriate to research methodology (Bazeley & Jackson, 2013). I realized by the end of second phase coding that a very small subset of participants, even one, would be sufficient to frame an emergent organizational dynamic involving that one participant and the organizational ICAS. As previously stated, the purpose of this research was to demonstrate the benefit of an enhanced ICAS KM framework, not quantitatively define a new KMS design.

The original challenge anticipated in this context was to attempt to identify the equivalent of outlier data points. After completion of first order data analysis with specific queries generated to capture salient transcript data points, I anticipated a meaningful follow-on activity, time permitting, to include a further review of existing transcripts for significant content not represented or captured in initial queries, perhaps representing outlier data points. My original thought was that subsequent coding by way of attribute assignments, representing excluded content from preliminary attribute coding, potentially could represent an opportunity to further frame or qualify existing terms and metaphors within the NVivo® Node structure, creating yet another unique lens through which to perceive knowledge flow and flow time dynamics.

I anticipated the opportunity would exist to identify this content as a legitimate outlier of meaningful data points relative to the initial set of research questions, translated into specific queries. I envisioned such outlier content potentially could provide a unique opportunity to explore additional relationships between emergent organizational forces surrounding knowledge creation. Additional relationships would then be infused into a deeper understanding of metaphors to be developed in the second phase of data collection. What I discovered was that with a meaningful Node structure representing key theoretical constructs, with appropriate classification structures that included meaningful attributes representing key ICAS and underpinning theoretical terms and metaphors, there were in fact no outliers.

Every voice in the organization has a rational place within the context of the ICAS knowledge ecosystem, and ultimately participates in shaping any given instance of that ICAS representation (Kozlowski & Chao, 2012). Likewise, every research participant response could readily find a meaningful connection to at least three ICAS Nodes with a corresponding classification schema for each. In essence, this became a very meaningful triangulation between theoretical foundation, research, and proposed ICAS KM enhanced design.

Data Coding

Specifically defined within a grounded theory research approach, open, axial, and selective coding can be employed to saturate a model or theory (Birks, Fernandez, Levina, & Nasirin, 2013; Denk, Kaufmann, & Carter, 2012). Consequently, each iterative phase of coding proceeds in stages (Hutchison et al., 2010). However, similar coding schemes have not been limited to grounded theory studies. A similar type of coding was employed to more meaningfully relate knowledge classifications within a multi-year case study (Nissen, 2006).

By coupling open coding within a first-order analysis I formally and effectively developed categorizations relating specific KT phenomena to ICAS emergent organizational attributes and characteristics. During a second-order analysis, capturing additional data points from extended causal group connections, I was able to employ axial coding constructs to develop a visual model of ICAS flow dynamics, visualizing previously obscured ICAS KM mechanism relationships (Hutchison et al., 2010; Birks et al., 2013; Denk et al., 2012).

A similar axial coding construct was employed to develop a knowledge dynamic visualization in Nissen's (2006) second-order analysis, based on a preliminary second-order axial coding used to create a dynamic knowledge classification (Nissen, 2006). A key axial coding advantage included a multidimensional visualization with characteristics that emerged from the dynamic knowledge classification (Nissen, 2006). These visualizations manifest most significantly in the form of NVivo® Node cluster reports during my equivalent second phase coding.

I anticipated significant multidimensional complexity resulting from viewing a single organizational KT phenomenon from multiple lens perspectives using Sysperanto slices. I further anticipated some type of axial coding visualization to emerge that would better shape, categorize, and relate emergent causal mechanisms at play during KT among varying sized organizational TbKM activity systems. What I discovered was emergent influencing ICAS forces in the form of fluid Node clustering linked to key theoretical foundations during open coding. Fluid Node clustering was subsequently extended in selective coding as Deville's original interview transcripts were coded with NVivo® classification attributes.

In this context, there was no single representation, or visualization such as with Nissen's (2006) dynamic knowledge visualization. What emerged from an equivalent axial coding was a series of ICAS instances represented by NVivo® Node Cluster reports. I used Pearson correlation coefficients to statistically explore significant dynamic Node relationships representing ICAS characteristics, dependent upon the lens through which the ICAS was viewed.

The result was a meaningful conceptual representation or visualization alignment with the proposed enhanced ICAS. As opposed to a single visualization, a series of unique organizational ICAS instances framed the next ICAS instance in terms of both KFlow and KFlow time. Each unique NVivo® Node Cluster report created a unique ICAS instance visualization (Bazeley & Jackson, 2013; Kozlowski & Chao, 2012; Nissen, 2006; Snowden, 2002). The result was analogous to frames in high speed film.

A key benefit to using historical data sets was that the link created between specific data points and research participant were removed prior to data analysis. Transcript data were disassociated with original research subject prior to transfer into my NVivo® research project. Deville (2012) meaningfully established relationships between individual participant perceptions and his perceptions of the organization's activities. Notes were embedded in participant transcripts and captured during the original interview process. The composite interview responses and embedded notes provided Deville sufficient foundation to link potentially specific improvement opportunities tailored his organization's unique activity systems and surrounding organizational dynamics (Deville, 2012).

Linking research findings back to original participant perceptions would thus become the true validation as a litmus test of my research outcome and recommendations.

This also represents additional potential opportunities for post-dissertation quantitative research, more specifically targeting granular KT and SM mechanism causality based on individual perceptions within larger ICAS emergent relationships (Andersson et al., 2015; Boisot & Sanchez, 2010; Kozlowski & Chao, 2012). Such granular perceptions could represent potential emergent organizational dynamics as directional causal forces emergent between and within mechanisms more clearly defined within knowledge ecosystem structures (Linger et al., 2007; Sayer, 1992).

This additional effort was not feasible based on time lapse between original data collection that took place in 2012 and current publication in 2016. However, future doctoral research studies could benefit significantly by using more closely linked prior research data to current dissertation projects by time, where NVivo® was used to capture and code original transcript data, as with Deville (2012). Prior NVivo® coded datasets could be integrated into a new NVivo® project representing a new theoretical perspective. This opportunity for doctoral candidates to leverage the potential power of existing research data is further explored in Chapter 5.

Lastly, selective coding was employed to create a meaningful story to connect categories identified from a second-order axial coding (Birks et al., 2013; Hutchison et al., 2010). Although not grounded theory research, a similar coding construct was designed taking second-order analysis data as input to create meaningfully related relationships within a propositional knowledge flow model (Nissen, 2006). The ICAS is fluid and contains many emergent characteristics (Bennet & Bennet, 2004; Linger, Hasan, & Burstein, 2007). Each ICAS instance can be represented by a unique set of

ICAS characteristics (Kozlowski & Chao, 2012). As a result of data analysis, therefore, a more meaningful ICAS visualization is proposed in Chapter 4.

Data Analysis Plan

My research project included a single initial data set (Deville, 2012), representing the military organizational perspective of a knowledge ecosystem. I discovered that the key characteristics of the proposed ICAS enhancements could be illustrated quite effectively with just one data set. As a result, there was no reasonable need to collect additional data sets representing the remaining industries originally identified. However, I wanted to maintain original plan integrity to degree possible.

Additionally, the original data set coded by Deville (2012) did not contain qualifying demographic data. Consequently, I was not able to classify interview subject content to organizational level of responsibility. In retrospect, this unforeseen constraint became a significant benefit. Had demographic data been available, another complex ICAS classification schema would have emerged to accommodate the additional data points. Although significant, this additional level of classification was not necessary to demonstrate the benefits of an enhanced ICAS KM framework.

The primary research objective for an enhanced ICAS framework was to gain increased visibility into previously obscure organizational ICAS emergence. Therefore, there existed no inherent requirement within the original design to differentiate organizational perspectives at the various level of organizational activities.

The overarching objective simply was to demonstrate the viability and value-add of an enhanced ICAS model to represent ICAS emergent characteristics within the organization. Upon reflection, the original data collection strategy to stratify organizational levels created an unnecessary and overly complex data collections strategy, a strategy better suited for follow-on research.

The initial interview questions were originally intended to be applied to each of the historical data sets, had they become available. Within each unique organizational context, I wanted to focus on perceptions specifically relating to possible industry-unique social, cultural, functional, informational, and political forces surrounding ICAS organizational knowledge creation. This strategy and rationale remains relevant, but beyond the scope of the current project, and as stated previously, better suited for follow-on research.

As originally designed, the initial synchronous interview process spanning each organization, and focusing on one to three key stakeholders within each, would thus have targeted leadership and team member perception of organizational dynamics surrounding activity systems within the organization. I anticipated capturing specific perceptions relating the organization’s unique work practices for KT, idea generation, and information exchange. With an enhanced ICAS model, viewing the same ICAS instance of a KT event or activity from each perspective would provide unique insights. This remains a significant possible follow on project using the current NVivo® model, created to represent the proposed ICAS enhancements.

The open-ended interview process remained relevant in the current asynchronous context. Perceptions regarding an organization’s knowledge creation phenomenon should be linked with actual work practices surrounding both the activity system and ICAS organizational emergent forces. The construct of open-ended remained relevant in the form of NVivo® classification coding against participant coded responses to specific ICAS Nodes. Additional coding simply identified additional relationships and meaning based on queries and reports I developed during exploration and interpretation of transcripts (Hutchison et al., 2010).

Follow-on interviews imply additional questions, potentially created by preliminary interpretation of transcripts, and were anticipated to be designed after initial data analysis. I originally anticipated live subjects, and these additional questions would have been delivered to one or more subordinate personnel, within specific work activity systems, premised upon preliminary interviews. Using transcripts, follow-on questions in the form of NVivo® queries likewise were dependent upon preliminary transcript data mining results. The delivery mechanism for questions and interview in my revised data collection strategy, initial and follow-on, was the coding and query capability of NVivo® software.

My initial objective for second order analysis with follow-on interviews was to provide a meaningful framework for developing a relevant double-hermeneutic spanning organizational context and researcher. I intended a double-hermeneutic would span the originally identified four target organizations, each representing one of the two to four unique industries to be studied.

However, by linking all levels of management and operational activity within a set of six primary NVivo® classification schemas representing all hierarchical levels of the organization, I was able to create a meaningfully equivalent double-hermeneutic in terms of research context and interview transcript content. The essence of the double-hermeneutic is the researcher's SM process that intentionally includes a shared participant–researcher SM activity (Pringle, Drummond, McLafferty, & Hendry, 2011).

Lastly, a third phase analysis further operationalized existing data collected during the first two interview cycles, where interview cycle represents a common dialogue via common questions. Following a hermeneutic approach, the third phase of data analysis was originally designed to include additional clarifying interviews to better understand macrolevel and/or micro social structures.

I discovered that social structures embedded in an organization's activity systems, within increasingly larger cyber-social networked contexts, ultimately shape emergent KT mechanism characteristics. Each unique micro-meso KT segment influenced the organizational ICAS KT dynamic uniquely. In my original research design, this was integral within a third phase analysis in form clarifying dialogs. I therefore anticipated creating additional queries during third phase data analysis.

I originally anticipated third phase queries would be necessary to fully operationalize key emergent organizational dynamics at the macro-organizational level. I anticipated operationalized ICAS characteristics would provide new insights necessary to frame specific KT mechanism dynamics linked to specific micro-meso TbKM activities (Boxenbaum & Rouleau, 2011; Kozlowski & Chao, 2012). What I discovered was this level or operationalization was not necessarily significant or relevant to the third phase of data analysis, but more appropriate to the second phase. This activity was effectively accomplished during axial coding using multiple types of NVivo® reports, specifically NVivo® Coding and Matrix Coding reports.

The narrative developed by a double-hermeneutic selective coding analysis simply refined and visually captured a blending of research context and organizational context through classification assignments corresponding to unique ICAS Node characteristics. This was most effectively accomplished by NVivo® reports in third phase analysis requiring no direct correlation to specific interview questions.

My original six research questions were linked to Deville's (2012) 15 research questions during axial coding, and further linked to Deville's original six KT Themes. I needed to triangulate a) Deville's original research KT Themes, b) my coded references linking participant responses to Deville's original KT Themes, and c) my coded references for each participant to select ICAS Nodes with Deville's original interpretations of his six KT Themes prior to third phase selective coding.

The original focus for additional open-ended selective coding interviews was anticipated to occur based on outcomes from a second phase, second order analysis. Accordingly, during original research design, these additional open-ended interviews were conceptualized to frame relationships between key social connections and emergent organizational dynamics within each organization's complex social networks in play during specific epochal events being studied. I used NVivo® queries to emulate these open-ended interviews in the form of matrix queries and classification visualizations.

Although epochal events are significant to the life and culture of an organization, daily routines perhaps provide the most unique insights into KFlow dynamics (Nissen, 2006). Individual perceptions of reality within a routine work activity system have been identified as foundational to understanding knowledge, as well as being significant to understanding complex emergent KT dynamics within the organization (Emmons, 2013).

In harmony with grounded theory type methodology, all interview activity or NVivo® equivalent coding to open-ended discussions or interview questions should be constrained to first and second phase, open and axial coding, respectively. Interpreting original participant SM activity within a double-hermeneutic needed to occur prior to selective coding. I needed to ensure classification schemas were complete and validated prior to creating ICAS instance visualizations during selective coding, as each ICAS instance visualization linked specific participant responses to specific ICAS Nodes with specific classification attributes.

The separation of dialogue and reflexive analysis more effectively maintains a balance between hybridized design data analysis activities, while concurrently establishing overall mixed-methodology integrity. Blending methodologies is considered essential to more meaningfully capture the essence of metaphors (Boxenbaum & Rouleau, 2011). Therefore, I required very specific open, axial, and selective coding, analysis, and interpretation activities to support the hermeneutical phenomenological focus of my research.

NVivo® Node Coding Strategy

Addressing reliability within qualitative research methodology includes confirming that researcher developed and deployed a consistent coding scheme with accurate and consistent dialogue translation (Boxenbaum & Rouleau, 2011). Researcher dialogue translation and coding scheme is a function of time and resource constraints (Bazeley & Jackson, 2013; Birks et al., 2013). Although designed for agreement between multiple coders, I clearly demonstrate consistency with a definition code book developed during initial first phase data collection activities using NVivo® memos (Hutchison et al., 2010).

I created multiple NVivo® coding memos to ensure meaningful definition changes to metaphor, theme, and terms were well documented as data collection moved through the various phases of analysis (Hutchison et al., 2010). I also used NVivo® Node definitions, Classification definitions, and Attributes to further define and operationalize metaphors, themes, and terms, while capturing operationalization rationale in NVivo® memos (Bazeley & Jackson, 2013).

Additionally, all research dialogues with research subjects should be recorded to allow consistent translation of each transcription to developed common terms and metaphors (Boxenbaum & Rouleau, 2011). This was effectively accomplished during original initial interview collection and transcription (Deville, 2012). As I recoded participant responses to Deville's original six KT Themes, I supplemented Deville's original field notes. I added my own extensive ICAS Node coding rationale within each transcript, for each question. Transcript notes were further aggregated and synthesized in my NVivo® memos. This note aggregation and synthesis activity further enhanced reflection and discovery.

Consistent capture and coding also should be linked to unbiased respondent engagement (Podsakoff et al., 2012). Likewise, this activity was accomplished effectively during the original interview process. Deville (2012) originally provided a copy of the coded interview transcript to each participant providing opportunity to correct interpretation of transcription comments.

In terms of the current study, this also implied careful equivalency mapping between synonyms and terms used by respondents spanning multiple historical contexts. Although a single data set was used, representing one organizational ICAS, the equivalency mapping requirement remains significant, and perhaps most significantly for research where NVivo® coding uses historical datasets. During first phase NVivo® ICAS Node creation, I carefully documented coding within a separate NVivo® memo document capturing rationale for all NVivo® Source coding activity against specific Nodes. These notes are clearly identified, translated into NVivo® ICAS Node design, and further discussed in detail in Chapter 4.

There are several bias controls that could be employed within social science research methods. Bias can be introduced by procedural and statistical research activities where questions and variables are not clearly defined prior to data collection (Podsakoff et al., 2012). For a hermeneutical phenomenological study, my original thought was not being as concerned about instrument reliability and clearly defined variables prior to data collection. I was more concerned for respondent’s ability to engage in meaningful dialogue to evoke a shared purpose that ultimately would have value to the individual respondent. In this context, I hoped to consider participant ability factors, motivational factors, and task factors that could potentially bias any given response (Podsakoff et al., 2012).

Ability factors that could negatively influence participant responses include education level, verbal acumen, and knowledge accessibility (Podsakoff et al., 2012). Likewise, motivational factors appear to have common root in the subject's perception of overall value of research dialogue, as well as the individual's perceived personal value to researcher (Podsakoff et al., 2012). A significant task factor that could bias potential individual responses most significantly for a hermeneutical phenomenological study would be more abstract and complex questions requiring significantly greater cognitive activity (Podsakoff et al., 2012).

I envisioned these factors then being translated into specific queries that would create potentially meaningful data points relative to each factor, for each respondent. What I discovered was that these factors should perhaps be translated most meaningfully into an NVivo® classification schema, perhaps labeled Bias Control, with NVivo® attributes corresponding to each factor. I did not code characteristics framing participant cognitive ability for validating bias control. The data were not available.

I would not argue capturing this level of demographic data for subsequent bias control validation is not significant with historical data sets within an NVivo® project. This activity is most relevant to live participant social science research and remains relevant for historical dataset analysis. The root issue is project complexity. The NVivo® project design challenge requires balancing the design of Nodes and classification schemas against anticipated queries simulating interview questions. As demonstrated, sufficient pattern complexity exists even within small sample sizes, relatively few questions, few ICAS Nodes, and corresponding classification attributes.

As a result, translating research design bias-control factors into attributes versus Nodes should ultimately reduce overall project complexity in terms of analysis. However, certain demographic factors would have to be captured and available in the historical data set to find meaningful translation into a classification assignment. Although I established a classification schema where these bias attributes potentially could be captured, I did not find it relevant to the current research project to pursue this level of participant bias coding.

I found this design consideration fortuitous, as I did not have requisite data to pursue either design option, nor was this level of bias validation significant to this study. However, for future NVivo® projects, this level of bias coding does remain a viable coding context for social science research where participant demographic data could be related to bias factors while revealing perhaps an entirely new set of ICAS emergent metaphors. Bias control factors could then be correlated to BIT boundary attributes (Briggs & Reinig, 2010).

Bazeley and Jackson (2012) introduced the concept of Node versus classification schema in principle as a project design decision premised on a series of decision criteria. However, I found the practical design of Node structure within the NVivo® project is perhaps more evolutionary than prescriptive. What may be originally designed as a Node may in fact evolve more meaningfully into a classification schema and/or classification attribute(s). I would therefore caution against preliminary dichotomous design decisions, but would rather let design evolve through first phase data collection, analysis, and interpretation.

Although I did not find ability bias factors to be available in demographic data associated with transcript content, I did find some motivation bias factors becoming visible within the context of the dialog itself (Podsakoff et al., 2012). I resolved perceived dialog bias not in the transcription but in listening to the original audio file in conjunction with the transcription. This required a considerable volume of time to listen, pause, review transcript notes, and re-engage the audio file.

However, the end result included an unforeseen by-product, specifically, a deeper awareness and understanding of participant's SM activity, fundamental to the double-hermeneutic, and required to translate original participant's perceptions of reality into the researcher's SM process (Pringle et al., 2011). In such instances, where appropriate and most visible, these attributes were framed in context to specific BIT Node classification attributes representing attention and ability boundary (Briggs & Reinig, 2012).

As extended cognitive connections are built, shared understandings potentially evolve in a double-hermeneutic, and research questions are anticipated to change between first and second phase analysis to accommodate these additional understandings. A key benefit from this design approach includes "less formal, less standardized and more interactive kind of interview [such that] the researcher has a much better chance of learning from the respondents what the different significances [*sic*] of circumstances are to them" (Sayer, 1992, p. 245).

I translated Sayer (1992) to include flexibility in framing more or less specific queries as appropriate to fully explore potential additional connections between original participant's SM and subsequent researcher-participant shared understandings. This design philosophy was implemented in a research methodology with three stages of data collection spanning a two-year period (Maitlis & Lawrence, 2007). The first stage created narratives of the SM processes. The second stage identified issue domains surrounding leader and stakeholder SG. And, a third and final stage identified conditions associated with leader and stakeholder SG (Maitlis & Lawrence, 2007).

Interestingly, it was not until stage one data collection was complete that a second set of relevant stakeholders and leaders was inductively identified for subsequent interviews (Maitlis & Lawrence, 2007). Although time was a significant constraint, I designed a similar three-stage approach to parallel three phases of analysis employed by Maitlis and Lawrence (2007). A conceptually equivalent three-order analysis design was also conducted by Nissen (2006).

Nissen (2006 defined (a) a first-order analysis to capture key organizational knowledge attributes and characteristics; (b) a second-order analysis that provided a dynamic knowledge classification with resultant dynamic knowledge visualization, and; (c) a third-order analysis using second-order interpretations as input, allowing for more meaningful understandings to emerge in the form of themes to better analyze KFlow patterns. Each approach captured elements of grounded theory coding activities that included open, axial, and selective coding. However, neither research was grounded theory study.

Three Phased Analysis Strategy

I originally conceptualized a first phase, first-order analysis design to synthesize both Maitlis and Lawrence (2007) and Nissen (2006) designs with a purposive quota sampling that would have targeted two or three key executives and managers within each participant organization. I wanted to begin identifying key organizational characteristics that conceptually surrounded specific organizational KT events. This purposive quota sampling was intended to capture initial understandings of the organizational events being studied at the time of original research.

I anticipated developing a follow-on stratified sampling to further target organizational demographics in relation macro-organizational subsystem characteristics. I originally envisioned this activity subsequent to second-order analysis, as I felt at time of research design this might provide unique perceptions of external actors and processes surrounding the knowledge in flux dynamics being studied.

However, I understood that this additional activity might not be feasible as this approach is void available contemporary research partners. As discussed within the data analysis plan, I discovered follow-on stratified sampling was not an appropriate design construct for my hybrid hermeneutical phenomenological and grounded theory study.

The first order analysis was tentatively divided into two distinct data captures, or what I originally envisioned as query activities with subsequent first-order coding. The first and required data capture was to be preliminary interviews in the form of queries with two or three members of senior leadership, individually or collectively. The initial sample would have been selected from within a leadership group dialogue to identify key epochal events within the organization for the purpose of this study. Concurrently, I anticipated I would have captured salient organizational dynamics surrounding these key epochal events.

The first data capture activity was originally designed not to focus on question and answer dialogue. I had intended simply to explore the senior leader(s) perceptions of significant change events within the organization's sphere of activity at the time of original research. The resultant preliminary set of conceptualizations was intended to explore that organization's knowledge emergence and transfer dynamics in terms of IFlow (Bennet & Bennet, 2004).

A second and required data capture in the form of additional queries would then have targeted two or three specific individuals based on preliminary discussions with senior leadership. The purpose was to capture mid-management and operational level team member responses. The construct of discussion and dialogue in current NVivo® query context simply implies an additional set of queries specific to the available data captured, and readily available in transcript form.

I anticipated this NVivo® query design construct would have effectively represented an additional purposive quota sampling set. I anticipated this second data collection activity within the first phase of data analysis to be the primary source of preliminary metaphors. I anticipated I would have discovered respondent perceptions spanning the potentially unique industry perspectives of emergent organizational knowledge (Boxenbaum & Rouleau, 2011).

Originally, a second phase, second-order analysis was designed to refine first-order conceptualizations within meaningful themes that would frame IFlow dynamics within discrete mechanisms, mechanisms representing organizational emergent characteristics such as KFlow, KT, and KE. I wanted to create a second-order understanding of emergent organizational dynamics that could be grouped, based on attributes and organizational dynamics identified during both the first- and second-order analysis interview process.

Within the second-order analysis, I anticipated data collection would have spanned two to three additional interview subjects based on group connections within a work activity system dynamic, as available. I anticipated additional questions would have emerged from the first order analysis that would further shape the second order analysis interview process.

The potential second phase sampling size based on these original design constructs could have reached a potential maximum of nine individuals within each target organization, resulting in a total possible sample size of 36 participants for a second phase data capture. I anticipated I would have developed and applied additional filtering criteria to the second phase sample size to identify the additional two to three interview subjects premised on initial first phase metaphor construction.

Within my original design, additional interview subjects for second phase data capture would not receive questions delivered to first phase, first-order interview subjects. In a traditional interview strategy, the original interview subjects identified for first phase data collection, however, would be receiving the interview questions delivered to the additional purposeful quota sampling group of two to three additional interview subjects identified for second phase data collection.

I realized this entire original design construct would not be viable as research partners from industry remained unavailable. However, as I listened to original transcripts provided by Deville (2012), based on my 22 years combined military experience with the later eight years within an Air Force IS administrative support role, I became aware of Air Force senior staff non-commissioned officer (SNCO) and officer responses in relation to lower SNCO and NCO responses.

Role and responsibility assumptions were based on language and frame of reference to leadership responsibility within the KT events captured. Key aspects of theme formation and metaphor development in the form of enhanced ICAS Node classification attributes, however, were carried into first- and second-order analysis activities. My objective was to maintain original design philosophical construct to degree possible using the historical data set available. However, I did not verify my SM perceptions with Deville, based on IRB data use agreement. Nor was attempt made to stratify beyond leadership (officer and senior SNCO) and non-leadership (lower ranking SNCO and NCO) in my coding of BIT attention and ability attributes.

Ultimately, I found these distinctions, although relevant in some research contexts and seemingly relevant within my original research design, to be in fact not relevant for this current research project. Hopefully, a next generation ICAS Node structure will formalize a set of Participant classification attributes to more effectively capture participant demographics that could more closely align with various motivational contexts and organizational contexts, including bias control factors.

In a second-order analysis, Sysperanto slices represented by key Node structures were applied to each ICAS KM enhanced design construct. Consequently, I created multiple views of ICAS organizational emergent activities influencing KT or KE SM and

SG in terms of enabling, enhancing, or inhibiting, specifically focusing on dynamics involving key organizational subsystem interdependencies (Alter, 2005, Maitlis & Lawrence, 2007; Nissen, 2006).

I anticipated the resultant concurrent multiple-dimensioned view of ICAS organizational dynamics surrounding KT and KE events would shed new insight and understanding on the macrolevel organization's knowledge ecosystem. Following the pattern of Nissen (2006), a second-order analysis would be divided into two parts.

The first part of second phase data analysis was designed to include aggregation, coding, and statistical analysis of captured data. I needed to frame new conceptualizations and variable relationships to better capture emergent organizational forces surrounding knowledge creation and flow. Accordingly, I did not attempt to explicitly identify or quantify all variables and anticipated correlations at inception of first phase data collection. As such, preliminary first phase questions, translated into NVivo® Node coding and queries, were simply an attempt to establish common perceptions in terms of metaphors versus specific variable relationships (Boxenbaum & Rouleau, 2011).

A key second phase outcome from the second part or final coding of the second-order analysis was anticipated to have been some form of visualization capturing emerging organizational dynamics surrounding knowledge intensive activity systems. In essence, I anticipated conceptualizing specific KT framing mechanisms to capture ICAS organizational forces within and around emergent KFlows, directly linking KFlow dynamics to specific KT activity.

What I discovered, however, was not a single visualization, but a series of time-sliced and context-sliced representations of Node relationships, as visualizations, using Sysperanto slice constructs. This only became intuitive after the fact, but links directly to conceptualizations of the ICAS organization that should be understood in terms of time-dependent instances where any visualization of the ICAS is but a moment-in-time snapshot of a complex organizational movement through time (Kozlowski & Chao, 2012).

Subsequently, I anticipated third-order analysis and visualizations would represent macrolevel social structures, such as an organization's activity systems within increasingly larger social network contexts that ultimately shape the emergent characteristics of specific KT mechanisms. During third phase data analysis original design, I had anticipated a third-order analysis would have used second-order analysis data as input (Nissen, 2006). This third-order analysis was intended to operationalize key, emergent organizational dynamics providing new insights to begin to address the research questions.

I anticipated this final level of analysis would have provided meaningful links between visualized second-order dynamics representing emergent forces surrounding KFlows and the proposed activity system enhanced ICAS proposed in Chapter 2. I anticipated that discovery during this final phase of analysis would have ultimately reshaped or conceptually altered aspects of the proposed, enhanced ICAS KM framework.

I further anticipated second- and third-order visualizations coupled with additional research in Chapter 4 to alter original design. These anticipations in fact became reality. The alterations to the originally proposed enhanced ICAS defined in Chapter 2 are represented visually in the concluding sections of Chapter 4, and further discussed in Chapter 5.

Bracketing Strategy

Researchers within a phenomenological study should employ a degree of bracketing, in which researcher's presuppositions about the nature of a phenomena are set aside (Laverty, 2003). This activity allows the reality of the phenomena to become visible and "to show the purely immanent character of conscious experience by means of careful description" (Laverty, 2003, p. 23). As such, a circular spiraling hermeneutic takes place between researcher and subject until researcher finds a place of sensible meaning (Laverty, 2003).

This evolving dialogue requires significant energy and time between subject and researcher to create this place of sensible meaning (Laverty, 2003). I originally designed a purposive quota sampling within each of the originally targeted four organizational data captures to allow for appropriate levels of time and energy. For current research purpose, this place of sensible meaning in context to hermeneutic spirals actually occurred most meaningfully within a single organizational context.

Understanding the essence of perceived reality within the organizational research context is inherent to researcher-research-organization double-hermeneutic. Sensible meanings evolved during three phases of coding and analysis that created positive SM activity within a double-hermeneutic spiral. In either case, live participant interview or historical interview, an equivalent volume of time should be factored into project design to allow for meaningful evolution of a double-hermeneutic.

In essence, the first-order analysis was designed to begin exploring the practical SM process of the researcher as the dynamics between SM and SG as researcher and subject spiral towards a shared understanding, or place of sensible meaning (Laverty, 2003; Weick, Sutcliffe, & Obstfeld, 2005). Within the original research design, I anticipated creating an asynchronous dialogue with historical subjects via NVivo® queries (Bazeley & Jackson, 2013). I believed this would effectively create an inherent degree of separation between participant and researcher.

I thought it intuitively obvious that creating an asynchronous dialogue would require bracketing with even greater intentionality than required with live subject dialogue. I interpreted asynchronous as implying greater opportunities for reflection, where additional reflection would require perhaps more careful attention to meaningful bracketing (Chan, Fung, & Chien, 2013).

Without prior live subject interview experience, I cannot validate this perception. However, I anticipated during NVivo® project design with three phases of coding activity there would be considerable opportunity for reflexive activity. This could potentially allow bias towards preconceived expectations. Prior expectations included the researcher's existing SM process involving emergent ICAS activities. I anticipated these prior understandings could potentially create a mental model of prior subject matter content, in terms of SM application to current research participant's perceptions of those same activities.

To avoid potential reflexive activity outcome bias, I used NVivo® memos to capture thoughts and coding relationships. Continuous time-stamped entries were necessary to create a sequence of thoughts, i.e., an SM and SG process with rationale for structuring those thoughts. I created a unique NVivo® memo for each primary research theoretical framework, where I captured observations in context to Node definition, child node tree structuring, classification attribute definitions, and coding outcomes.

The resultant NVivo® field journal provided the necessary reference frames to maintain desired bracketing while allowing for double-hermeneutic SM with shared understanding that created new research insight (Bazeley & Jackson, 2013; Feldman & Orlikowski, 2011; Tufford & Newman, 2012). Bracketing constructs, in essence, should be coded in the NVivo® project by design in terms of Node definition, structure, restructuring, NVivo® classification design, and attribute definitions within each defined classification schema Node assignment. And, each construct was time-stamped in the appropriate NVivo® memo, contemplated in reflexive activity, and related to all NVivo® memos containing related notes.

Second-order analysis was anticipated to include additional interviews in the form of NVivo® queries with a growing number of subjects, with the intent of limiting a second-order analysis participant quota to a maximum of five to 10 individuals within each organization. A lower boundary for purposive quota sampling for second-order analysis was initially set at two to three subjects per organization. However, this additional level of limiting respondent interviews between multiple organizational contexts in the form of additional NVivo® queries was not required, as a single historical organizational context was the research foundation for all data analysis.

Issues of Trustworthiness

Research methods require explicit and clearly defined forms of validity and reliability to evaluate research integrity premised on a positivist approach to research (Wagner, Lukassen, & Mahlendorf, 2010). Validation criteria for research based on a constructivist approach do not meaningfully fit directly into the positivist approach criteria, and thus typically require some degree of equivalency translation (Wagner et al., 2010).

Evaluation criteria for hermeneutic phenomenological research based on a constructivist approach could include credibility, transferability, dependability, confirmability, and applicability (Wagner et al., 2010). The emphasis in shifting terminology corresponds to a shift from scientific methodology evaluation criteria to a more naturalistic perspective. Correspondingly, this philosophical shift in evaluation criteria shifts focus to confirmability versus objectivity (Wagner et al., 2010).

The credibility of qualitative research may be evaluated by some form of consensual validation, triangulation, construct validation, and/or face validation when considered from a postmodern research perspective (Akerlind, 2005). Yet, another research perspective could include some form of rhizomatic [*sic*] validation, where validation shifts from judgment to understanding (Ongstad, 2014).

Ultimately, most of the diverse perspectives with sometimes unique validation constructs have been synthesized through the interpretive lens emphasizing researcher reflexivity (Akerlind, 2005; Elliott, Ryan, & Hollway, 2012; Walker, Read, & Priest, 2013). All validation in qualitative research thus can be seen as an attempt to ensure accuracy of findings. The challenge then for each qualitative researcher is to frame their validation strategy and qualify the terms used in specific context to the individual research project (Ongstad, 2014; Schou, Høstrup, Lyngsø, Larsen, & Poulsen, 2012).

The goal then is not to become distracted in the minutiae of generalized positivist or constructivist terminologies (Wagner et al., 2010). Social science research with methodology validation continues to emphasize a shift towards the naturalistic perspective as a methodology paradigm (Wagner et al., 2010). Appropriately, validation credibility, transferability, dependability, and confirmability have been considered among the most meaningful validation criteria for hermeneutical phenomenological studies (Schou et al., 2012; Wagner et al., 2010).

Extending existing theories may be accomplished most effectively by releasing the power of metaphors to create new perspectives within a genuine dialogue between researcher and research subject (Boxenbaum & Rouleau, 2011). Appropriately, the researcher thus becomes an active participant in the research process (Schou et al., 2012). I did not employ research questionnaires associated with clearly defined variables. As a result, reliability criteria should emphasize bias mitigation created during the initial question sequence with appropriate corresponding queries (Hutchison et al., 2010; Schou et al., 2012).

A specifically designed series of questions were represented as NVivo® tailored queries designed to evoke shared understandings and a common language relative to the research topic (Hutchison et al., 2010; Myers & Klein, 2011). Therefore, confirmation of validity and reliability representing research trustworthiness as applied to hermeneutical phenomenological research is fully demonstrated in Chapter 4. Validity and reliability became inherent in Node design, creation, and structuring as well as in classification schema design, creation, and definition, as well as participant Node classification coding.

Credibility

For social science research, credibility should require some variant of triangulation that meaningfully corroborates evidence between theoretical foundations and primary research sources with individual members of the organization (Ongstad, 2014; Schou et al., 2012; Wagner et al., 2010). The research purpose and method should be described clearly and the research method should meaningfully apply to the purpose of the research (Schou et al., 2012).

Credibility thus should be the first and pre-eminent validation criterion. Credibility involves confirming the understandability and usability of theories in use by organizations to guide their collective actions (Wagner et al., 2010). And, the relationships established from research should be practical and relevant to those theories (Wagner et al., 2010). Borrowing from grounded theory research, credibility can be established by ensuring there is a specific problem identified and then mapping research results directly back to a possible solution.

To illustrate, my current interview question five (CQ05) was intended to explore key SM inhibitors that were perceived to be in force at the time KT and/or KE activity occurred in the organization. Deville (2012) related perceived SM inhibitors to participant-defined organizational challenges, further related to KT activities with his original interview questions (OQs) OQ09, OQ10, and OQ14 collectively. SM inhibitors and various types of organizational KT challenges were subsequently identified in existing theory and coded to specific ICAS Nodes during phase one QIMS activity.

Credibility was clearly established during the coding process as evidenced in Chapter 4 NVivo® project design through theory coding to specific Nodes during first phase coding. Additional credibility was clearly established during subsequent query analysis design resulting from theoretically sound and consistent NVivo® classification attribute coding linking key NVivo® ICAS Nodes to Deville’s (2012) 11 participant’s responses.

Triangulation is an important element of research validity and inherent to the hermeneutic phenomenological approach (Fielding, 2012; Boxenbaum & Rouleau, 2011). The objective of triangulation is to ensure corroboration between various sources and theories in context to specific themes and perspectives (Fielding, 2012). Themes in this context should relate directly to metaphors (Boxenbaum & Rouleau, 2011).

The apex of triangulation emerged in the form of agreement between an organizational member’s perceptions with an equivalent NVivo® Node representation, in any given ICAS instance (Boxenbaum & Rouleau, 2011; Kozlowski & Chao, 2012). Establishing key interdisciplinary relationships between theoretical foundations and proposed research questions should be validated by the organization's target sample population. In essence, the connection(s) between theory and research outcomes to practical application(s) should be seen as relevant and applicable by organizational leaders (Wagner et al., 2010).

Organizational feedback is considered a key litmus test for research credibility (Houghton et al., 2013). Therefore, organizational feedback in context to prior research transcripts needed to manifest via query capture of significant terms and metaphors. Each query then had to demonstrate meaning validated directly to original participant meaning, based on transcript interpretation and contextual references within the transcript.

Triangulation was accomplished by validating current research Node coding and interpretation with original Node creation and coding by Deville (2012). Deville made specific and meaningful field notes within his NVivo® project linking individual responses to six KT Theme Nodes that were developed subsequent to his interview process. I used those foundational links and relationships at the Node level to validate similar relationships in my Node structures, prior to moving into second phase data collection.

Triangulation in NVivo® projects using existing research data sets should be validated in any new research proposed Node structure during the first phase of data analysis, during open coding or the equivalent. This establishes the foundation for credibility during axial coding data analysis by demonstrating integrity between original research NVivo® Node structures created by original researcher and current research project's NVivo® Node structure.

Establishing direct validation of current Node structures, linked to research foundation, to prior research Node structures should be a triangulation fundamental exercise when using NVivo® data sets from prior research. I employed this validation exercise for each unique new ICAS Node metaphor created and related classification schema conceptualized during first phase open coding.

Transferability

Transferability requires documented rationale for sample size and set (Houghton et al., 2013; Schou et al., 2012; Wagner et al., 2010). Additionally, transferability should be demonstrated by clear explanations of social phenomena and patterns that are applicable across organizational boundaries and/or research projects (Wagner et al., 2010). Clear explanations of enhanced theoretical relationships in this context should include sufficient richness of meaning to allow readers to transfer research directly into their work practices (Gioia et al., 2013). Dependability hinges upon agreement between data, developed themes, interpretations of those themes, and practical applications.

Member checking can be used to validate both interpretation and practical applications (Schou et al., 2012). Member checking in relation to prior research data with historical transcripts should link current interpretations back to original research interpretations captured in original researcher field journal notes. I continuously matched by interpretations via NVivo® query results against Deville’s (2012) NVivo® memo comments, as well as Deville’s published findings.

Transferability as a validity criterion for hermeneutical approaches within social science research is most relevant in context to framing social networked connections that may be common to subsequent research (Houghton et al., 2013; Wagner et al., 2010). As a result, this research should be highly transferrable in context to the proposed dynamic and emergent socially networked KT capabilities defined by my ICAS Nodes within any ICAS organizational knowledge ecosystem. To facilitate this research transfer, the selection of sources and research context should be clearly established (Schou et al., 2012). This was the primary focus of transferability validation spanning all phases of coding and interpretation.

An additional level of validation includes confirming the degree to which a) individual TbKM activity, b) extrapolated into associated micro-meso work activity system's unique performance characteristics, and c) further linked to overall business performance impact can transfer to other organizational contexts. This is not a typical research objective for hermeneutical approaches (Wagner et al., 2010).

I did have this concern when I considered which potential prior research data sets might meaningfully target current research goals. There needed to be a perceived high degree of congruence between original captured data and my research objectives. I culled and evaluated many dissertations spanning several institutes to create a meaningful pool of potential source datasets. Transferability validation when using historical datasets is equally applicable to transferring datasets in as with transferring methodology out.

Supporting chaos theory, in essence, is typically not a high-order transferability validation objective within phenomenological research. Transferability in this context, however, was also very relevant. TbKM activity is unique to each organizational context

(Kozlowski & Chao, 2012; Linger et al., 2007). However, ICAS emergence dynamics surrounding unique TbKM activity is quite the opposite.

I needed to ensure the proposed enhanced ICAS KM framework would transfer readily into all ICAS knowledge-work intensive organizations. I also needed to ensure the ICAS Metaphor would likewise link to as broad a range of historical, current, and future KM research as reasonably feasible. I attempted to embrace chaos theory in relation to ICAS Node design as well as ICAS Node Classification design. This required a focused and balanced tension between viral Node designs and a more structured yet flexible and adaptive Node design.

Dependability

Dependability includes the perception of research reasonability (Houghton et al., 2013; Schou et al., 2012). Dependability does not ensure the possibility of exact replication of the researcher dialogue, as this was considered quite impossible in subsequent hermeneutical phenomenological studies (Wagner et al., 2010). In light of this limitation, the use of metaphors within hermeneutical research to a) more meaningfully conceptualize existing theory while b) enhancing the same existing theory to discover new understandings requires a form of bricolage (Boxenbaum & Rouleau, 2011). The researcher in this context becomes the handyman that designs and deploys remodeled existing theory by combining “various theoretical concepts, ideas, and observations” (Boxenbaum & Rouleau, 2011, p. 281).

The reasonability of the remodeled existing theory should resonate with those members of the organization purposefully selected to participate in the bricolage experience (Schou et al., 2012; Boxenbaum & Rouleau, 2011). Reasonability is typically considered most meaningfully demonstrated after data collection activities have been clearly documented. I used NVivo® memos to capture the bricolage experience in detail including collective interpretations resulting from that bricolage (Boxenbaum & Rouleau, 2011; Schou et al., 2012; Wagner et al., 2010).

I framed collective interpretations as a meaningful validation link between current research outcomes with prior research participants (Deville, 2012), and to anticipated outcomes articulated in prior research theory. However, resonating remodeled existing theory with original research subjects can only be validated in context to existing data points and transcript depth of content, i.e., the depth, breadth, and meaningful content of original participant responses.

As such, careful consideration should be given to validating there is a resonation between proposed theory enhancement and actual work practices, to the extent that resonation can be captured within existing transcript depth of content. Establishing dependability thus should not be an arbitrary process (Houghton et al., 2013). Meaningful and relevant direct quotes should map terms and metaphors expressed by individuals during original data collection to related specific organizational terms and concepts, as well as common terms and metaphors captured in existing and more contemporary theory.

This is the exact validation process for live subjects, and should be meaningfully replicated within any proposed methodology where historical data sets are used that include interview transcripts and associated original audio files. I carefully demonstrated this level of dependability by documenting rationale used to define the project's Node structures and coding schemas in phase one and phase two data analysis.

I validated ICAS Node structures to existing theory in phase one, and subsequently in phase two to individual responses from Deville's (2012) data set. Where appropriate, I captured live quotes from original participants and linked those to specific terms and metaphors relating to the evolution of an enhanced ICAS framework design. Original participant quotes are included in Chapter 4.

Confirmability

Confirmability requires clear delineation as to timing and source of developed themes (Schou et al., 2012). The question should be addressed as to whether themes emerge or are themes clearly defined prior to data collection. Unlike quantitative research, themes and key data relationships do not have to be clearly understood at the beginning of data collection (Boxenbaum & Rouleau, 2011; Schou et al., 2012).

For the hermeneutical phenomenological study, the researcher seeks to discover new themes in the form of metaphors (Boxenbaum & Rouleau, 2012). Confirmation that emergent metaphors link to research questions therefore are more appropriately defined by researcher relationship to research findings, versus initial variable definition prior to data capture (Boxenbaum & Rouleau, 2011; Schou et al., 2012).

Confirmability can be adapted meaningfully to reasonability within the bricolage script. The researcher should use organization-neutral terminology to avoid a potential bias introduced by overly familiar identification with research participant and environment (Houghton et al., 2013). This would be case, for example, where research participant comes from the researcher's parent organization (Houghton et al., 2013). However, avoiding bias does not mitigate the researcher from developing a genuine dialogue with research subject to evolve a bricolage script between researcher and research subject (Boxenbaum & Rouleau, 2011).

The challenge is to maintain a balance between the two where the researcher's position has been clearly defined as an active participant in the bricolage process. Within the current research context, the researcher-participant dialogue became inherently passive in this sense, as the participant's perceptions are previously codified in historical transcripts. Yet, the fundamental requirement for confirmability being organization-neutral terminology should be established in the NVivo® project coding framework.

Emergent themes and their relationship to shared metaphor meaning(s) between researcher and original participant were confirmed post data collection as having been an inherent component of the genuine dialogue (Boxenbaum & Rouleau, 2011; Deville, 2012; Simpson et al., 2004). I consider this the active sense of confirmability when using historical datasets. The challenge within this study was the genuine dialog had to be emulated via a series of carefully constructed queries, limited by the SM boundary framed by the depth of original transcript content.

Consequently, I demonstrated confirmability most effectively post data collection where the exact value and importance of researcher position as well as confirmation of shared metaphor meaning(s) were clearly defined as part of my research findings (Boxenbaum & Rouleau, 2011; Schou et al., 2012). This determination held true to this study, as with all social science research, regardless of present or historical context for creating the genuine dialogue.

A final challenge associated with hermeneutical phenomenological studies attempting to interpret relationships between micro- and macrolevel organizational emergent behaviors involves ecosystem fallacy (Kozlowski & Chao, 2012). Ecosystem fallacy is premised on the amplification of emergent behaviors of the individual and subsequently manifesting those behaviors within micro-meso organizational behaviors. As such, ecosystem fallacy could have potentially created skewed correlations of the characteristics of the lower levels, at individual and/or micro-meso level emergent behaviors (Kozlowski & Chao, 2012).

Accordingly, specific macrolevel conceptualization can only infer types of relationships, as the ICAS becomes a unique entity at any moment in time where causality may be lost when viewing micro-meso organizational behaviors, within team-based or group-based TbKM activity systems (Kozlowski & Chao, 2012; Snowden, 2002). ICAS Node relationships embedded within a specific visualization with clearly defined KT framing mechanism relationships can be visualized based on the lens being used, focusing on micro-meso behaviors (Kozlowski & Chao, 2012).

In part, this is a result of two unique characteristics of emergent behavior in a social context (Kozlowski & Chao, 2012). Observed emergent phenomena are directly related to the lowest level of aggregation, i.e., the individual, where cognition, affect, and psychological behaviors in general cannot be directly observed (Kozlowski & Chao, 2012). Thus, interpreting emergent organizational phenomena at a macrolevel based on aggregations at group levels where micro-meso organizational behavior occurs can create an ecosystem fallacy (Kozlowski & Chao, 2012).

However, the linking of multiple causal relationships through multiple views of any ICAS organizational instance can provide significant predictive insights into emergent ICAS dynamics to the degree lower-level, down to lowest-level construct validity is maintained. Establishing construct validity in this context should include creating a touch-point to the bricolage script by design within the NVivo® project. This high level of construct validity was most effectively accomplished with clearly defined, consistently coded, and organizationally neutral interpretation within NVivo® Node description, Node coding, classification schema design, and ultimately brought forward into classification attribute coding of original interview transcripts.

Ethical Procedures

All social research involves some level of participant risk and requires explicit researcher ethical responsibility to mitigate subject harm in any form, including organization reprisal. Risk mitigation is accomplished by maintaining the highest level of individual privacy (Singleton & Straits, 2010). Social science research has the potential to create subject harm personally, psychologically, and socially (Singleton & Straits, 2010). With personal harm, a research subject may experience embarrassment or humiliation as a result of being involved in any social science research attempting to uncover organizational dynamics that should inherently involve organizational structures, leadership, and social norms (Singleton & Straits, 2010).

Psychologically, a research participant's self-esteem could be damaged based on their perceived relationship to emergent organizational dynamics discussed during the interview process (Singleton & Straits, 2010). Socially, a research subject could experience alienation from peers and/or management, indicating a perceived loss of trust or confidence (Singleton & Straits, 2010). Because the specific research design for this project originally emphasized a very limited sized purposive quota sampling, all three types of harm originally had potential to manifest during interviews and post research. As a result, all ethical decision-making regarding subject confidentiality would have had to be teleological, more precisely my research outcomes would have had to demonstrate that individual harm in any form was mitigated during and subsequent to research publication (Singleton & Straits, 2010).

Each organization involved in the original research study would have had to provide informed consent very clearly and plainly describing ethical responsibility of both researcher and organization. Ethical responsibility thus ensures anonymity of all respondents and confidentiality of collected data. Anonymity and confidentiality is migrated to, and maintained within this study by the additional separation of time and organizational identification with historical data set participants prior to inclusion in my NVivo® database. Any prior organizational identifying data were removed prior to my first order data analysis. In this sense, anonymity remained a direct shared responsibility between current researcher and original participant organization.

Additionally, within the original research project data collection, each potential subject has previously provided informed consent with a clear understanding that at any time during any phase of the research the subject was free to disengage from the study (Deville, 2012). As the data set represented in this research included research subjects that completed the previous research project, research subjects originally disengaging from the initial research project were not included. Therefore, subjects disengaging from the original study could not by definition be identified directly in any communication during or subsequent to current research publication, as they simply do not exist in my current NVivo® project.

During first and second phase interview processes using live subjects, careful discernment and researcher sensitivity to body language should be employed. Subjects in such contexts should be encouraged to practice a sense of individual bracketing, allowing the respondent to view the phenomenon being discussed with a sense of personal detachment (Chan et al., 2013). Although emotions and attitude perceptions can be discussed, they can be done so from the perspective of the larger emergent organizational dynamic being framed, potentially mitigating possible damage to self-esteem.

A researcher should use appropriate reinforcing language supporting additional bracketing during the dialogue to maintain positive perspectives, even during dialogue regarding negative experience. Maintaining positive perspectives and detachment can ameliorate emotional re-immersion into that experience to the point of psychological harm (Pringle et al., 2011; Tufford & Newman, 2012). Shifting focus from individuals to roles within macrolevel forces and dynamics surrounding work system dynamics can further facilitate respondent bracketing (Tufford & Newman, 2012). None of these traditional sensitivities were relevant and applicable to this study.

At the completion of each data analysis phase with live subjects and active organizational research partners, debriefing each respondent as well as the organization is necessary. During debriefs, general characteristics of KFlow dynamics and emergent organizational mechanisms should emphasize an explicit detachment from specific responses. As such, shared research results should focus only on the identified emergent characteristics of the organization as they relate to any ICAS organization.

Appropriately, shared research results during any debrief should relate data at that stage of inquiry to preliminary research conducted prior to the interview process that frames generalized, emergent organizational dynamics within an ICAS. None of these requirements pertained to this current study as all participants were historical in context.

The goal of each debrief with live subjects and active research partners is to create shared understanding and perhaps new awareness between organization and researcher regarding an organization’s unique set of activities. In the current research context, this included those shared understandings that relate to emergent organizational characteristics surrounding KFlows, and ultimately in the formation of OI. Achieving this goal potentially would provide an additional level of separation between individual respondent and the organization’s emergent dynamics as an ICAS.

The focus then would be on structures and mechanisms, not individuals and their responses. For this study, only the generalized organization’s demographics were known, as communicated in original research data set acquisition (Deville, 2012). Representing those generalized demographics independent of organization affiliation within the current research is not relevant, as an overarching purpose of this study was to develop a KMS framework that is not bound or unique to specific industry knowledge creation dynamics.

Whether live or historical, interview subjects should not be identified by name anywhere on forms, query reports, or within notes. Neither should functional role and specific responsibilities within the organization be linked to interview data-points that are made public or visible. All data remained confidential in nature and any link between individual roles, responsibilities, and interview response in form of query outcomes were removed from data prior to importing the original NVivo® dataset. Interview response data can only be viewed post publication with meaning in aggregate form, or when viewed in the form of direct quote. Thus, responses cannot be linked directly back to any respondent by individual identifier within the organization or some organizationally unique identifier.

A confidentiality agreement between myself and historical firm is not necessary in this approach nor required to mitigate information regarding firm-specific, activity-system dynamics. As the original data set is not linked to a specific organizational entity directly in my research, coding notes have been linked to transcripts, as well as presented in aggregate and summary format. I also quoted salient individual responses to meaningfully demonstrate a shared understanding or specific conceptualization, representing either an individual or shared perception, or both.

Without organizational links, direct quotes cannot be linked back to specific original organizational participants, nor can NVivo® memo notes embedded in transcripts to capture time-stamped bricolage experience be linked to a prior organizational entity. Thus, transcript coding framed generic and conceptual relationships representing emerging organization dynamics surrounding generic work activity system and networked groups. Embedded extensive field notes within transcripts thus created a rich future research repository, concurrently maintaining complete confidentiality of original participant. Appropriately, direct quotes were also infused into data analysis reporting in Chapter 4.

All ICAS organizations demonstrate some level of collective intelligence, by definition, and therefore mechanisms and structures emergent within the ICAS organization can demonstrate positively the emergence of organizational intelligence unique to each organization. Coupling current research NVivo® Node structures with previous research data, such as Nissen's (2006) data set and/or the data set created by Maitlis and Lawrence (2007), could further aggregate existing research into a much larger and more generalized data set.

An expanded data set blending primary, in this case the existing Walden University KMS-specific research data set provided by Deville, with additional secondary data could provide significant additional insights. Specifically, where first-order and second-order data analysis have considerable overlap in terms of conceptualizations, resulting from common data reduction, additional ICAS emergent characteristics and dynamic relationships might become visible.

This evolving inclusion of additional historical data sets was not discussed previously during data collection and analysis, as the complexity of this undertaking is well beyond the scope of this research based on time and resource constraints. However, evolving inclusion remains a potential and legitimate means to further guarantee respondent confidentiality and anonymity in context to any future published research results. Perhaps more importantly, an outcome of the current research design is a potentially significant opportunity for future qualitative and quantitative research capturing increasingly larger volumes of existing KMS research data.

Without inclusion of secondary data from additional studies, it would be necessary to mask individual responses during group-level and individual live debrief by referencing previous research frameworks to maximize emphasis on mechanisms and structures. However, with inclusion of historical data sets as primary source data, debriefs were not applicable, and removal of individual and organizational affiliation with data is a given, as previously described. If live research subjects exist, however, referencing existing research themes linked to collective respondent responses would have created additional levels of separation.

Had live subjects been available, additional levels of separation between subject and specific data points could also have further mitigated potential personal, psychological, and/or social harm. This would have been accomplished by linking participant responses in the form of themes and concepts versus direct quotes to a) Nissen's (2006) second-order dynamic knowledge classification as well as b) first-order concepts and second-order themes regarding SM and SG developed by Maitlis and Lawrence (2007).

In this study, the need for such additional considerations of data-subject separation to alleviate potential individual psychological harm was not relevant. As a result, I was able to link at will historical subject responses to current themes and metaphors with direct quotes as appropriate. Historical data in this context had the additional inherent benefit of providing meaningful validation without compromising original participant anonymity.

Summary

A hermeneutical phenomenological research design was used to collect and analyze data based on a three-stage approach to data analysis and coding. Open-ended interviews in a first-order data collection were simulated with a set of carefully constructed and tailored NVivo® queries. Secondary data collection included coded Node structures from stage one coupled with additional equivalent open-ended interview data resulting from additional tailored NVivo® queries and reports.

I used a tertiary stage of data analysis to create visualizations of emergent KT within organizational ICAS structures by selectively coding second-order themes to specific participant responses. The resultant themes were found to be most closely aligned with a metaphor or series of metaphors specifically representing a unique ICAS instance. I anticipated in original design some degree of clearly defined causal relationship to emerge between macrolevel ICAS structures and knowledge transfer framing mechanisms.

However, I found specific macrolevel conceptualization can only infer types of relationships without including specific degrees of causality, where causality is an aggregation of multiple micro-meso phenomena. As the ICAS becomes a unique entity at any moment in time, some macrolevel causality is lost, or becomes hidden, when viewing micro-meso organizational behaviors, especially within team-based or group-based activity systems (Kozlowski & Chao, 2012; Snowden, 2002). However, I clearly demonstrate that causality or relationship visibility loss is minimized in the current design.

The most meaningful correlated relationships embedded within a specific visualization with clearly defined KFlow and IFlow mechanism relationships can perhaps best be perceived or visualized based on the lens being used to create a specific visualization where micro-meso behaviors take place. As previously stated, causality was not an objective in design. However, because I designed sufficiently complex classification schema and ICAS Node design, I did create in several cases visibility into certain emergent ICAS forces visualized as influencers in the form of KFlow or IFlow triggers.

ICAS forces representing IFlow or KFlow triggers did in fact represent a degree of causal influence on IFlow dynamics. I validated this observation with multiple Pearson correlations against multiple ICAS Nodes during second phase interpretations. I anticipate that as the ICAS Node framework evolves, certain classifications will in fact identify more direct causal relationships within any given ICAS IFlow–KFlow dynamic.

Finally, no data were collected prior to IRB approval (IRB approval number for this study is 03-04-15-0042654). All data were analyzed using NVivo® software to construct meaningful node relationships that supported discovery of emergent concept relationships. Chapter 4 provides a detailed description of each phase of analysis with appropriate classifications and visualizations.

Chapter 4: Results

Conceptualizing knowledge and KM have shifted toward “macrocognition activity” (Kozlowski & Chao, 2012, p. 333). The original concept linked human decision-making to complex problem spaces. Kozlowski and Chao (2012) evolved macrocognition conceptually to bridge shared mental models, transactive memory, and knowledge emergence into wickedly complex problem-solving spaces specifically within a team knowledge-work dynamic.

Therefore, an emergence dynamic involves increasingly larger spheres of organizational knowledge-based activity systems that should link individual and organizational cognitive activities (Briggs & Reinig, 2010; Lyles, 2014). Increasingly complex cognitive activities are framed by IFlows through complexly organized cyber-physical-socially networked structures (Amini, 2010; Boisot & Sanchez, 2010; Kozlowski & Chao, 2012; Zhuge, 2014).

Briggs and Reinig (2010) considered individual ideation a macrocognition activity when conceptualizing knowledge within wickedly complex problems. However, the inherently fluid characteristic of knowledge as a macrocognitive activity has not been clearly defined in an IFlow context. IFlow should encapsulate time, span organizational and cognitive boundaries, and emerge within socially complex intra-organizational networks (Ahuja et al., 2012; Boisot & Sanchez, 2012; Kozlowski & Chao, 2012).

An IFlow within the ICAS organization originally included any resource that could flow through an organization, where knowledge was considered an emergent resource (Bennet & Bennet, 2014). Understanding complex acts of knowing should be coupled with enhanced understandings of both organizational IFlows and supporting KFlow dynamics (Bennet & Bennet, 2004; Nissen, 2006). And, IFlows and KFlows should infuse socially complex network dynamics with enhanced understandings of micro- and macroTbKM dynamics, most significantly in context to cognitive activities and cognitive boundaries (Briggs & Reinig, 2010; Kozlowski & Chao, 2012).

To better understand IFlows, including work activity system KFlows that frame organizational cognitive activities, I have extended existing ICAS theory to propose a work-system enhanced ICAS KM framework. Management methodologies have been embedded in this framework. Sysperanto slices representing intersections of knowledge, situational complexity, work activity systems with complex and emergent social networks, as well as organizational subsystem dynamics have been meaningfully linked within vertical and horizontal KFlow framing mechanisms. Within these KFlow framing mechanisms, SM and SG can be monitored more effectively, understood more comprehensively, and framed more intentionally.

Method

I used a qualitative phenomenological methodology as the foundation for gaining deeper understanding of the ICAS organization's micro-meso behaviors emergent within and surrounding organizational phenomenon involving KFlows. Situated between individual and various levels of TbKM activity systems, from the work group level or microlevel, to a larger organizational context, i.e., the macrolevel, is a confluence of SM and SG individual cognitive activities, the meso level (Kozlowski & Chao, 2012).

The relationship framed when juxtaposing micro-meso organizational behaviors with individual cognition and SM activities creates a unique research challenge for the social scientist (Kozlowski & Chao, 2012). As previously discussed, a primary key to ensuring interpretations of emergent phenomena at increasingly larger spheres of KFlow within an organizational context is designing high degrees of construct validity at each level of analysis (Kozlowski & Chao, 2012).

I hybridized the foundational qualitative phenomenological study with elements of grounded theory coding and analysis, similar to the hybridized case study research methodologies used by Nissen (2006) and Maitlis and Lawrence (2007). As a result, I was able to leverage the power of open, axial, and selective coding to build from individual perceptions to increasingly larger spheres of organizational SM, SG, and knowledge activities while ensuring high degrees of construct validity at all levels of coding.

Overarching grounded theory coding, I used a hermeneutical approach allowing for meaningful double-hermeneutics to evolve within each coding phase, as well as spanning phases. The resultant cascading double-hermeneutics fostered evolving emergent self-organization ICAS SM characteristics as a bricolage, providing transformative knowledge dynamics interpretations (Boxenbaum & Rouleau, 2011; Myers & Klein, 2011).

I initially recoded participant perceptions regarding knowledge (Deville, 2012). Subsequently, I framed perceptions in sets as metaphors (Boxenbaum & Rouleau, 2011).

Lastly, I linked metaphors to micro-meso organizational behaviors (Kozlowski & Chao, 2012; Myers & Klein, 2011).

The qualitative methodology employed as a result was a hermeneutical phenomenological approach hybridized with open, axial, and selective coding constructs from grounded theory study. This approach provided the optimum framework for collecting, analyzing, and interpreting data from multiple perspectives necessary to visualize enhanced understandings of ICAS dynamics between

- individual SM impacted by emergent environmental characteristics;
- group-level and micro-meso SM and SG; and
- emergent micro-meso socially complex networking behaviors.

Concurrently, each of these dynamics had to be framed individually and collectively within the emergent self-organization characteristics as currently understood to exist within the ICAS organization (Bennet & Bennet, 2004).

Data Collection

To begin the first hermeneutic, I represented ICAS emergent complexity as NVivo® Node metaphors within a multidimensional knowledge ecosystem framework design. My initial design concern was ICAS Node representation. Therefore, I needed to design meaningful Node relationships within NVivo® to model operationalized ICAS characteristics that included complex SM and SG, individual cognitive activities, multiple flow dynamics, as well as multiple knowledge-work activity level relationships.

First phase data collection included a) creating NVivo® Nodes, b) creating a research classification schema, and c) coding foundational research within and between

Nodes. Concurrently, I bridged theoretical foundations to validate the ICAS Node structure representing a multidimensional knowledge ecosystem. Initial Node coding within NVivo® linked unique ICAS equivalent Child Nodes to theoretical source foundations. Significant insights emerged simply by incrementally running similar Node Cluster reports by word similarity as additional source theories were coded to existing Node structures. Thus, iterative coding and validation activity included significant QIMS activity.

As a result, the first double-hermeneutic emerged as Nodes were enhanced conceptually into metaphors to represent key operationalized characteristics and terms of each new theory, linked to existing coded theories. These preliminary discoveries, as well as the preliminary Node structure design and rationale are discussed within first phase open coding analysis and interpretation.

The second phase of data collection, modeled after axial coding, began with developing a preliminary classification schema to support attribute value coding of original participant responses to the initial ICAS Node structure. This activity was necessary to triangulate original research findings to the enhanced ICAS ecosystem framework I created within the NVivo® Node structure. Prior to creating a final classification schema and assigning attribute values in selective coding, I needed to ensure that coded themes created by Deville could be replicated within my NVivo® design. This first part of axial coding is discussed as part of second phase axial coding.

A second level of axial coding resulted from original research themes developed by Deville (2012), based on his initial observations and notes being coded to enhanced

ICAS framework Nodes. I developed NVivo® queries after this second-order axial coding was completed to represent a dialogue space around my proposed interview questions.

Additional research interview questions in the form of NVivo® queries were most meaningfully and logically developed after an open coding foundation established a reliable NVivo® ICAS Node structure. The ICAS Node structure required validation to ensure key emergent ICAS knowledge ecosystem characteristics were adequately represented. Additionally, I required a second component of axial coding to further operationalize original participant responses.

I recoded participant responses to Deville's (2012) original six KT Themes. I needed to expand upon Deville's original coding such that each of the 15 original questions created one coded Participant Node, resulting in 165 coded Participant Child Nodes, in addition to the original six KT Theme Nodes created by Deville. Triangulation at the individual level required individual Participant Parent Nodes, as well as a unique Child Nodes for each interview question and response.

With this additional level of coding, I was able to further operationalize each Participant Node with one or more NVivo® Child Nodes. I more specifically linked key phrases from participant responses to Deville's original theme Nodes, but more importantly, I created the foundation to very specifically link key perceptions from specific participant responses to multiple ICAS Nodes.

I was then be able to create the necessary coded relationships to represent a specific ICAS slice representing a specific perspective of any given ICAS instance, from any individual perspective. I effectively validated a reliable NVivo® enhanced ICAS framework Node structure through a series of NVivo® queries linking original themes created by Deville to current NVivo® structure. This second part of axial coding is discussed within my final analysis and preliminary interpretations of second phase axial coding.

Selective coding included analysis of visualized shifts of key terms represented within NVivo® Node Cluster and Node Matrix reports, such as KT and KE in relation to TaK and ExK. I coded participant responses as coded Participant Child Nodes to ICAS Nodes using the complex classification schema developed during axial coding.

As a result, I viewed ICAS emergent knowledge through various lenses represented as Sysperanto slices to explore key ICAS emergent dynamics, while concurrently viewing these dynamics from the perspective of the individual respondent. First and second phase coding thus created the required NVivo® Node structure with sufficiently robust classification schemas such that Sysperanto slices, or views of any given ICAS instance, could be coded to my extended Child Node coding of original participant responses.

As with true grounded theory coding, I needed to interpret each phase sufficiently to create the foundation for the subsequent phase of coding. As a result, beginning with coding Source theory Nodes to ICAS Nodes, I was able to interpret these various ICAS instance views statistically through NVivo® query reporting, discussed in more detail in my findings section following analysis of each phase coding activity.

I perceived an almost fluid shift of Node clustering resulting from initial coding to specific theoretical foundations, evolving through participant response coding to ICAS Nodes during selective coding. A classification schema representing key ICAS attribute values concurrently evolved as each seemingly fluid shift created unique insight. This validation activity visualized the preliminary enhanced ICAS theoretical extension value-add using various ICAS flow dynamics and subsystem relationships as lenses.

Each new theoretical foundation shifted the Node clustering to accommodate that theoretical influence. The key is that I had simulated a unique lens represented by each new theoretical foundation. Each lens, each theoretical source coding, created a unique perspective of the ICAS as represented by NVivo® Node clustering reports using word similarity.

However, the effulgent visualization power of the Sysperanto slice represented in NVivo® was not realized until selective coding. During selective coding, ICAS instance visualizations represented

- combinations of Child Node coding to theoretical foundation;
- respondent perceptions coded through equivalent ICAS characteristics within the NVivo® classification schemas, and;
- emergent dynamics between two or more NVivo® Nodes within the 57 Nodes available that represent the enhanced ICAS ecosystem dynamic within the NVivo® model.

The statistically significant correlations around specific Node clusters representing unique ICAS instance and multiple views of that instance are discussed in my final findings as well as further interpreted in Chapter 5.

NVivo® Project Initiation: First Phase Open Coding

I began Node coding as an open coding foundational exercise by creating the NVivo® Node structure. I balanced Node design complexity to meaningfully represent the multiple perspectives of knowledge activities, emergent ICAS characteristics, cognition dynamics, and micro-meso and macro-meso socially complex networking forces flowing within the ICAS organization. The balancing challenge was two-fold.

Firstly, I needed to frame an optimum number of NVivo® Parent and Child Node relationships within the ICAS structure to meaningfully aggregate participant response coding, minimizing excessive Node structure complexity. Secondly, I needed to concurrently provide future opportunity to analyze discrete ICAS Node points of influence within any given ICAS instance, significantly influencing Node structure complexity. Additionally, historical definition of ICAS emergent characteristics had to be transformed into more robust metaphors to capture contemporary understandings that more meaningfully qualify aspects of ICAS dynamics with greater clarity and insight.

Nodes can represent individual cases relating directly to a "bounded, definable unit of analysis" (Bazeley & Jackson, 2013). Alternatively, Nodes can be linked to concepts, using one of two types of Nodes. In NVivo®, Case Nodes and Nodes are treated separately for simplicity in logically or cognitively separating concepts from physical objects under investigation.

Case Nodes have specific case demographics associated with each unique case, e.g., an individual participant or individual journal article. Nodes more generically represent concepts, or in my case, ICAS metaphors. This philosophical approach to Node separation within NVivo® projects is primarily designed to alleviate viral coding systems (Bazeley & Jackson, 2013). I blended both constructs within my NVivo® project to create a set of Nodes representing both concept and case.

As recommended by Bazeley and Jackson (2013), I first adopted the philosophical approach of Node as concept bin to begin preliminary concept coding of source articles to Nodes versus Case Nodes, the more obvious Node choice. An interpretation-rich coding scheme quickly emerged as a powerful metaphor discovery framework. By maintaining Node simplicity linked first to key literature theory and concepts, in a meta-synthesis coding, I created an opportunity to subsequently evolve a classification schema tailored to individual cases from Deville's data set for observing and analyzing a specific instantiation of an emergent organizational form (Boisot & Sanchez, 2010).

This was the first of a series of double-hermeneutic discoveries, versus an intentional or anticipated original design construct. The original NVivo® Node construction was designed with relative simplicity specifically for the primary purpose of validating Node coding construct, creating a structure that could be validated initially with triangulation between NVivo® Nodes including:

- foundational theory design attributes preliminarily coded to one or more corresponding concept Nodes using the guiding principle of a Node as bin for conceptualizations or metaphors (Bazeley & Jackson, 2013; Boxenbaum & Rouleau, 2011);

- each unique theoretical foundation coded to a unique Node where a given Node structure relationship would represent a specific set of ICAS characteristics for subsequent classification coding (Bazeley & Jackson, 2013; Hutchison et al., 2010); and
- Deville's (2012) original research outcomes and new theory attributes and relationships being linked to NVivo® Child Nodes under concept Nodes (Bazeley & Jackson, 2013; Boxenbaum & Rouleau, 2011).

What I discovered was that I created a potentially powerful framework to explore an existing participant research data set representing an ICAS instantiation (Boisot & Sanchez, 2010). For future research, the resultant overarching NVivo® structure representing an enhanced ICAS framework could thus be tailored to additional ICAS instantiations, i.e., historical KM and KMS research data sets. As importantly, I could also use this foundational framework in future research to create enhanced ICAS Node relationships with additional Child Nodes and further enhance classifications based on additional research as Source Nodes.

However, prior to coding theoretical sources, I needed to first design a project Node structure by defining Nodes in context to key theoretical concepts. Parent Nodes within the ICAS folder in this context represent primary attributes or characteristics of an enhanced ICAS as an NVivo® Parent Node. Emergent forces and secondary characteristics of the proposed enhanced ICAS are identified as Child Nodes.

Additionally, primary theoretical foundations are also represented by Parent Nodes with a Child Node structure as appropriate, each representing key theory variables. However, translating theoretical foundation concepts and attributes of each concept into an organizational instance required the additional qualification from NVivo® classifications. Specific ICAS attributes were assigned to each Node/Child Node as appropriate. Classification schema design began during second phase axial coding and culminated in third phase selective coding.

Firstly, creating a preconceived rigidity between Node and classification relationships that should be kept more loosely coupled or initially disassociated can create coding challenges as well as introduce unintentional bias in classification design (Bazeley & Jackson, 2013; Hutchison et al., 2010). Initially, explicit Node and classification disassociation allowed logical associations between NVivo® Node and classification schemas to emerge as concepts and relationships. Subsequently, additional relationships evolved during axial coding, thus maturing my conceptualized ICAS metaphors (Bazeley & Jackson, 2013; Boxenbaum & Rouleau, 2011).

Secondly, the rationale for initially and intentionally separating classification attribute coding from Node coding by phases was not to ensure Node structure validation. My primary concern was to leverage the foundational Node framework as a larger guiding metaphor to begin to capture systemic characteristics of the ICAS that influence, frame, shape, control, and flow throughout the ICAS over time. What I discovered was that by accomplishing the later, the former was inherently accomplished by evolutionary design adjustments.

My initial coding objective was to link organizational TbKM emergent phenomena surrounding KFlows within various levels of socially aggregated KNets, i.e., micro- and macro-meso level TbKMs. TbKM dynamics had to be linked to the larger ICAS emergent characteristics such that I could better understand dynamic and systemic ICAS relationships. To allow these relationships to manifest as metaphors that describe and inform key relationships, Node and classification design needed to evolve from within the NVivo® coding system. Classification attribute assignment did not occur until third phase selective coding where individual participant responses were coded by assigned attribute values to pre-existing coded Node relationships.

If I had added additional classification criteria with defined attributes concurrently with preliminary Node structure creation, my initial impulse, I would have lost the opportunity to explore emergent TbKMs. TbKMs were viewed in context to micro-meso organizational as well as emergent ICAS self-organization characteristics during first phase analysis. Additional classification attribute design too early during Node design would have created an artificial framework that could have potentially mitigated discovering Node shifts during second phase coding.

Viewing specific emergent ICAS organization instantiations through a specific theoretical lens required concurrently observing individual participant perceptions in the form of classification attributes. However, while an individual respondent's perceptions represent a micro-perspective of an enhanced ICAS framework, the ICAS characteristics representing surrounding organizational micro- and macro-TbKM emergent behaviors can be explored independent of classification attribute coding, i.e., purely theoretically.

Thus, separating Node coding and classification coding between phases further allowed constructs coded from underpinning theories and supporting literature in open coding to be meaningfully validated prior to individual response coding via classification attributes to ICAS Node relationships during selective coding. ICAS Node relationships evolved during open coding that began to describe overarching metaphors, such as a SM framing mechanism, and were matured during axial coding.

As open coding became a double-hermeneutic, I found first phase Node coding linking foundational research to multiple ICAS Nodes revealed classification schema relationships between multiple ICAS Nodes. Assigning classification schemas as a type of metaphor to multiple Nodes provided enhanced visibility into individual participant perceptions. Participant perceptions were coded to existing Node structures during third phase selective coding. What I originally visualized prior to open coding as a meaningful set of classification schemas was far more rigid and less illuminating than what emerged. This is consistent with existing research relating to NVivo® design and grounded theory coding (Bazeley & Jackson, 2013; Hutchison et al., 2010).

With the existing foundational Node coding in progress, I became sensitized to NVivo® query capability to include or exclude one or more selected Nodes and associated coded content (Bazeley & Jackson, 2013). NVivo® queries allow for multiple selection criteria, one being the NVivo® folder.

Following recommendations provided by Bazeley and Jackson (2013), I created a unique set of NVivo® folders subsequent to preliminary Node creation to isolate specific Node structures to enhance future query design. I originally did not see the value of folder creation, as I felt the parent-child Node structure itself was sufficient, and my initial concern was designing a project that balanced simplicity and reporting functionality with an emphasis on simplicity (Bazeley & Jackson, 2013).

As I began to import Deville's NVivo® participant case Nodes in preparation for open coding, while concurrently gaining deeper understanding of NVivo® capabilities, it became apparent a relevant folder structure was fundamentally essential. Folders within NVivo® projects primarily provide meaningful separation of various concept Node and Source Node structures, if nothing else (Bazeley & Jackson, 2013).

However, I found that folders additionally provided meaningful separations between key project content that allowed greater flexibility to target specific micro-meso and macro-meso metaphors representing emergent ICAS characteristics during axial and selective coding queries. Ultimately, I discovered both Node and folder structure were necessary within an NVivo® project to be most meaningful for data analysis. An appropriate combination of folders and Nodes facilitates blending both design and evolutionary discovery to create meaningful physical and logical relationships, respectively.

The resultant original NVivo® parent Node structure represents an enhanced ICAS framework linked to key theoretical foundations. As there is considerable overlap between emergent ICAS characteristics and organizational knowledge in literature, often framed in similar constructs yet linked uniquely to research focus, I quickly realized that a single theoretical foundation or source should be meaningfully coded to multiple enhanced ICAS characteristics. As a result, each emergent or defined enhanced ICAS characteristic was represented by a unique Node and/or Child Node relationship with multiple theoretical foundations coded to multiple Nodes in a many-to-many relationship.

First phase open coding linked primary theoretical foundations to NVivo® Node(s) and included supporting research that intentionally captured meaningful historical sources where appropriate. Selection factors framing appropriateness included a unique perspective, a seminal perspective, and/or being complimentary to more contemporary theoretical construct(s).

I wanted to capture a meaningful and significant set of synonyms and metaphors representing conceptualizations of a particular characteristic within an enhanced ICAS framework. Synonyms and metaphors needed to bridge historical with contemporary research. The resultant coded synonyms and metaphors each provided unique and robust theoretical ICAS perspectives. These perspectives included unique ICAS emergent characteristics visualized within a specific ICAS instantiation. ICAS instances became foundational to classification schema design (see Table 1) (Kozlowski & Chao, 2012).

An overarching coding factor included maintaining project feasibility in context to original research questions. First phase open coding subsequently linked primary research and theoretical foundation content to NVivo® Node(s) and Child Node(s). It is important to note Table 1 was designed to capture significant relationships between parent Node structure and key theories as well as primary supporting concepts and frameworks. As such, not all sources were coded explicitly. Sources not coded explicitly are annotated with a Table note and *italicized*. However, non-coded theoretical foundations remain included in Table 1, as they were referenced to inform and design final classification schema attributes.

Consequently, all supporting theories and supporting conceptualizations are thus represented in Table 1. The rationale for inclusion or exclusion of noncoded theoretical foundation was simply that each noncoded but referenced theoretical foundation for final classification design provided

- significant unique or additional conceptual understanding influencing specific Node structure design relationships;
- more meaningful participant coding to specific Child Node(s) or specific Child Node(s) design;, and/or,
- enhanced design of classification schema with additional values and meaning of each where theory was most meaningfully represented within a classification schema versus a Child Node within the ICAS Node structure.

The parent Node structure with supporting Child Nodes therefore provided for meaningful construct validation by triangulating Child Node coding to underpinning source theory and additional supporting sources. Child Node structures representing coded emergent characteristics of a) the ICAS environment (Table 3), b) self-organization (Table 4), c) organizational knowledge (Table 5), d) OI (Table 6), e) organizational subsystems (Table 7), f) SG (Table 8), g) SM (Table 9), and h) Sysperanto work system architecture (Table 10) are each presented and discussed separately.

Child nodes representing bounded ideation theory (BIT) boundaries developed by Briggs and Reinig (2010) are presented in Table 2. Several key ICAS characteristics within an enhanced ICAS framework (See Figure 7) do not have supporting Child Nodes, therefore not represented in a unique table. These include ICAS emergent flow dynamics (IFlow), permeable organizational boundaries (IBoundary), and organizational and individual filtering dynamics represented within the ICAS selectivity characteristic (IFilter).

Table 1

NVivo® Parent Nodes Linked To Research

Parent Node Name	Coded Theories & Concept Frameworks *Node Structure Design Concept References (Not Coded)*
Bounded Ideation Function	Bounded Ideation Theory (BIT) (Briggs & Reinig, 2010; *Senge, 1994*[a])
Emergent Environment	ICAS Organization (Bennet & Bennet, 2004; Linger et al., 2007; Kozlowski & Chao, 2012; *Lee, Park, & Kim, 2014*[a]; *Mangia et al., 2013*[a]; *Senge et al., 1999*[a])
Emergent Self-Organization	ICAS Organization (Bennet & Bennet, 2004); Kozlowski & Chao, 2012; Linger et al., 2007; *Sanda & Johansson, 2011*[a]; *Yang & Shan, 2008*[a])
ICAS Flow (IFlow)	ICAS Organization (Ackerman & Halverson, 2000; *Amini, 2010*[a]; *Anand et al., 2012*[a]; Bharadwaj et al., 2013; Becker, 2007; Bennet & McGee, 2005; Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Boxenbaum & Rouleau, 2011; Kozlowski & Chao, 2012; Lee, P. et al., 2010; Linger et al., 2007; *Lipparini et al., 2013*[a]; Mackey & Jacobson, 2011; Madsen & Desai, 2010; Maitlis & Lawrence, 2007; Miranda et al., 2011; Nissen, 2006; ; *Soda & Zaheer, 2012*[a]; Turner & Makhija, 2006; Weick et al., 2005)

Parent Node Name	Coded Theories & Concept Frameworks *Node Structure Design Concept References (Not Coded)*
Knowledge	Foundational Theories (Ackerman & Halverson, 2000; *Ahuja et al., 2012*[a]; *Amini, 2010*[a]; *Argote, 2012*[a]; *Ashoori & Burns, 2013*[a]; Becker, 2007; Bharadwaj et al., 2013; *Bennet & Bennet, 2004*[a]; *Blumer, 2011*[a]; *Brodbeck et al., 2007*[a]; *Choo, 1998*[a]; Bennet & McGee, 2005; Borgo & Pozza, 2012; Boisot & Sanchez, 2010; Briggs & Reinig, 2010; Caron et al., 2007; *Cavaliere & Lombardi, 2013*[a]; *Chowdhury, 2005*[a]; *Deville, 2012*[a]; *Dulipovici & Robey, 2012*[a]; *Flaherty & Pappas, 2012*[a]; *Heidegger, 2006*[a]; *Joia & Lemos, 2010*[a]; *Hussin et al., 2012*[a]; Lee, P. et al., 2010; Linger et al., 2007; Lipparini et al., 2013; *Louis-Sidney et al., 2012*[a]; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; *Mangia et al., 2013*[a]; *Minbaeva et al., 2012*[a]; *Nonaka & Takeuchi, 1995*[a]; Nissen, 2006; *Snowden, 2002*[a]; Turner & Makhija, 2006; Kozlowski & Chao, 2012; *von Krogh & Roos, 1995*[a]; *von Krogh et al., 2012*[a]; *Vo, 2012*[a]; Weick et al., 2005; *Wiig, 1993*[a])
Organizational Intelligence (OI)	Organizational Intelligence (*Argote, 2012*[a]; *Bennet & Bennet, 2004*[a]; Jacks et al., 2012; Kozlowski & Chao, 2012; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006)
Organizational Memory (OM)	(Ackerman & Halverson, 2000; *Argote, 2012*[a]; Bennet & McGee, 2005; Borgo & Pozza, 2012; Briggs & Reinig, 2010; *Huang et al., 2012*[a]; *Jackson, 2012*[a]; *Kang et al., 2007*[a]; *Lee, Park, & Kim, 2014*[a]; Kozlowski & Chao, 2012; Linger et al., 2007; *Louis-Sidney et al., 2012*[a]; *Lyles, 2014*[a]; Mackey & Jacobson, 2011; Madsen & Desai, 2010; Maitlis & Lawrence, 2007; Miranda et al., 2011; Nanclares et al., 2012[a]; Nissen, 2006; Turner & Makhija, 2006; *Padova & Scarso, 2012*[a]; *Perera et al., 2014*[a]; Rowlinson et al., 2010; *Schultz & Hernes, 2013*[a]; *van Wijk et al., 2012*[a])
Organizational Subsystems	Dynamically Connected Organizational Subsystems (*Narayanan & Nath, 1999*[a])

Parent Node Name	Coded Theories & Concept Frameworks *Node Structure Design Concept References (Not Coded)*
Permeable Boundaries (IBoundary)	Emergent & Designed Intra-Organizational KFlow & IFlow Boundaries (Ackerman & Halverson, 2000; *Bennet & Bennet, 2004* [a]; Becker, 2007; Bharadwaj et al., 2013; Bennet & McGee, 2005; Boisot & Sanchez, 2010; Boxenbaum & Rouleau, 2011; Kozlowski & Chao, 2012; Linger et al., 2007; Madsen & Desai, 2010; Nissen, 2006; *Olsen et al., 2012* [a]; Turner & Makhija, 2006)
Selectivity (IFilter)	Organizational Individual and Micro-meso SM Filters (*Bennet & Bennet, 2004* [a]; Becker, 2007; Borgo & Pozza, 2012; Kozlowski & Chao, 2012; Mackey & Jacobson, 2011; Madsen & Desai, 2010; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006;)
SG (SG)	Organizational Individual and Micro-meso SG Activities (Ackerman & Halverson, 2000; Borgo & Pozza, 2012; Briggs & Reinig, 2010; Boxenbaum & Rouleau, 2011; Kozlowski & Chao, 2012; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Miranda et al., 2011; Nissen, 2006; Turner & Makhija, 2006; Weick et al., 2005; Weick, 2012 [a])
SM (SM)	Organizational Individual and Micro-meso SM Activities (Ackerman & Halverson, 2000; Bharadwaj et al., 2013; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Burford, 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Rowlinson et al., 2010; Kozlowski & Chao, 2012; Weick et al., 2005, *Weick, 2012* [a])
Work System (Sysperanto WS)	Organizational Task-based Activity Systems (TbKMs) and Knowledge Work Activities (Alter, 2005; *Anand, 2012* [a]; *Ashoori & Burns, 2013* [a]; Boisot & Sanchez, 2010; Borgo & Pozza, 2012; Burford, 2012; *Brodbeck et al., 2007* [a]; *Hussin et al., 2012* [a]; Kozlowski & Chao, 2012; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; *Charles et al., 2013* [a]; *Senge, 1994* [a]; Turner & Makhija, 2006)

Note: [a]Referenced for Node structure conceptualization but not included directly in Node coding.

The Bounded Ideation Function Node structure, represented in Table 2, identifies Child Nodes and source coding corresponding to the ideation process defined within Bounded Ideation Theory (BIT) (Briggs & Reinig, 2010). Of all the ICAS Node structures, this was one of the few relatively straightforward in design. Each of the six BIT boundaries is represented by a corresponding Child Node. Within BIT, ability boundary was considered an independent variable and the remaining five boundaries represented moderating or influencing variables. Collectively, these six ideation boundaries frame the shape of the ideation ogive, i.e., a diagonal arch representing the ratio of good ideas to total ideas (Briggs & Reinig, 2010).

Although the ability boundary in theory was unique from the remaining five boundaries, creating a Child Node representing each of the six boundaries underneath the parent Node seemed a logical translation of theory to Node structure. The actual number of coded references (Coded Refs) within Table 2 and remaining Child Node tables correspond to all referenced and coded Source Nodes.

Table 2

Research Coded to BIT Child Nodes

Parent Node Name Child Node	Coded Refs	Theoretical Foundations & Conceptualizations
Bounded Ideation Function	11	Bounded Ideation Theory (BIT) (Briggs & Reinig, 2010)
Ability Boundary	154	Ability (Briggs & Reinig, 2010; Kozlowski & Chao, 2012; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Weick et al., 2005)

Parent Node Name Child Node	Coded Refs	Theoretical Foundations & Conceptualizations
Attention Boundary	51	Attention (Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Exhaustion Boundary	6	Physical, Psychological, & Emotional Exhaustion (Briggs & Reinig, 2012)
Goal Congruence Boundary	107	Goal Congruence & Alignment (Ackerman & Halverson, 2000; Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Solution Space Boundary	52	Solution Space Complexity (Ackerman & Halverson, 2000; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Understanding Boundary	157	Understanding & Comprehension (Ackerman & Halverson, 2000; Bennet & McGee, 2005; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)

Within the ICAS organization, eight primary emergent characteristics have been visualized representing organizational activities and forces most significantly influencing OI, where OI represents an overarching emergent ICAS characteristic (Bennet & Bennet, 2004) (See Figure 1). These eight emergent forces or characteristics include three emergent environmental characteristics and four emergent self-organization characteristics. OI as an overarching emergent ICAS characteristic is represented by the ICAS parent Node Organizational Intelligence (OI) (See Table 6).

The Australian KM ecosystem framework adds key organizational elements, drivers, and enablers that shape a similar set of emergent characteristics within an organization's knowledge ecosystem. Collectively, this set of emergent characteristics also meaningfully represents an ICAS (Linger et al., 2007) (See Figure 2). The significant design characteristics of the Australian KM ecosystem framework representing organizational knowledge drivers and enablers are represented within the enhanced ICAS Selectivity and Permeable Boundaries Child Nodes (See Table 1).

However, all other characteristics and emergent forces within the Australian KM ecosystem are most meaningfully represented within one or more of the enhanced ICAS framework Nodes or Child Nodes. Each ICAS Node or Child Node uniquely identifies the interplay of the eight ICAS emergent characteristics. Blending the two frameworks within an enhanced ICAS Node framework, I focused on bridging knowledge-based activity systems, i.e., TbKMs (Linger et al, 2007), with emergent ICAS OI (Bennet & Bennet, 2004) (See Figure 5).

My primary design consideration for capturing key emergent characteristics of the enhanced ICAS framework within Node/Child Node structures therefore rested in the proposed workflow enhanced ICAS framework (See Figure 5). The three emergent environmental characteristics (Table 3) and four emergent self-organization characteristics (Table 4) are represented with a corresponding Child Nodes associated with each. The confluence of these seven primary emergent ICAS characteristics manifest within IFlow and KFlow forces (Bennet & Bennet, 2004).

Table 3

Research Linked to ICAS Environment Child Nodes

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Structure Design Concept References (Not Coded)*
Emergent Environment	4	ICAS Organization Emergent Environmental Forces (*Bennet & Bennet, 2004* [a]; Linger et al., 2007; Kozlowski & Chao, 2012)
Uncertainty	35	Emergent Uncertainty (Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Complexity	32	Designed and/or Emergent Complexity (Bharadwaj et al., 2013; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Burford et al., 2011; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Change	18	Designed and/or Emergent Change (Burford et al., 2011; Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)

Note: [a]Referenced for Node structure conceptualization and design but not included directly in Node coding.

Table 4

Research Linked to Self-Organization Child Nodes

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Structure Design Concept References (Not Coded)*
Emergent Self-Organization	41	ICAS Organization (*Bennet & Bennet, 2004*[a]; Kozlowski & Chao, 2012)

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Structure Design Concept References (Not Coded)*
Share Purpose	77	Emergent Shared Purpose (Ackerman & Halverson, 2000; Briggs & Reinig, 2010; Burford et al., 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Multi-Dimensionality	20	Emergent Multidimensionality (Bharadwaj et al., 2013; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Knowledge Centricity	72	Emergent Knowledge Centricity (Ackerman & Halverson, 2000; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Optimum Complexity	34	Emergent Optimum Complexity (Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)

Note: [a]Referenced for Node structure conceptualization and design but not included directly in Node coding.

The most complex Node structure to evolve within the first phase of coding was the NVivo® Node structure representing organizational knowledge, represented by the ICAS Node labeled Knowledge (Table 5). In contrast, creating ICAS parent Nodes with appropriate Child Nodes became obvious for several theories, such as BIT (Briggs & Reinig, 2010). But the ambiguous, paradoxical, and fluid nature of individual and concurrent micro-meso socially complex and emergent knowledge created a unique set of design challenges when considering a Parent/Child Node structure representing knowledge (Chae et al., 2005; Kozlowski & Chao, 2012; Snowden, 2002). Conceptually, knowledge itself could be a composite of all ICAS Nodes and not necessarily be represented by a specific Node.

Alternatively, a second approach was to create a separate parent ICAS Node structure representing a composite of knowledge conceptualizations representing specific theoretical foundations as Childe Nodes. This approach could potentially provide a meaningful composition of knowledge dynamics captured as Child Nodes, but had the associated risk of potentially creating an artificial framework in and of itself. The key would be to balance structural complexity with meaningful knowledge paradox representations (Chae et al., 2005; Snowden, 2002).

A third option would have been to embed specific knowledge characteristics within other Nodes. For example, I considered KFlow becoming inherent to knowledge networks (KNet) Child Node and not represented by a separate Child Node explicitly. However, this may have potentially masked significant distinctions in context to certain ICAS emergent characteristics. Coding to both KFlow and KNets through classification schemas linked to individual responses, for example, might provide unique insights into how knowledge flows and networks interact under certain ICAS conditions. The decision involved several weeks of reflection with additional QIMS activity.

I decided on the second approach and created a unique ICAS parent Node labeled Knowledge (Table 5) with sufficient depth in the form of Child Nodes to isolate key characteristics of the knowledge paradox (Chae et al., 2005), without creating unnecessary Node complexity (Bazeley & Jackson, 2013). Additional Child Node design logic follows Table 5.

Table 5

Research Linked to Organizational Knowledge Child Nodes

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Design Concept References (Not Coded)*
Knowledge	25	*Argote, 2012*[a]; *Bennet & Bennet, 2004*[a]; *Snowden, 2002*[a]
Control Mechanisms	30	Ackerman & Halverson, 2000; Burford et al., 2011; Turner & Makhija, 2006; Rigaud-Tellez & Hernandez, 2012
Clan Controls	94	Organizational Micro-meso (Group Level) Controls (Becker, 2007; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Outcome Controls	47	Organizational Process Controls (Burford et al., 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Process Controls	65	Organizational Process Controls (Bharadwaj et al., 2013; Borgo & Pozza, 2012; Briggs & Reinig, 2010; Burford et al., 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Ecosystem Framework	74	Knowledge Ecosystem (Becker, 2007; Bharadwaj et al., 2013; Bennet & McGee, 2005; Boisot & Sanchez, 2010; Caron et al., 2007; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Kozlowski & Chao, 2012; Rigaud-Tellez & Hernandez, 2012; Turner & Makhija, 2006)
Exchange (KE)	43	Knowledge Exchange (Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Madsen & Desai, 2010; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Design Concept References (Not Coded)*
Explicit (ExK)	77	Explicit Knowledge (Becker, 2007; Bharadwaj et al., 2013; Bennet & McGee, 2005; Briggs & Reinig, 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; *Snowden, 2002* [a]; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Flow (KFlow)	202	Knowledge as Tacit-Explicit Flow (Ackerman & Halverson, 2000; Becker, 2007; Bharadwaj et al., 2013; Bennet & McGee, 2005; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Caron et al., 2007; Lee, P. et al., 2010; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Miranda et al., 2011; Nissen, 2006; *Snowden, 2002* [a]; Kozlowski & Chao, 2012; Weick et al., 2005; *Deville, 2012*[a]; *Lipparini et al., 2013* [a]; *van Wijk et al., 2012* [a]; *Snowden, 2002*[a])
Flow Time (KFlowT)	42	Knowledge Flow (Cycle Duration) (Bharadwaj et al., 2013; Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Rowlinson et al., 2010; Snowden, 2002; Kozlowski & Chao, 2012; Weick et al., 2005; *Deville, 2012* [a]; *Lipparini et al., 2013* [a]; *van Wijk et al., 2012* [a]; *Snowden, 2002* [a])
Networks (KNets)	172	Knowledge Networks (Ackerman & Halverson, 2000; Becker, 2007; Bharadwaj et al., 2013; Bennet & McGee, 2005; Borgo & Pozza, 2012; Boisot & Sanchez, 2010; Briggs & Reinig, 2010; Caron et al., 2007; Lee, P. et al., 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; *Snowden, 2002* [a]; Kozlowski & Chao, 2012; Weick et al., 2005; *Ahuja et al., 2012* [a]; *Boisot & Sanchez, 2010* [a]; *Amini, 2010* [a]; *Cavaliere & Lombardi, 2013* [a]; *Brodbeck et al., 2007* [a]; *Lipparini et al., 2013* [a])

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Design Concept References (Not Coded)*
Stocks (KStock)	104	Organizational Knowledge Stocks (Objects) (Ackerman & Halverson, 2000; Becker, 2007; Bharadwaj et al., 2013; Bennet & McGee, 2005; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Caron et al., 2007; Linger et al., 2007; Mackey & Jacobson, 2011; Madsen & Desai, 2010; Maitlis & Lawrence, 2007; Miranda et al., 2011; Nissen, 2006; Turner & Makhija, 2006; *Snowden, 2002* [a]; Kozlowski & Chao, 2012; Weick et al., 2005; Choi, 2014; *Louis-Sidney et al., 2012* [a]; *Padova & Scarso, 2012* [a]; *van Wijk et al., 2012* [a]; *Jackson, 2012* [a]; *Nissen, 2006* [a]; *Rowlinson et al., 2010* [a])
Tacit (TaK)	129	Tacit Knowledge (Ackerman & Halverson, 2000; Becker, 2007; Bharadwaj et al., 2013; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; *Snowden, 2002* [a]; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005; *Deville, 2012* [a])
Transfer (KT)	54	Knowledge Transfer (Becker, 2007; Bennet & McGee, 2005; Briggs & Reinig, 2010; Lee, P. et al., 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Rowlinson et al., 2010; *Argote, 2012* [a]; *Louis-Sidney et al., 2012* [a]; *Dulipovici & Robey, 2012* [a]; *Flaherty & Pappas, 2012* [a]; *Hussin et al., 2012* [a]; *Blumer, 2011* [a]; *Joia & Lemos, 2010* [a]; *Minbaeva et al., 2012* [a]; *Chowdhury, 2005* [a])
Work Activity (KWrk)	176	Knowledge Work Activity Systems (Linger et al., 2007; *Anand et al., 2012* [a]; *Ashoori & Burns, 2013* [a]; Borgo & Pozza, 2012; Kozlowski & Chao, 2012; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; *Hussin et al., 2012* [a]; *Boisot & Sanchez, 2010* [a]; *Brodbeck et al., 2007* [a]; *Burford, 2012* [a]; *Alter, 2005* [a])

Note: [a]Referenced for Node structure conceptualization and design but not included directly in Node coding.

Originally, I had the choice to place various organizational controls affecting knowledge as Child Nodes within a unique parent Node called Organizational Control Structures. Alternatively, I could have created a parent Node labeled Control Mechanisms under the parent Node labeled Knowledge, with clan, process, and outcome organizational controls represented as Child Nodes under the Node labeled Control Mechanisms.

A primary benefit of the NVivo® database includes relational capabilities to move similar objects, such as Nodes, to like objects and create Child Nodes underneath. Representing knowledge as an ICAS Node labeled Knowledge was one node that seemed intuitively to require a preliminary design construct to a) capture key ICAS characteristics associated with organizational knowledge while b) concurrently allowing subsequent discovery to determine design effectiveness.

Consequently, I initially placed organizational controls as an ICAS parent Node structure, but prior to coding I shifted these controls as Child Nodes underneath the Node Knowledge. I shifted to the original second design option by moving organizational controls as Child Nodes under the Node Knowledge for two reasons. Firstly, I wanted to maintain Node structure integrity representing Knowledge. I also found organizational controls were most meaningfully associated with KE and KT activities, SG and SM activities, perhaps most meaningfully conceptualized within the ICAS Selectivity/Permeable Boundaries dynamic.

Secondly, as I completed the Node structure, I continuously reviewed, revisited, and re-synthesized additional theoretical foundations relating to organizational memory, OI, complex emergent social networks, SG and SM, as well as the IFlow dynamic for the express purpose of capturing fresh insights into meaningful Node design within an NVivo® project. Additional literature reflection resulted in postulating organizational controls to be inherently embedded within knowledge that is both object and flow over time (Maitlis & Lawrence, 2007; Nissen, 2006; Snowden, 2002). This choice was validated during second phase axial coding final interpretations.

I was surprised to discover that just the act of creating the Node structure itself presented several postulations, such as the above. But the act was infused with a conscious connection to emerging double-hermeneutics. I anticipated based on proposed enhanced ICAS design that an ICAS instance would create new insights into additional views of that same instance (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012).

What I discovered was that by the simple act of Node design I began shaping a mental model representing IFlow over time as a conceptual movement from view to view within a single ICAS instance. A unique microperspective of that instance was represented within a single theoretical foundation, infused with additional insight provided by a synthesis of several related theoretical foundations, in essence simulating a type of IFlow. Ultimately, maintaining aggregation independence between Parent and Child Nodes provided the flexibility to explore such propositions while maintaining project construct validity.

Initially, I was careful to prevent aggregation of Child Node coding to parent Node, as there were instances where I felt coding most meaningfully targeted the Parent Node. Preventing Child Node coding reference aggregation to parent Node is a design choice of the NVivo® project (Bazeley & Jackson, 2013). This Node design setting allowed Node movement flexibility while maintaining optimum Node structure integrity, especially during early phases of project coding (Bazeley & Jackson, 2013).

During first phase open coding I was not as concerned about where organizational controls would be placed in terms of reporting and data analysis, for example, as I was about simplifying the root parent Node structure. The philosophical choice of Node design ultimately was a by-product of additional research synthesis. By not aggregating Nodes early in design, I created the flexibility to move Parent Nodes to Child Nodes without potential complications created by aggregated reference coding overlap.

Additionally, I evaluated KE and KT Child Nodes with two possible parent Nodes. In one design option, KE and KT would be placed under the Child Node representing KFlow, where KFlow itself is a Child Node under the parent Node labeled Knowledge. A second design option was to keep these separate as Child Nodes under the parent Node labeled Knowledge. In the design choice for KE and KT Child Nodes, key theoretical foundations implied placing KE and KT as Child Nodes under the Child Node representing KFlow would create an artificial constraint when designing queries.

Accordingly, I chose the second design option to separate KE and KT as Child Nodes under the parent Node Knowledge to more effectively represent an ICAS instance with an NVivo® equivalent Sysperanto slice. The unique dynamics of KE and KT required visibility both independently and collectively with KFlow. KE and KT in concert with KFlow dynamics at knowledge flow time (KFlowT) intervals are integral to unique TaK–ExK and ExK–TaK knowledge cycles (Joia & Lemos, 2010; Kozlowski & Chao, 2012; Linger et al., 2007). A key flow framing mechanism within an enhanced ICAS framework therefore should include the emergent as well as organizationally designed ICAS IBoundary and IFilter characteristics (Bennet & Bennet, 2004). I needed to isolate KFlow to ensure I could understand KFlow impact on emergent IFilter and IBoundary.

Collectively, IBoundary and IFilter Child Nodes within the ICAS Node structure thus became the work activity touch-point or locus for SG and SM coding interpretation, both at individual and micro-meso contexts. This locus of knowledge formation frames individual as well as micro-meso shared understandings in context to varying levels of organizational TbKM activity specific to KFlow (Alter 2005, Briggs & Reinig, 2010; Linger et al., 2007; Nissen, 2006) (Figure 5). Ultimately, this evolved to represent the locus of organizational knowledge, discussed in more detail in my findings.

As a result, to simulate interview questions I needed to ensure maximum flexibility in targeting specific Child Nodes simply and effectively in queries. I was not certain disaggregating Child Node coding from parent Nodes would provide maximum reporting clarity. However, maintaining necessary coded content independence would maintain statistical integrity in reporting (Bazeley & Jackson, 2013). An overarching decision criteria was keeping Nodes at the highest optimum level in the Node structure balancing simplicity and functionality for statistically significant reporting.

ICAS OI represented by the ICAS Node Organizational Intelligence (OI) (Table 6), is a dynamic and emergent outcome of all organizational activity systems, micro-meso to macro-organizational. OI is surrounded by and/or embedded within controls and governance structures, physical and cyber spaces, and within formal and social networking. OI is infused with individual, micro-meso, and organizational knowledge and creativity and is linked meaningfully to, or not by lack of, complex and emergent networked social relationships.

OI is further constrained and/or released by functional characteristics of the organization that include a) processes, both formal and informal, b) organizationally defined structures, as well as c) supporting information systems and structures. OI is extremely perishable as resultant right action(s) may only be specific to an ICAS instance or moment in time (Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Linger et al., 2007; Kozlowski & Chao, 2012).

Table 6

Research Linked to Emergent ICAS Intelligence Nodes

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Structure Design Concept References (Not Coded)*
Organizational Intelligence (OI)	25	Organizational Intelligence (Bennet & Bennet, 2004[a]; Jacks et al., 2012 [a]; Argote, 2012 [a])
(OI)Actions	33	OI Actions (Borgo & Pozza, 2012; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Structure Design Concept References (Not Coded)*
(OI)Creativity	43	OI Creativity (Becker, 2007; Bennett & McGee, 2005; Boxenbaum & Rouleau, 2011; Burford et al., 2011; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
(OI)Decisions	15	OI Decisions (Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Lyles, 2014 [a]; Zhuge, 2011 [a]; Jacks et al., 2012 [a])
(OI)Problem Solving	65	OI Problem Solving (Kozlowski & Chao, 2012; Briggs & Reinig, 2010; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006)

Note: [a]Referenced for Node structure conceptualization and design but not included directly in Node coding.

Table 7 contains the key Child Nodes representing organizational contingency theory enhanced as five emergent phenomenon (Hatch & Cunliffe, 2012). When viewing the complex and emergent characteristics of the ICAS, framing key overarching organizational subsystems as a unique lens to observe an ICAS instance provided visibility to larger or macro-organizational level forces. The Australian KM ecosystem placed culture alongside organizational capability as the locus of all organizational knowledge (Linger et al., 2007) (See Figure 2).

Within an enhanced ICAS Node structure representing an emergent and complex organization, I likewise placed cultural subsystem phenomena as a central ICAS force (Hatch & Cunliffe, 2012; Jacks et al., 2012). The advantage of organizational theory becomes apparent when conceptualizing the dynamic and emergent interacting relationships between the organization's five main subsystems, while meaningfully framing high degrees of interdependence with the surrounding emergent environment, the sixth subsystem phenomena (Hatch & Cunliffe, 2012).

Within my enhanced ICAS metaphor conceptualization of subsystem, four of the five primary organizational subsystems include the informational subsystem, social subsystem, functional subsystem, and political subsystem as the locus of power distribution. These four subsystems exist interdependently surrounding, and are each interdependent with, the central and fifth subsystem, the cultural subsystem.

What is unique and still very relevant to an enhanced ICAS design are the common characteristics of each subsystem that manifest within and between each subsystem as phenomena (Hatch & Cunliffe, 2012). These common characteristics include focus, components, management task structure, process, individual roles, and underlying norms (Narayanan & Nath, 1999). The organizational subsystem phenomena can be viewed individually or collectively with one or more additional subsystems with unique Sysperanto slice representations (Alter, 2005; Hatch & Cunliffe, 2012).

The seemingly simple, yet within the ICAS, extremely complex separation of knowledge resulting from formally structured versus informally socially networked organizational activities becomes directly related to SG, SM, organizational knowledge in relation to KFlow and KFlow time. Collectively, these create a paradoxical relationship between TaK and ExK when linked to IFlow dynamics, dependent upon varying controls manifest during any given ICAS instance interval (Kozlowski & Chao, 2012). And, these represent but a very small subset of dynamic interplays in terms of patterns.

Yet, within the historical contingency theoretical view, any formal organizational context can be viewed holistically through the functional subsystem lens and informal context in relation to social networking through the social subsystem lens. And these two ICAS instances representing subsystem perspectives could be viewed together, as overlaying lenses through an NVivo® ICAS Node equivalent Sysperanto slice.

A potential research opportunity from the subsystem perspective includes exploring the dynamic micro-meso interactions linking ExK and TaK to KE and KT activities in terms of KFlows over time. In addition, the resultant flow dynamics confluence would have to be visualized in context to SM and SG. I anticipated that perhaps these complex ICAS flow dynamics could best be explored through meaningful attribute coding of the common characteristics of the organizational subsystems (Hatch & Cunliffe, 2012).

Organizational theoretical constructs may yet provide the most meaningful set of lenses through which to view specific ICAS emergent dynamics when represented by ICAS Nodes. Various ICAS Node relationships can be viewed using a corresponding set of unique classification attributes corresponding to each of the six organizational subsystem emergent phenomenon common characteristics (Hatch & Cunliffe, 2012). Within the current ICAS Node design, contingency theoretical perspective of subsystem dynamics and emergent phenomena are blended into meaningful organizational subsystem metaphors (Narayanan & Nath, 1999; Hatch & Cunliffe, 2012) (Table 7). Each subsystem metaphor contains unique ICAS organization emergent characteristics.

Table 7

Research Linked to Organizational Subsystem Nodes

Parent Node Name Child Node	Coded Refs	Coded Theoretical Foundations *Node Design Concept References (Not Coded)*
Organizational Subsystems	12	Dynamically Connected Organizational Subsystems (*Narayanan & Nath, 1999*[a])
Cultural Subsystem	37	Emergent Organizational Culture Characteristics (Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Functional Subsystem	51	Emergent and Designed Organizational Structure Characteristics (Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
IS Subsystem	87	Emergent and Designed Organizational Information Systems (Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Nissen, 2006; Kozlowski & Chao, 2012)
Political Subsystem	24	Emergent and Designed Legitimate Organizational Power Structures (Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Social Subsystem	76	Emergent and Designed Organizational Structure Characteristics (Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Nissen, 2006; Kozlowski & Chao, 2012)

Note: [a]Referenced for Node structure conceptualization and design but not included directly in Node coding.

Framing a Parent/Child Node structure for organizational SG (Table 8) and SM (Table 9) seemed intuitively straightforward when considering the underpinning theoretical foundations linking SG to SM (Maitlis & Lawrence, 2007; Weick, 2012; Weick, Sutcliffe, & Obstfeld, 2005). However, I had several design options to consider:

1. View SG as triggered by a SM need and embed SG Child Nodes under a parent SM Node (Maitlis & Lawrence, 2007);
2. View both SM and SG as elements represented by Child Nodes of an overarching SM process Parent Node (Weick, 2012; Weick, Sutcliffe, & Obstfeld, 2005);
3. View SM and SG as autonomous activities and embed the SM process as integral to SM with a process Child Node under a Parent Node representing SM (Maitlis & Lawrence, 2007; Weick, 2012); or
4. View the SM process independently by isolating the SM process as a Child Node underneath the ICAS selectivity (IFilter) parent Node. The rationale for this last option was influenced by defining the IFilter function within the ICAS as inherently an SM process (Bennet & Bennet, 2004).

It was at this point in designing the Node structure representing SM and SG that I perhaps became most aware of the complexity of modeling emergent and dynamic organizational characteristics associated with ICAS activities. My primary theoretical foundation for framing SM and SG was based on triggers, enablers, and inhibitors most clearly distinguished as gaps within a micro-meso discourse between leaders and stakeholders (Maitlis & Lawrence, 2007). I chose to isolate SG and SM as separate parent Nodes. This seemed the most logical first choice. I then added the third design option to embed the SM process as a Child Node (SM Process) under the parent Node SM (SM).

The fourth option included isolating the SM process as a Child Node under the Parent Node IFilter, representing ICAS organizational selectivity. Intuitively, this design relationship appeared to create an artificial constraint for viewing any given ICAS instance, as SM would have to be meaningfully validated to be most meaningfully represented within an ICAS filtering dynamic. As an overarching objective was not to design and fit theory, but to evolve design as revealed by theory, I chose not to create this forced relationship. Additionally, beyond this research, the resultant NVivo® Node structure with classification schemas should accommodate inherently, or be sufficiently flexible in design to morph to any theoretical perspective or framework.

Accordingly, the designed NVivo® ICAS Node structure should thus have sufficient structural integrity with inherent flexibility to represent any type and level of ICAS activity within the organization. To view emerging theory and research surrounding organizational SM activities (Table 8), while maintaining a cohesive link between ICAS equivalent SG activities (Table 9), while concurrently linking seminal underpinning theoretical foundations linking both SM and SG seemed most logical to satisfy initial design expectation for both integrity and flexibility.

Table 8

Research Coded to SG Child Nodes

Parent Node Name Child Node	Coded Refs	Theoretical Foundations
SG (SG)	64	Organizational Individual and Micro-meso SG Activities (Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012)

Parent Node Name Child Node	Coded Refs	Theoretical Foundations
Enablers	138	SG Enablers (Ackerman & Halverson, 2000; Borgo & Pozza, 2012; Briggs & Reinig, 2010; Boxenbaum & Rouleau, 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Miranda et al., 2011; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Inhibitors	36	SG Inhibitors (Constraints) (Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Triggers	53	SG Triggers (Initiating Drivers) (Briggs & Reinig, 2010; Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012)

After reviewing the resultant SM Node structure (Table 9), I revisited embedding the SM process within the parent Node SM (SM) and removing the Child Node representing the SM process. However, this option would have created a problematic Node relationship for subsequent queries. I would have had to isolate SM and SG characteristics in context to specific SM process characteristics independent of other ICAS Nodes. To accomplish this, I would have had to transfer key SM process activities into the Activity classification schema. I considered this additional level of classification complexity would limit ICAS emergence visibility. As a result, Node/Child Node structures representing activities and forces corresponding to individual and organizational SG and SM are found in Table 8 (SG Nodes) and Table 9 (SM Nodes), respectively.

Table 9

Research Coded to SM Child Nodes

Parent Node Name Child Name	Coded Refs	Theoretical Foundations
SM (SM)	12	Organizational Individual and Micro-meso SM Activities (Linger et al., 2007; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012)
Enhancers	117	SM Enhancers (Bharadwaj et al., 2013; Briggs & Reinig, 2010; Boxenbaum & Rouleau, 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Weick et al., 2005)
Process	200	Individual and Micro-meso SM Process (Activities) (Ackerman & Halverson, 2000; Bharadwaj et al., 2013; Borgo & Pozza, 2012; Boxenbaum & Rouleau, 2011; Briggs & Reinig, 2010; Burford, 2011; Linger et al., 2007; Mackey & Jacobson, 2011; Maitlis & Lawrence, 2007; Nissen, 2006; Turner & Makhija, 2006; Rowlinson et al., 2010; Kozlowski & Chao, 2012; Weick et al., 2005)

I anticipated the SM process Child Node representation might become meaningfully linked to the knowledge Child Node Work Activity (KWrk), as well as the knowledge Child Node KNets to better interpret IFlow dynamics linked to work system KFlows. During axial and selective coding I found this to be true to a degree, but not for the reason anticipated. Optimally, the ICAS Child Node SM Process (SMP) requires either a unique classification schema or additional SM and SG classification attributes to more comprehensively frame complex and emergent SM process dynamics. I discuss this in my first phase data analysis.

The Sysperanto IS architecture, represented by the parent ICAS Node, Work System (Sysperanto) (Table 10), contains yet another unique construct for isolating individual, micro-meso, and larger organizational activity system dynamics within emergent ICAS knowledge ecosystem characteristics. The Sysperanto slice by definition is a lens or perspective of any given information system instance (Alter, 2005). Every organizational IS remains inherently an activity system (Alter, 2005; Linger et al., 2007).

The knowledge ecosystem defined within the Australian KM framework, like Sysperanto, is first and foremost an architecture. My original Node design considerations for knowledge ecosystem architecture characteristics representing KNet structural dynamics intuitively linked Sysperanto Elements (Alter, 2005) to the Australian KM knowledge ecosystem elements, drivers, enablers, networks, and boundaries (Linger et al., 2007).

Subsequently, several Node design options manifested for linking these two theoretical foundations. Originally, I considered isolating the construct of a knowledge ecosystem as an overarching parent Node with corresponding Sysperanto Elements represented by unique Child Nodes, one for each of the Australian knowledge-eco system elements, drivers, enablers, networks, and boundaries. I realized, as with SM and SG, regardless of Node structure design, it would be difficult if not a given that I would infuse some level of potential artificial construct if I did not meaningfully isolate Child Nodes while maintaining a meaningful set of parent Node(s) to Child Node(s) relationships.

I chose to isolate Sysperanto Child Nodes from the ICAS dynamic with the creation of a Work System (SysperantoWS) Parent Node. My rationale was I could envision no meaningful need for Node coding this theory at this time, based on current research goals. The true contribution of the Sysperanto IS architecture in terms of better understanding ICAS emergent dynamics is the slice construct itself, not necessarily the entire IS Sysperanto architecture.

And, Sysperanto slice becomes most meaningfully infused as a design construct within an ICAS equivalent Node structure. I did not need to create a unique physical Node Slice to represent each unique instance of an ICAS (Boisot & Sanchez, 2010). The viral coding implications for such a design choice become apparent when considering the volume of patterns potentially created by just a single participant coding.

The root challenge is one of pattern recognition. With just four meaningful characteristics of a dynamic knowledge flow visualization, 240 distinct patterns emerged representing knowledge activities over varying knowledge flow times (Nissen, 2006). Within the simple ICAS representation of first phase coded Node structures there are 57 defined Nodes. I originally anticipated there would evolve an equivalent initial number of classification attribute values during axial coding.

At the end of axial coding, however, I had approximately 350 classification attributes. The resultant patterns necessary to capture these in a unique physically, i.e., manually, coded set of ICAS Node slice Child structures would require some type of complex auto-coding over an exceptional large number of potential slice Node representations. With each concurrent coding of a single source reference to an inordinately large volume of individual ICAS Child Nodes as a QIMS activity further exasperates this complexity, exponentially.

Thus, I chose not to code these unique patterns specifically to a physical subsystem slice Node structure. Coded participant references with meaningful attributes assigned against the currently defined 57 Nodes allowed for a significantly large and meaningfully comprehensible volume of these patterns to emerge. With just one fully coded participant during selective coding, there was sufficient complexity to validate the enhanced ICAS framework representation with the existing NVivo® Node structure.

Yet, I still wanted a Node structure representing the Sysperanto framework to create maximum opportunity for discovery during third phase selective coding. The Sysperanto Work System Node structure (Table 10) could potentially illuminate interesting ICAS overarching or architectural characteristics within a specific ICAS instantiation (Boisot & Sanchez, 2010).

My primary challenge was time constraint. To accomplish this additional level of coding would require a complex and unique classification schema with a significant number of attributes with correspondingly complex attribute values. I realized during third phase coding that this effort was beyond the scope of this research, better suited to follow-on research.

Although I envisioned this level of coding in early phases of research design as significant for addressing the two primary research questions, I realized as I progressed through axial coding that the inclusion of the key strength of the Sysperanto architecture, i.e., the Sysperanto slice, was ultimately infused into the NVivo® Node structure design, including Nodes and classification attributes.

As such, unique attribute coding against the Sysperanto Node structure itself was not required. However, the structure is included in NVivo® Node design for an enhanced ICAS KM framework as Sysperanto does provide unique opportunities to drill down into specific types of KM systems as special types of an IS. Additionally, and perhaps more importantly, the coding exercise provided for enhanced understandings of ICAS emergent characteristics in relation to specific Sysperanto slices with specific inherited properties relative to specific slices representing unique ICAS emergent characteristics.

Table 10

Research Coded to Sysperanto Child Nodes

Parent Node Name Child Name	Coded Refs	Theoretical Foundations
Work System (SysperantoWS)	28	Organizational Task-based Activity Systems (TbKMs) and Knowledge Work Activities (Alter, 2005; Linger et al., 2007)
Element	28	Work Activity System Component (Borgo & Pozza, 2012; Linger et al., 2007; Nissen, 2006; Turner & Makhija, 2006; Alter, 2005)
Lens (Slice)	18	Work Activity System Instantiation (Perspective) (Linger et al., 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Alter, 2005)
Property	60	Work Activity Micro-Properties (Attributes) (Borgo & Pozza, 2012; Linger et al., 2007; Nissen, 2006; Turner & Makhija, 2006; Kozlowski & Chao, 2012; Alter, 2005)

Two concerns might become immediately apparent when viewing all Node tables collectively. Firstly, there may appear a degree of significant overlap between Node and coded source. The original design construct was simply to map as many meaningful terms and concepts to specific ICAS Nodes such that each ICAS Node contained a high degree of original theory terms and concepts unique to a specific Parent or Child ICAS Node. I found the resultant design provided the highest level of significant correlation between Child Nodes.

Therefore, although a theoretical source may be coded to 10 or more Node/Child Nodes representing key designed and emergent characteristics of an enhanced ICAS organization's framework, the coded source content captured only those terms and concepts most relevant to that specific Node/Child Node (See Figure 11 and Figure 12). All sample coded references displayed in Figures 11 and 12 are simply representative of all ICAS Node coding against selected Source Nodes.

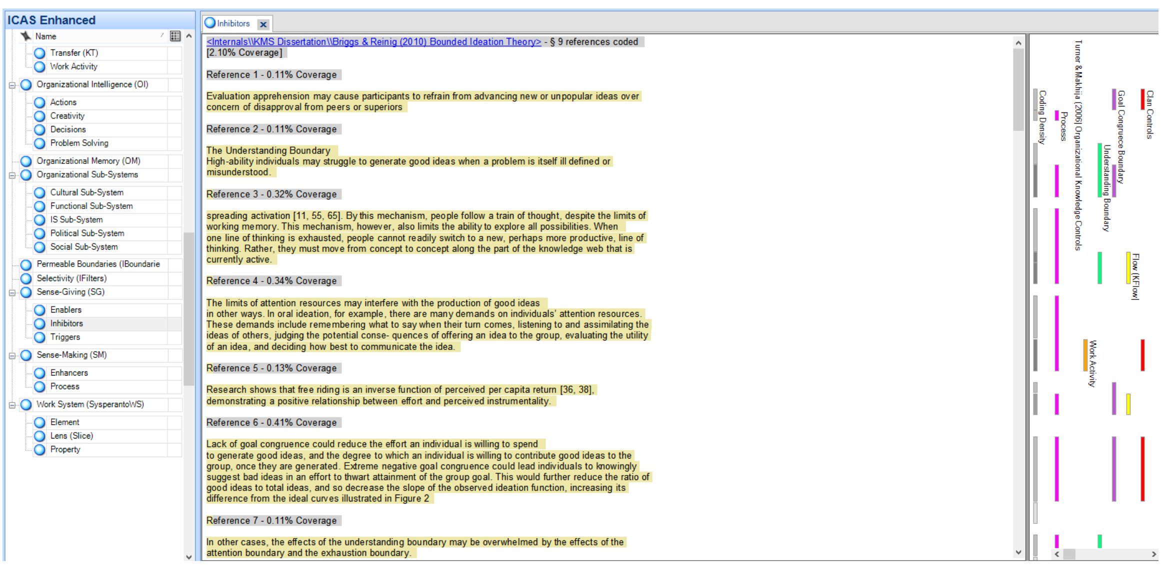


Figure 11. Sample NVivo® source coding of node SG inhibitors.

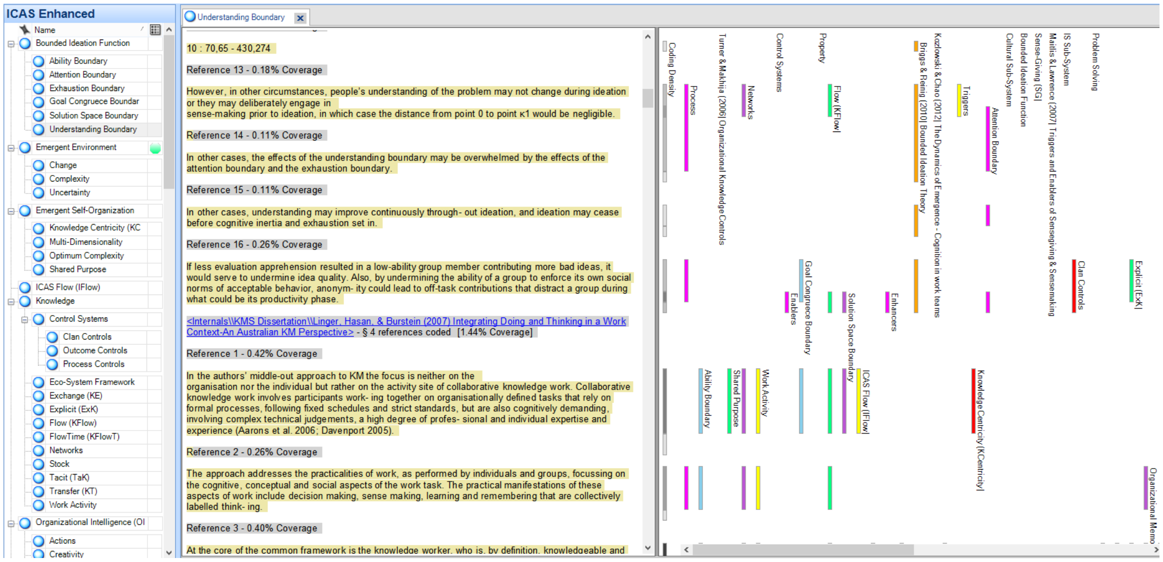


Figure 12. Sample NVivo® source coding of BIT understanding boundary.

Secondly, from a cursory exploration of all tables collectively there may appear seemingly significant gaps to historical, contemporary, current, and emerging research theories and concepts. A key NVivo® project design objective was to illustrate the potential of an enhanced ICAS framework to address the two primary research questions. Mutual exclusivity of source theory and concepts to one ICAS Node coding or collectively exhaustive coding all relevant research to all possible ICAS Nodes was neither feasible nor meaningful to demonstrate the potential benefit of the proposed enhanced ICAS design.

An overarching open coding design consideration was ensuring construct validity within NVivo® Node structures. Construct validity would confirm a structurally sound Node framework with optimum integrity for second phase axial coding. Structural integrity as a final consideration thus provided guidance for source theory selection for first phase open coding of key terms and concepts. The idea was to model a perception or view of the ICAS specific to micro-meso social activity systems' emergent dynamics and characteristics. In this context, each source theory with unique research perspective represented a partial view of the entire ICAS dynamic.

While robustness and diversity of additional source content will always potentially mature a model representation, a significant imbalance in coding potentially could manifest if source concepts were not meaningfully coded across 13 parent Nodes with corresponding 44 unique Child Nodes representing key ICAS characteristics within an enhanced ICAS framework. Accordingly, each additional theoretical foundation would become, as with original theories coded, a multi-day and in some cases a multi-week synthesis, reflection, coding, reflection, and coding refinement process.

Specific text associated with a wide variety of ICAS characteristics within one theoretical perspective, but limited in coding of additional terms and/or unique concepts to only one or several select Child Nodes likewise may have potentially biased or skewed the foundational model. Where limited coding of a single source is present within the ICAS Node structure, however, the purpose was to expand the set of existing concepts, terms, or metaphors most closely associated with primary theoretical foundations. As a result, based on significant QIMS activity, a meaningful subset of research embracing (a) seminal and historical content, and (b) contemporary content was selected and coded to as many Child Nodes as reasonably feasible.

Accordingly, the Node structure created with Child Nodes provided sufficient depth for mapping specific source references to key Node/Child Nodes, meaningfully representing key enhanced ICAS characteristics within the NVivo® project (See Figure

13). I deemed this a reasonable first level of a first phase open coding foundation based on correlations between Child Node content, discussed in more detail in my findings.

ICAS Enhanced

Name	Description	Classification	Sources	Referenc
Bounded Ideation Function	All Cognition activity, individual and organizational, initially coded at a Boundary. The relationship between the number of good ideas and the number of ideas contributed. "BIT posits that boundaries of	Activity	3	11
Ability Boundary	Function of degree of intelligence and domain-relevant experience and abilities. Intelligence: Capcity to learn and reason; ability to recognize patterns and relationships.	Activity	9	154
Attention Boundary	A function of limits of individual working memory. Concepts initially activated begin a series of subsequent concept or idea activations, to the point of memory capacity exhaustion. At this point previous id	Activity	7	51
Exhaustion Boundary	The limits of mental and physical endurance that affect the ratio of good ideas to total ideas, and subsequently changes the shape of the ideation function from the maximum possible good ideas. Experts	Activity	1	6
Goal Congruece Boundary	Social factors, i.e., norms, expectations, social facilitation, task goals, and matching, affect the degree to which individuals feel motivated to allocate scarce resources to generating ideas (Paulus & Brown,	Activity	6	107
Solution Space Boundary	Task is a problem or opportunity upon which people have agreed to take action (common or shared purpose). Solution space will fall on a contimuum between degree of open-ended tasks and degree of		9	52
Understanding Boundary	Degree to which problem is understood, problem-space is clearly defined, goals are clearly defined, expectations are known, and degree to which one can recognize that a problem has been solved (diffic		12	157
Emergent Environment	Conditions external to the organization that emerge as a result of significant driving forces external to the organization creating pressures within the organization. These forces are grouped into five main c		2	4
Change	Increasing speed of transactions and information flow. Increasing complexity of interactions creating exponentially large patterns requiring complex interpretations (p.17).		6	18
Complexity	Increasingly larger number of possible states based on increasingly complex social and cyber-physical spaces making it extremely difficult to identify optimum network connections for information and kno		10	32
Uncertainty	Increased unpredictability based on inability to understand current situation and create an optimum problem space. Links to Cognitive Boundaries (Briggs & Reinig, 2010).		6	35
Emergent Self-Organization	Those forces within the organization, based on actions, organizational structures, KT, KE, sense-making, sense-giving, information flows, knowledge flows, and organizational Flows. ICAS Flow can be g		4	41
Knowledge Centricity (KCe	Aggregation of relevant information derived from the knowledge of the organization's components that enables self-synchronization and increases collaboration opportunities (p.32). This would be a functi		10	72
Multi-Dimensionality	Organizational flexibiility resulting from knowledge worker ability and freedom to perceive problem spaces from multiple perspectives while applying a variety of thinking styles.		4	20
Optimum Complexity	Number of possible states that make a difference to the organization, meaningful states. Whereas Complexity addresses the many possible diverse states based on five driving forces (p.14 Figure 2-1), O		7	34
Shared Purpose	Ability of organization to unify, integrate, and mobilize organizational resources.		10	77
ICAS Flow (IFlow)	Enables Knowledge Centricity. Facilitates connections and continuity that maintain unity and Shared Purpose. Includes people, information, and learned experiences, knowledge.		17	123
Knowledge			4	25
Control Systems	Interventions, organizational defined and emergent activities, practices, governance structures and control mechanisms		7	30
Clan Controls	Informal socialization mechanisms that take place in an organization that facilitate shared values, beliefs, and understandings. These include rituals and ceremonies, and also include socialization proces		12	94
Outcome Controls	Those mecahanisms that focus on the outcomes of tasks or the specific outputs desired by the organization, requiring explicit outcome requirements being clearly defined and communicated.		7	47
Process Controls	Mechanisms that specific appropriate behaviors and processes in which employees must engage. Individual are held accountable to the process rather than the outcome of the processes.		10	65
Eco-System Framework	Knowledge eco-system constructs, functional frameworks, cycles.		13	74
Exchange (KE)	Knowledge Exchange is a dialog dynamic.		7	43
Explicit (ExK)			11	77
Flow (KFlow)	Various types of organizational activities involved with knowledge in flux over time (Nissen, 2006, p.245) as a function of flow time (hrs => yrs), life cycle stage (create, share, apply), rearch, and explicitne		19	202
FlowTime (KFlowT)	Duration of knowledge life cycle.		9	42
Networks	Formal and informal knowledge networks comprised of formal and informal social aggregations and individual relationships. These relationships provide enabling foundations for sense-making.		17	172
Stock	Organizational knowledge asset.		16	104
Tacit (TaK)			13	129
Transfer (KT)	Knowledge distribution and dissemination in context to information exchanges that enhance understanding, improve coordination of knowledge objects and assets, enhance cognitive boundary perception		12	54
Work Activity	TbKM Activity System in context to Sysperant Work System, an activity involving a networked relationship between information, people, and activity.		9	176
Organizational Intelligence (OI)	Ability of organization to perceive, interpret, and respond to environment.		6	25
Actions	Right decisions at the right time resulting from emergent characteristics of self-organization create optimum actions.		8	33
Creativity	New idea creation, linked to BIT (Briggs & Reinig, 2010)		10	43
Decisions	Selecting optimum choices of action based on problem-solving space.		6	15

Figure 13. Node structure definitions, sources, and coded references.

Open coded also required a second-level of additional Node design and coding activity. The purpose of this additional open coding included the initial Node creation and source coding of original transcript data specifically to aggregate via NVivo® auto-coding original KT themes and concepts captured by Deville (2012). I received an NVivo® export of 11 participant responses (P01-11) that included original audio file for each, associated transcription text file, and original research field notes in the form of NVivo® memos. My initial activity during open coding phase two required original interview transcript coding to replicate the original six KT Theme Nodes against my ICAS Nodes triangulated to Deville's original findings (Table 11).

Table 11

Current Coding (CC) to Deville (2012) Six Original Themes

		Coded References by Theme					
		Theme 1	Theme 2	Theme 3	Theme 4	Theme 5	Theme 6
Source	Total Coded References	Combined Formal Informal Networks	Formal Structure Affects KT	Knowledge = Information	Knowledge As Activity	Value of Face to Face	Verification Confirmation
P01	55	7	10	14	8	9	7
P02	56	6	11	5	15	7	12
P03	75	5	18	12	21	12	7
P04	45	2	14	1	16	4	8
P05	54	8	14	6	14	6	6
P06	63	7	15	4	18	5	14
P07	48	6	18	2	14	4	4
P08	46	2	16	2	8	10	8
P09	39	3	10	7	6	7	6
P10	60	5	16	7	14	9	9
P11	50	7	11	6	14	3	9

The original six themes developed by Deville (2012) representing key metaphors framing the KT process emerged through meaningful bricolage during the original interview process (Boxenbaum & Rouleau, 2011). I was not concerned with replicating the original coding schema outcome, i.e., exact original reference coding between interview subject and specific question to specific theme, but rather leverage the power of the six original emergent themes as metaphors relevant to an enhanced ICAS framework.

To begin this process, I needed to create a meaningful bricolage between original themes, original interview subjects, and current research context.

This bricolage included concurrent transcript coding while listening to corresponding audio file with the outcome of coded participant references to themes represented in Table 11. To evolve original themes to current research metaphors, I needed to additionally aggregate these themes around each participant as well as around each interview question. NVivo® auto-coding provided the optimum flexibility for this next level of original transcript coding.

The result was a significantly larger volume of references coded to themes than originally coded by Deville (2012). For example, where Deville coded zero references to Theme 6 for Participant 01 (P01), I coded seven. A coding comparison between Deville's original theme coding to participant responses and my coding of participant responses to an equivalent set of NVivo® Nodes representing current research equivalent themes is provided in Table 12.

Table 12

Original Coding (OC) Deville (2012) and Current Coding (CC) Comparison

	Coded References by Theme											
	Theme 1		Theme 2		Theme 3		Theme 4		Theme 5		Theme 6	
Source	OC	CC	OC	CC	OC	CC	OC	CC	OC	CC	OC	CC
P01	3	9	7	13	3	20	1	8	1	12	0	7
P02	4	9	0	13	3	5	1	15	4	7	1	12
P03	2	5	0	20	4	12	2	21	1	12	3	7
P04	1	3	0	15	1	1	1	16	0	4	6	8

	Coded References by Theme											
	Theme 1		Theme 2		Theme 3		Theme 4		Theme 5		Theme 6	
Source	OC	CC	OC	CC	OC	CC	OC	CC	OC	CC	OC	CC
P05	2	10	0	15	1	6	1	14	2	6	0	6
P06	3	10	0	15	0	4	1	18	2	5	0	14
P07	1	7	0	18	0	2	1	14	2	4	0	4
P08	2	4	1	18	2	2	3	8	2	10	0	8
P09	1	4	1	10	0	7	0	6	2	7	3	6
P10	0	5	1	16	1	7	1	14	2	9	1	9
P11	2	9	2	11	0	6	1	14	3	3	2	9
Total	21	75	12	169	15	83	13	161	21	92	16	111

Note: OC = original coding (Deville, 2012); CC = current NVivo® project coding.

The difference in coding outcome resulted in part from my use of original themes as metaphors versus variables to represent enhanced understanding of ICAS organizational characteristics resulting from a broader organizational ICAS perspective. Deville (2012) was isolating specific content to specific themes unique to social networking and KT. Social is but one of approximately 75 attributes related to knowledge networks within my enhanced ICAS Node representation. I thus coded additional references to more meaningfully link original participant responses to specific enhanced ICAS organizational characteristics.

For example, in the case of Theme 6 coding, Verification Confirmation, Deville (2012) was capturing unique confirmation indicators within a specific KT activity. I was capturing a variety of indicators with more granular and specific transcript content in relation to (a) organizational feedback loops (Linger et al, 2007); (b) SG acknowledgments (Maitlis & Lawrence, 2007, Weick, 2012), and ; (c) shared understanding confirmation signals (Boisot & Sanchez, 2010; Briggs & Reinig, 2010).

Within the TbKM discourse of knowledge work (See Figure 3), concepts of TbKM linked to Activity Theory create a common mapping of related activities, thus the discourse (Linger et al., 2007). The resultant common mapping as knowledge work discourse was further linked to a formal management communication structure where management feedback moves between individual and organizational level activity systems (Linger et al., 2007). This type of learning as a feedback loop structure is represented within the Australian knowledge ecosystem framework as a discourse loop (Linger et al., 2007).

However, there is an additional social learning feedback loop creating individual and collective shared perspective loop of the knowledge ecosystem's culture and social learning process (See Figure 4) (Linger et al., 2007). Both feedback loops are linked to individual and micro-meso organizational SM activities (Argote, 2012; Kozlowski & Chao, 2012; Linger et al., 2007). ICAS SM activities should meaningfully link these two feedback loops within any given ICAS instance (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012).

Additionally, I had to consider larger or more macro-organizational feedback dynamics in terms of various types of SM and SG messages and indicators at varying levels of organizational activity within multiple unique perspectives of the ICAS instance, concurrently. Deville's Theme 6 was originally designed to capture specific KT confirmation indicators within a specific type of KE activity.

I had to enhance conceptualization of this theme to represent a metaphor capturing the broader constructs of a complex set of feedback loop signals from various control and learning activities within the knowledge ecosystem (Ahuja et al., 2012; Kozlowski & Chao, 2012). Additional reference coding was necessary for more comprehensive classification coding to specific ICAS Nodes during third phase selective coding to capture IFlow and KFlow dynamics, among others.

ICAS organizational feedback loops inherently include individual and micro-meso organizational social network dynamics as an underlying structure for the knowledge ecosystem feedback mechanism. Accordingly, additional reference coding for each participant also created additional NVivo® classification coding opportunities during second phase coding. The additional level of classification coding was necessary to link participant perceptions to broader organizational feedback dynamics within an ICAS instance, most specifically related to ICAS emergent selectivity, i.e., ICAS Node IFilter, and ICAS Node IBoundary.

As I coded original transcripts, as an evolving dialog, I generated unique question phrasings. Likewise, Deville (2012) followed a coherent and structured dialog with each participant spanning the 15 original interview questions and 11 respondents. However, anchored to the original 15 questions, each unique participant dialog created unique phrasings for certain questions, tailored to perceptions of the participant. The subtle shifts in phraseology were most appropriate to create meaningful shared understanding between Deville and participant. As a reasonable outcome, the double-hermeneutic established between Deville and interview subjects in relation to organizational context created a shared space of sense, from which his six key themes emerged (Birks et al., 2013; Pringle et al., 2011).

Thus, Deville's (2012) evolving dialogs with interview subjects during the interview process provided for richer content exploration in relation to these six emerging themes (Boxenbaum & Rouleau, 2011; Denk et al., 2012). Richer content exploration took the form of more specific qualifying and clarifying questions to more meaningfully capture specific respondent perceptions (Wagner et al., 2010). One key result was a structurally sound interview process with significant construct validity that created a perspective-rich open-ended dialog. A second key result was a set of 11 transcription files where primary and secondary questions were not represented with the exact same verbiage.

Deville (2012) effectively mitigated the resultant NVivo® coding impact, as did I, by manually coding 15 primary interview questions for 11 participants to each of the six themes as necessary. This did not require transcript structuring using NVivo® headers to facilitate NVivo® auto-coding (Bazeley & Jackson, 2013). There is a place for auto-coding, and there is a place for manually coding source content (Bazeley & Jackson, 2013). Transcript coding to NVivo® Nodes where a Node represents a key concept or metaphor requires careful attention to content, context, and original participant perceptions (Bazeley & Jackson, 2013; Hutchison et al., 2010). Subsequent interpretations of Deville's original themes, in relation to current research enhanced ICAS Node representation in the form of metaphors, likewise required a very intentional and manual coding process.

However, I also required the additional analysis power inherent to NVivo® Case Node structures representing both individual responses and aggregate responses. I was uncertain of future use during open and axial coding, however, I wanted to ensure the NVivo® project structure contained the maximum exploratory potential (Birks et al., 2013).

As a result, I auto-coded one additional NVivo® Case Node structure for individual responses to each question, resulting in 15 (Questions) × 11 (Participants, P01…P11) = 165 total NVivo® Participant Response Case Nodes (See Figure 14).

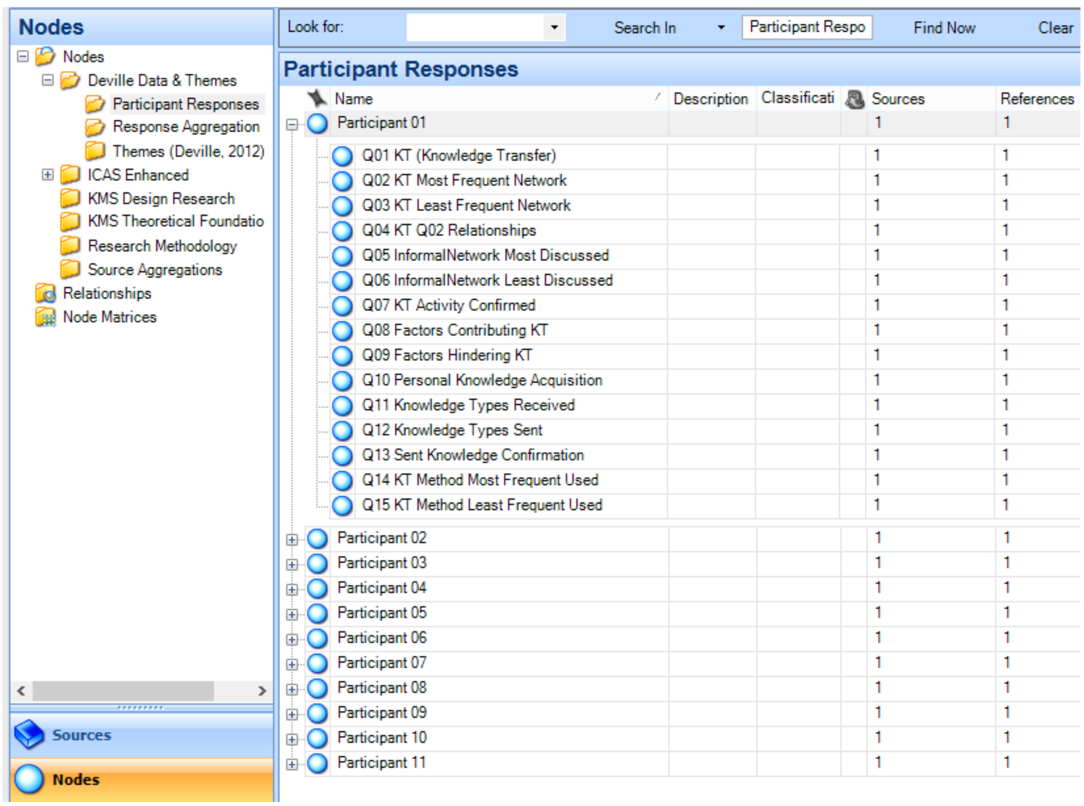


Figure 14. NVivo® auto-coding interview question to participant.

A second NVivo® Case Node structure was necessary to aggregate coding all 11 respondents to a single interview question in the form of 15 Question Response Aggregation Case Nodes (See Figure 15).

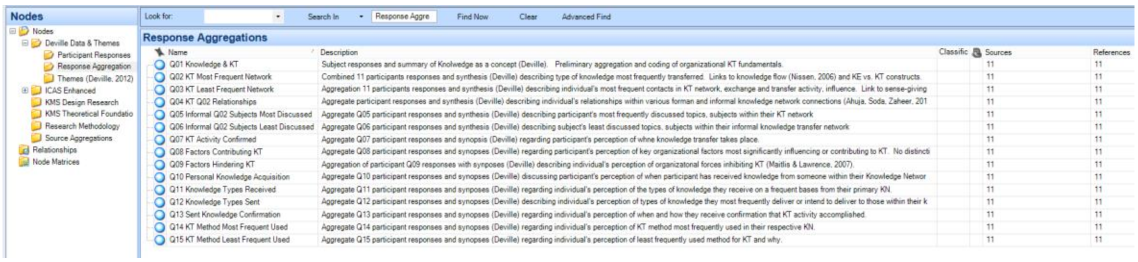


Figure 15. NVivo® auto-coding case nodes aggregating participate responses.

NVivo® requires exact phrasing for auto-coding transcript content to Case Nodes similar to Microsoft® Word auto-formatting a table of contents based on specific MS Word® text Styles. I used specific NVivo® Styles in the same manner as MS Word® text styles; however, unique to NVivo® auto-coding, NVivo® additionally requires exact and consistent phrasing across all transcript source files to create consistent auto-coding spanning a set of source file content (Bazeley & Jackson, 2013).

I began auto-coding by experimenting with P01-P03 within an NVivo® test project where:

- NVivo® Header 3 text style was assigned to each transcript participant transcript title,
- Header 6 text style assigned to all participant's responses to each of the fifteen questions, and
- Header 8 text style assigned to each question's reflective synopsis/analysis within a test copy of the NVivo® project. (Most preliminary design, initial

creation, and initial validation occurred in a test environment prior to moving to the production NVivo® environment.)

As NVivo® uses headers for auto-coding paragraph content style and capturing all content between unique styles, Header 8 created a meaningless Node structure because all content between NVivo® Header 8 style content included the next question response. As a result, the following altered sequence was transcribed to the production NVivo® database:

1. Auto-create Header 3 set and Header 6 Node sets as these provided sufficient coding connection between source content questions and responses to each question, such that question and response were contained within a single Participant Node, e.g., Q01 and Q01 Preliminary Synopsis/Analysis (Deville, 2012).
2. Delete original transcript reference coding between all Participant Nodes and transcript source, as NVivo® Header 3 provided equivalent link to entire source while identifying only those summary themes at top of the linked text until Header 6 paragraph style is encountered to begin Q01. Header 6 was necessary only to capture by participant each *question* (by Participant) as well as *synopsis/analysis* content. Deville differentiated original participant responses from field notes within transcripts with a comment line indicating a preliminary content analysis.
3. Auto-create a Collection Set to create aggregation clusters for all participant responses to each question that included preliminary analysis captured by

Deville (2012). This provided the option to further expand these Node Sets as necessary, while providing a meaningful aggregation capability to accomplish Header 8 grouping representing each of the fifteen original interview questions (Bazeley & Jackson, 2013).

NVivo® auto-created and auto-coded a resultant set of 165 Case Nodes corresponding to the 11 original transcripts and 15 original interview questions. As indicated in Figure 14, exactly one source was auto-coded to a Case Node representing one reference corresponding to each original primary research question response resulting in 165 total Case Nodes. Additionally, as indicated in Figure 15, each of the original 11 subjects' responses were further auto-coded in aggregate as a Case Node to each of the 15 original interview questions.

As a result, all respondent responses to a single question were auto-coded as 11 references to one aggregate response Case Node, for a total of 15 additional Case Nodes. I anticipated using these additional 15 aggregate Case Nodes during second phase selective coding where participant responses would be coded to specific ICAS characteristics representing micro-meso social contexts.

This effectively completed phase one open coding. During this phase I created a meaningful representation of an enhanced ICAS framework within the NVivo® project with an NVivo® ICAS Node structure. I designed each parent Node structure based on theoretical foundations. As new foundations were applied, several design options emerged and structural shifts to Parent/Child Node relationships occurred as deemed appropriate. Rationale for specific design choice was provided where necessary. I subsequently coded specific research theory with sufficient theme and terms to specific ICAS Nodes to create a construct-valid foundation for phase two data analysis.

Additionally, I imported original research data (Deville, 2012), including source transcripts, source audio files, and Nodes representing Deville's original six Themes. Deville's original coding to themes was not required, therefore not imported, as I manually replicated while expanding original transcript coding to original themes. As a result, this part of phase one open coding replicated Deville's original theme coding to participant responses while validating the structural integrity of my enhanced ICAS framework within the NVivo® Node design. I completed phase one coding by tailoring original transcript files to allow NVivo® to auto-create and auto-code 180 additional Case Nodes for second phase data analysis.

NVivo® Classification Schemas: Second Phase Axial Coding

The cyclical nature of grounded theory interpretation activity within an NVivo® project includes a unique iterative spiral. The iterative spiral begins in phase one open coding and is brought forward into phase two axial coding (Birks et al., 2013; Hutchison et al., 2010). The iterative spiral I followed included coding, interpretation, discovery, reflection, additional research, and re-interpreting ICAS characteristics. With each spiral I increased the ICAS dynamics scope from individual, to micro-meso social, and ultimately to an entire ICAS instance (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012; Myers & Klein, 2011).

I captured unique and evolving insights as the iterative spiral for each ICAS characteristic blurred boundaries between all surrounding ICAS characteristics, TbKM knowledge work activities, and organizational ICAS emergent forces. Throughout this evolutionary bricolage, ICAS characteristics, activities, and emergent forces were re-interpreted into more meaningful ICAS metaphors (Boxenbaum & Rouleau, 2011; Hutchison et al., 2010).

This critical research approach created multiple levels of double-hermeneutic between theory, participant responses, and researcher perceptions (McKemmish et al., 2012; Wagner et al., 2010). With each new spiral I was able to more meaningfully transform foundational organizational ICAS characteristics into enhanced metaphors representing an enhanced ICAS framework. Several of the key metaphors to emerge included ICAS flow dynamics (IFlow), selectivity dynamics (IFilter), and ICAS permeable boundaries (IBoundary) (Bennet & Bennet, 2004; Myers & Klein, 2011).

To begin second phase coding, I created a preliminary set of five primary classification schemas based on new meanings discovered during open coding. Case Nodes have unique characteristics within an NVivo® project, to include associating scaled, categorical, or attribute data with different types of data sources (Bazeley & Jackson, 2013). I linked 165 individual response Case Nodes with unique perceptions to key ICAS characteristics and activities.

A corresponding set of 15 Case Nodes aggregated 11 participant's collective perceptions corresponding to each of the 15 research questions. As such, the aggregate Case Nodes represent unique micro-meso social contexts to explore similar perceptions in context to an ICAS instance, versus characteristic or activity (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012).

I created a unique Node for selected journal articles. I assigned a Source Attributes classification schema to each. The objective of this classification coding was to ensure I could run queries against source journals by year, author, publication, topic focus, and/or source type. I originally used Source Attributes classification coding against source articles using NVivo® Compound Queries to validate a meaningful percentage of coded sources captured key concepts, terms, and metaphors current within five years, based on coding start date in early 2014.

I was concerned that a contemporarily valid and enhanced ICAS framework needed to capture a significant volume of contemporary terms and concepts. However, I was more concerned with a theoretical foundation adding value to an enhanced ICAS construct, weighted against simply coding contemporary within five years as the value-add litmus test. Specific rationale for specific theoretical source selected to create both classification schema attribute definitions as well as ICAS Node design have been carefully described in open coding.

While continuously testing first order coding construct validity using text queries in conjunction with compound queries, certain enhanced ICAS framework characteristics emerged. Some characteristics framed new Child Nodes and shifted Node relationships structurally. And, some characteristics emerged that would be captured more meaningfully by NVivo® classification schemas versus additional Node structure.

The most significant characteristics emerging during open coding in context to classification schema design related to:

- ICAS organizational flows (IFlow) (Ahuja et al., 2012; Bennet & Bennet, 2004; Linger et al., 2007);
- knowledge flows (KFlow) and flow times (KFlowT) (Nissen, 2006);
- SM (SM) activities in relation to knowledge exchange (KE) and knowledge transfer (KT) (Maitlis & Lawrence, 2007; Weick, 2012);
- cognitive abilities, individually in terms of boundaries (Briggs & Reinig, 2010), as well as collectively within a micro-meso social context (Kozlowski & Chao, 2012), in the form of organizational memory (Ackerman & Halverson, 2000; Argote, 2012; Hung et al., 2012; Jackson, 2012);
- knowledge objects (Louis-Sidney et al., 2012; Miranda et al., 2011; Nissen, 2006; Padova & Scarso, 2012); and
- knowledge paradoxes (Chae et al., 2005; Snowden, 2002).

As a result of first phase activities, the metaphor representing ICAS flow dynamics evolved from Bennet and Bennet's (2004) foundational constructs to an expanded representation within an enhanced ICAS framework, i.e., represented by Node IFlow. Within the ICAS organization's emergent dynamics, people, resources, organizational characteristics, knowledge, work activity outcomes, and memory all flow throughout the organization (Bennet & Bennet, 2004; Linger et al., 2007). Organizational power also flows throughout the organization and is infused within organizational activity systems, also captured in IFlow (Hatch & Cunliffe, 2012).

Additionally, organizational memory, specific controls influencing various feedback loops, KFlows, and organizational balancing dynamics flow and create tensions throughout the ICAS organization. Organizational ICAS IFlow dynamics originally postulated by Bennet and Bennet (2004) as well as the Australian KM ecosystem (Linger et al., 2007) were augmented to become a more effulgent ICAS IFlow metaphor representing ICAS forces surrounding

- Data and information flows as well as KFlows differentiating KT and KE (Choo; 1998; Dalkir & Liebowitz, 2011; Nonaka & Takeuchi, 1995; Rigaud-Tellez & Hernandez, 2012);
- vertical as well as horizontal controls and power within and across organizational activity systems (Ashoori & Burns, 2013; Becker, 2007; Flaherty & Pappas, 2012; Hatch & Cunliffe, 2012; Minbaeva et al., 2012; Turner & Makhija, 2006);
- organizational learning and learning objectives (Joia & Lemos, 2010; Nanclares et al., 2012);
- organizational framing structures for optimal performance (Soda & Zaheer, 2012; van Wijk et al., 2012);
- micro-meso social networks (Ahuja et al., 2012; Amani, 2010; Hussin et al., 2012; Kozlowski & Chao, 2012); and
- organizational memory (OM) as flow and object (Boisot & Sanchez, 2010; Choi, 2014; Huang et al., 2012; Padova & Scarso, 2012; Rowlinson et al., 2010).

Each IFlow dynamic represents a unique set of ICAS emergent forces. These resultant set of forces are (a) complexly interwoven flow dynamics within the ICAS organization and require alignment; (b) have specific direction; (c) have unique intentionality within each ICAS instance, and; (d) create complex acts of knowing (Ahuja et al., 2012; Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Snowden, 2002). The enhanced ICAS IFlow is thus a metaphor encapsulating all resultant complex emergent ICAS force relationships.

IFlow within an enhanced ICAS KM framework is most meaningfully interpreted as a function participant perceptions ($P_1..P_n$) engaged in TbKM activity within the researched organization. The current research dataset included 11 participants, therefore an upper boundary of P_{11}. The IFlow metaphor during axial coding provided additional insight into organizational focal point(s) for each unique ICAS force to better understand perceptions of emergent dynamics within an ICAS instance:

$$f(ICAS\ flow) = \sum_{P=01}^{P=11} \left(\sum_{\mathbf{KWrk}}^{\mathbf{KFlow}} ICAS\ Node(s)\ \times\ Node\ Classification(s) \right)$$

Note: p = participant perceptions (coded) (Deville, 2012)

Figure 16. NVivo® ICAS flow formula.

The enhanced ICAS IFlow metaphor illuminated ICAS trigger dynamics closer to point of force origin within a series of countervailing loops, discussed in more detail in axial coding data analysis findings section. Various ICAS Nodes were linked via queries to a coded participant's response at ICAS Nodes TbKM knowledge work (KWrk) and KFlow. Participant perceptions were concurrently coded to one or more additional ICAS Nodes while coded to KWrk and IFlow Nodes.

Participant perceptions of organizational IFlow characteristics were seen to influence the shape and nature of IFlow forces during each participant's referenced knowledge-work activity. Kinetic IFlow is inherent in all organizational TbKM activity. However, not all IFlow is active. I discovered certain types of micro-meso KFlows create unique knowledge flux dynamics, resulting in potential IFlows versus kinetic IFlows. Potential IFlow forces were seen to manifest dependent upon knowledge state and flux, within a knowledge continuum, during SM and SG micro-meso KWrk in relation to active KFlow dynamics.

The combined effect of emergent forces manifest by IFlow dynamics also creates unique management challenges. The confluence of people and ICAS emergent forces fosters or inhibits organizational performance short-term in relation to kinetic IFlows and sometimes more long-term in relation to potential IFlows. In a knowledge economy, positive organizational performance and continuous OI should be directly and positively correlated to both positive kinetic and potential IFlows (Bennet & Bennet, 2004; Marcin, 2013; Phene & Tallman, 2014).

OI has been framed as fluid and perhaps most meaningfully understood as a series of paradoxes in the form of dynamic tensions (Bennet & Bennet, 2004; Snowden, 2002). OI has been considered integral to organizational performance (Bennet, 2004; Nissen, 2006). A subset of the IFlow dynamic includes KFlows, in literature not directly linked to organizational performance when considering OI as an organization's performance driver (Bennet & Bennet, 2004; Linger et al., 2007).

"These patterns [knowledge flow visualizations] suggest that the dynamics of knowledge involve cycles between knowledge creation and application (i.e., between learning and doing). Hence, they link knowledge flows [KFlow] with work flows [KWrk] and, in turn, *with organizational performance* [emphasis added]" (Nissen, 2006, p. 254). Nissen (2006) identified the linking force between work flows (KWrk) and organizational performance as a drive force (See Figure 7):

> Our finding [is] that work affects performance directly and mediates the effect of knowledge flows [KFlow] on organizational performance. Knowledge stocks and flows affect work *directly* [emphasis added], as outlined above. But we find *no* [emphasis added] evidence from the case to suggest that knowledge flows have a *direct linkage* [emphasis added] to organizational performance. Yet they link back through mediating *information flows* [emphasis added] to the IT artifact. (p.256)

Subsequently, KFlows have been linked meaningfully with many organizational networking dynamics in context to knowledge-work activities, specifically in context to social network cohesion (Tortoriello, Reagans, & McEvily, 2012). KFlows have also been related directly with many facets of organizational process dynamics (Langley et al., 2013). However, research has yet to make direct causal and/or relationship connections between organizational performance over time and specific KFlow dynamics.

Knowledge as stock and flow, termed an inflow, was seen to influence innovation capabilities within organizational units, specifically at the work group level (van Wijk et al., 2012). Specific knowledge stocks potentially foster organizational innovation dependent upon KFlows which carry varying types of organizational knowledge stocks to work teams (van Wijk et al., 2012). Although KFlows were a specific research premise, direct correlations did not include KFlows, but were between specific types of knowledge stocks and two types of work team innovation, exploratory and exploitive (van Wijk et al., 2012).

Direct causal or correlational connection was not established between work unit performance, organizational performance, or intelligence, and knowledge flows. By virtue of knowledge stock availability, exploratory or exploitive innovation capability emerged within the work unit (van Wijk et al., 2012). The only statistically significant correlations in terms of KFlows were between horizontal and vertical KFlows (van Wijk et al., 2012). As a result, van Wijk et al. (2012) recommended future research is needed to “uncover how knowledge flows into units influence the type of knowledge stocks, and how these stocks, subsequently, influence the extent rather than the nature of inflows” (p. 945).

Therefore, I originally visualized KFlow as not directly impacting organizational performance. As a result, organizational performance was captured as an active IFlow force within the Organizational Intelligence (OI) Node, where OI is a composite of four key organizational activities including a) organizational learning, i.e., creativity, b) right actions, c) right decisions, and d) effective problem solving, all dynamically interconnected (Bennet & Bennet, 2004). I contrasted active OI with organizational memory (OM), more static and passive, representing an ICAS IFlow force potential, yet integral to optimal organizational performance.

I found OM directly relates to specific knowledge stocks within socially complex, ICAS-networked knowledge objects. I have interpreted OM, therefore, to represent ICAS potential energy forces, while creativity represents ICAS active or kinetic energy forces. Both types of ICAS energy seemed logical representations of an ICAS emergent characteristic, i.e., organizational performance. I captured organizational performance as potential and kinetic energy forces respectively within the OM and OI ICAS Node/Child Node structures.

Knowledge stocks (KStock) and KFlow directly affect work activity systems. Although not directly impacting OI, KFlow does impact OI indirectly (Nissen, 2006). I postulated this indirect impact on OI as a function of work activity system potential to create TaK when solving an organizational problem. I captured TaK conversion at ICAS Node KFlow within a knowledge cycle KFlowT, through a KNet dynamic (Ahuja et al., 2012; Nissen, 2006).

Knowledge conversion activity, however, is not simply a series of cyclical TaK–ExK and ExK–TaK spirals, but includes a paradoxical KFlow continuum where all knowledge forms exist concurrently. TaK and ExK nonetheless remain very meaningful knowledge object states for optimizing KFlow governance and control. Although KFlow and IFlow remain distinct ICAS forces, KFlow–IFlow and concurrent IFlow–KFlow dynamics, tightly coupled to socially complex KNets, also represent a paradoxical continuum within the emergent ICAS organization.

This became an important design consideration when creating a metaphor for IFlow within an enhanced ICAS knowledge ecosystem design. I found this complex relationship can be captured most meaningfully in any given ICAS instance through a classification schema versus ICAS Node structure (Hutchison et al., 2010). NVivo® classification schemas created a meaningful coded reference link between individual and collective perceptions of organizational knowledge transfer, tacit and explicit, as well as many other ICAS dynamics (Table 13).

Table 13

ICAS Flow Classification Schema Attributes

Attribute Name	Attribute Property	Attribute Values
Degree of Influence	As various activities and resources connect organizationally within any given emergent organizational dynamic, creating an instance of the ICAS organization (Kozlowski & Chao, 2012), the relationship of all identified forces and organizational objects in terms of positive or negative influence on that emergent dynamic.	Not Applicable[a] 5 Extremely Positive 4 Positive Influence 3 Neutral[b] 2 Negative 1 Extremely Negative
Direction	Lateral, vertical, or multi-directional. Within the ICAS all forces have some directional force, unless it is a dormant or latent force, requiring a Trigger, in which case we could consider the force or ICAS Flow to be potential energy in nature, and undetermined. This would differentiate active forces, i.e., dynamic, from unknown potential forces, i.e., static, where direction is undetermined and cannot be known at the time representing an ICAS instance.	Not Applicable[a] Vertical Laterally Up[c] Laterally Down[c] Horizontal Static Multi-Directional

Attribute Name	Attribute Property	Attribute Values
Nature	Similar to Sysperanto Classification attribute *Activity Purpose*, but more broadly defined in context to overarching outcome of emergent ICAS flow (Bennet & Bennet, 2004). IFlow occurs as a result of the confluence of emergent and dynamic forces, yet there should be a primary outcome of this confluence, or purpose for its emergence, that may inform ICAS force origin, whether to align resource(s), initiate activity(s), or create networked relationship(s). The social subsystem, for example, is more networked than aligned, as the subsystem itself is emergent.	Not Applicable[a] Align Resources[d] Initiate Activities[e] Network Relationships[f]
Force Type	The correlation of four primary forces within the ICAS. Although similar to the nature of an ICAS flow, more specifically frames individual and micro-meso social context of force. Although the force nature may be to initiate an activity, the rationale behind the force (force locus) could be to conserve resources (direction); focus energy and attention (intention); increase a knowledge capacity or capability (knowledge), or; frame cognitive abilities and improve SM (knowing) (Bennet & Bennet, 2004, pp. 196-198).	Not Applicable[a] Direction Intention Knowledge Knowing

Note: [a]An NVivo® default attribute value. [b]Coded for Nominal data type integrity. [c]Represents dynamic ICAS force direction; however, some forces may be more meaningfully captured in specific ICAS instances as a diagonal force vectoring from point of origin rising (increasing in intensity) along a time or some other continuum or decreasing in intensity. [d]Coordination, command, control activities; logistics, IT, and IS activity alignment. [e]Force triggering event or initiation activity, may be a dynamic (Senge, 1994). [f]Linking organizational knowledge objects (Kos) and learning objects (Los) with Iflow and KFlow within Activity Systems.

With each unique ICAS characteristic and force, unique classification attribute values were coded to very specific phrases of each participant response. Additionally, a collective visualization of several phrases representing a concept that includes the original phrase were coded with additional classification attribute values to ICAS Nodes to further capture subtle shifts of attribute values between varying levels of IFlow and

KFlow dynamic. Both were queried against coded Node structures to represent an open-ended question, i.e., an NVivo® Matrix Coding Query, in relation to a Sysperanto slice with a specific ICAS force or characteristic.

The NVivo® relational database architecture creates an extremely powerful analysis engine by allowing coded objects to be embedded in larger coded objects. However, only one NVivo® Classification schema can be applied to any given NVivo® Node, thus ICAS Flow as a classification schema will be applied uniquely to the NVivo® ICAS Flow Node (IFlow). When any participant response was coded to the IFlow Node, the ICAS Flow Classification Schema was leveraged to categorize ICAS flow forces associated with that coded response (Bazeley & Jackson, 2013).

From first phase open coding, each theoretical foundation coded to relevant NVivo® ICAS Nodes identified specific observed and anticipated ICAS relationships. I anticipated ICAS Node relationships to emerge based on a specific type of organizational ICAS instance dynamic. The ICAS Flow classification schema was designed expressly to represent these coded theoretical relationships corresponding to complex ICAS emergence. The remaining five ICAS classification schemas each represented additional unique facets of organizational ICAS emergent characteristics and forces.

I created a series of NVivo® Matrix Coding Queries to capture Pearson correlations between all nodes coded to specific respondents, and compared those correlations to positive and negative influences in terms of KFlow and ICAS Flow. NVivo® Matrix Coding Queries leverage the full potential of coded references to correlate NVivo® Node relationships (Bazeley & Jackson, 2013).

Collectively, axial coding queries created the final value attributions of all ICAS classification schemas. These queries are discussed in detail in data analysis findings. As a result, classification schemas were created for IFlow dynamics, KFlow Dynamic, Networking Dynamic, Balancing Dynamic, Cognition Dynamic, and Activity (See Figure 17).

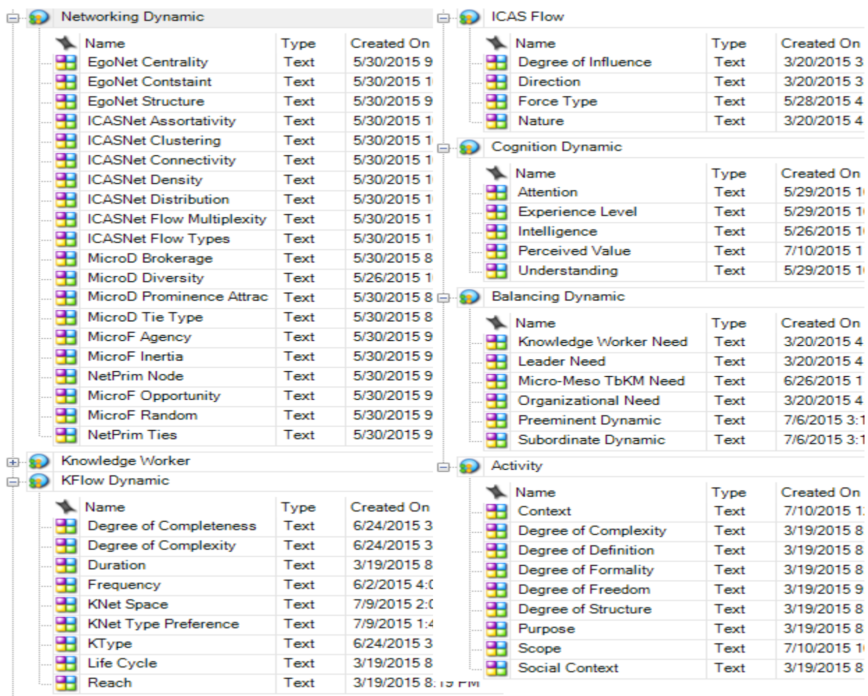


Figure 17. NVivo® ICAS classification schemas.

KFlow and IFlow dynamics were conceptualized uniquely in terms of (a) OI influence; (b) KFlow influencing OI indirectly (Nissen, 2006), and; (c) concurrently IFlow influencing OI directly (Bennet & Bennet, 2004). Both micro-meso TbKM KFlow and macro-meso organizational level TbKM IFlow dynamics are inherently interwoven into the fabric of any ICAS organizational instance (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012). Consequently, I anticipated each type of flow represented in an IFlow continuum would uniquely and directly influence OI over any given ICAS flow time interval (Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Linger et al., 2007).

IFlow over an ICAS instance duration was found to most directly influence OI in context to actions and decisions (Bennet & Bennet, 2004; Kozlowski & Chao, 2012). KFlow over a subset or segment of that time, i.e., knowledge flow time duration in a micro-meso social context, was seen to directly influence OI creativity and problem solving. I required an additional dynamic representation to uniquely capture these and other complex force dynamics, such as differentiating between kinetic and potential ICAS emergent forces.

To complete the Sysperanto slice construct, I created a set of NVivo® Relationship Types used to link specific Node relations in terms of force direction and dynamics (See Figure 18). NVivo® relationships are used to visualize how concepts relate to one another (Bazeley & Jackson, 2013; Hutchison et al., 2010). Concepts can be represented as Nodes, or can simply represent metaphors resulting from unique Node relationships (Bazeley & Jackson, 2013).

I merged both constructs where Node and Node relationships became interwoven to frame enhanced ICAS metaphors. NVivo® Relationship Types emerged conceptually during open coding and were created in second phase axial coding specifically for investigating macro-TbKM dynamics in relation to organizational subsystem dynamics (Hutchison et al., 2010).

The following connections were defined for Node relationships as: (a) Associated (NVivo® relational default); (b) Networked (symmetrical force extending in both directions, from NodeA=>NodeB AND NodeB=>NodeA), (c) Sends (NodeA=>NodeB representing a positive relationship extension); (d) Receives (NodeB=>NodeA as a confirmation or form of control relationship), or; (e) in Dynamic Tension (a symmetrical force that exerts equivalent balancing pressure towards stabilizing both concurrently). Dynamic Tension was defined as an emergent construct during open coding that evolved and matured the metaphor patterns during axial coding.

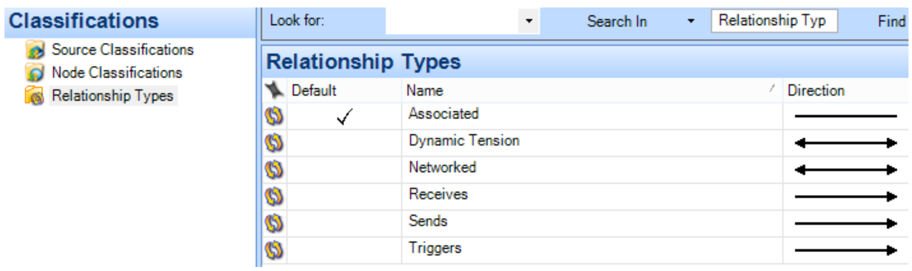


Figure 18. NVivo® relationship type nodes.

The combination of a) two ICAS Nodes, b) classification attribute values coded to participant responses, and c) a single relationship type assignment to a pair of Nodes created a meaningful subset of ICAS Sysperanto slice elements. I anticipated using relationship types to create Relationship Nodes during third phase selective coding. I originally anticipated Relationship Nodes would be fundamental to visualizing an enhanced ICAS model within the NVivo® model. As phase two coding evolved, I found IFlow vectors for ICAS forces are represented more meaningfully within various ICAS Node classification schemas.

Specifically, KFlow, IFlow, and Balancing classification schemas each provided very specific ICAS force vector attributes. KFlow force vector attributes were meaningfully related to micro-meso knowledge emergence, while IFlow force vector attributes more meaningfully related to macro-meso knowledge movement. Balancing classification schema differentiated IFlow potential and kinetic force in terms of knowledge worker need, as well as primary and subordinate organizational need. This model is discussed in detail in my findings in Chapter 5.

Organizational tensions persist between change and stability (Bennet & Bennet, 2004; Langley et al., 2013). Balancing these tensions creates optimum complexity through complex arrangements of ICAS organizational characteristics, activities, and forces (Bennet & Bennet, 2004). A significant volume of these complex arrangements exists within any given ICAS instance (Kozlowski & Chao, 2012).

Thus, ICAS instance slice patterns from open coding were reinterpreted during axial coding as ICAS Node patterns as the *ICAS instance* formula ($f(ICAS\ Slice)$). Each ICAS instance as a formula was conceptualized to represent an NVivo® Sysperanto slice (See Figure 19). I formulated an ICAS Sysperanto slice representing a unique ICAS instance perspective or lens as:

$$f(ICAS\ Slice) = \sum_{P=01}^{P=11} IFlow\left(\sum_{\mathbf{P}=2}^{\mathbf{P}=n} ICAS\ Node\ \times\ Node\ Classification\ \times\ Relationship\ Type\right)$$

Note: p = participant perceptions (coded) and **P** = *patterns of two to an upper limit (n) Nodes. KFlow (*$\mathbf{P}_1$*), and KWrk (*$\mathbf{P}_2$*) are the foundational minimum two patterns (*$\mathbf{P}_1 + \mathbf{P}_2$*) for visualizing any given ICAS instance, thus the IFlow summation lower boundary* **P**=2.

Figure 19. NVivo® ICAS instance formula.

Therefore, ICAS Nodes KWrk, KFlow, and IFlow were coded to Participant 01 as foundational ICAS Nodes. Conceptually, IFlow and KFlow should become the foundation of any given ICAS slice pattern analysis, or perspective of an ICAS instance for any combination of participant observations. KWrk links KFlow dynamics directly and/or indirectly to IFlow

IFlow thus places member's knowledge-work activity(s) in context to macro-meso organizational dynamics. All individual KWrk within a micro-meso social dynamic either directly or indirectly, actively and/or potentially, influences the ICAS organization's collective intelligence (Bennet & Bennet, 2004; Linger et al., 2007; Kozlowski & Chao, 2012). The ICAS Instance formula ($f(ICAS\ Slice)$) representing a Sysperanto slice therefore became the foundation for visualizing previously obscured or hidden emergent ICAS characteristics and forces.

An ICAS instance, ultimately, is reality perception either individually and/or collectively within a micro-meso social networking dynamic. Thus, one or more participants create an organizational IFlow member set. One or more organizational IFlow member set(s) of perceptions frame the ICAS instance boundary, as a system boundary, represented by a minimum IFlow, KFlow and KWrk Nodes.

The resultant perception framework as a system was bounded by Deville's (2012) 11 participants, when viewing a specific ICAS organizational instance. For any given organization, the organizational ICAS dynamic should be represented most meaningfully by the sum of all stakeholder perceptions, internal and external. Various patterns of ICAS activities, forces, and characteristics are linked together through various levels of ICAS KWrk dynamics. The ICAS Instance formula therefore also became the foundation for addressing both research questions.

The premise of patterns as an ICAS metaphor was another key conceptualization of the ICAS to emerge from axial coding. One set of patterns, to illustrate, represented organizational ICAS activities, characteristics, and forces that included a) leadership behaviors, b) organizational control mechanisms, c) organizational memory and learning loops, d) micro-meso behaviors, e) work group activities, f) SM and SG activities, and; g) individual level-balancing decisions. Collectively, the result was a specific ICAS flow dynamic within a given ICAS instance.

The resultant flow dynamic visualization was, in essence, an enhanced slice representation or lens through which to view the ICAS organization's knowledge-work activity frozen in time within a flow continuum. Ultimately, each pattern set, containing one or more patterns, is framed by the perceptions of organizational reality by one or more organizational members. Thus, the nested summations in the ICAS instance formula, i.e., patterns within perceptions.

Consequently, classification schemas synchronize organizational ICAS Node patterns and individual perceptions. Therefore, the classification schema representing macro-TbKM or organizational level IFlow characteristics were conceptualized independent to more micro-meso social KWrk KFlow dynamics. However, each shared a common level of KWrk–KFlow–IFlow interleaved complexity.

Visualizing IFlow characteristics and forces for any given ICAS instance from an individual's perception, using classification schemas, ultimately includes some degree of complexly networked social dynamics surrounding KFlows over segment flow times (KFlowT). At the micro-meso or macro-meso KWrk level, SM and SG are coupled with cognitive capabilities, individually and collectively. In conjunction with organizational filtering mechanisms, the TbKM SM–SG dynamic is influenced by organizational memory, organizational controls, and multiple emergent ICAS forces. The result is a complex paradox of knowledge dynamics.

I began framing a foundational set of additional ICAS Node classification schemas representing the complex micro–meso social dynamic during open coding, and formalized these schemas during axial coding. During axial coding, classification attribute values of one schema would influence or inform the attribute definition and values of one or more related schemas in a cyclical narrative. The classification schema set that emerged included KFlow Dynamic, Networking Dynamic, Balancing Dynamic, Cognition Dynamic, and TbKM Activity (See Figure 17).

The most relevant rationale for framing various attributes within each are represented as NVivo® classification values for

- the KFlow Dynamic representing knowledge flow dimensions (Nissen, 2006) (Table 14);
- a Balancing Dynamic representing IFlow requests (needs force) (Bennet & Bennet, 2004; Linger et al., 2007) (Table 15);
- various TbKM Activity representing key characteristics of the organizational knowledge activity discourse (See Figure 3) (Table 16);
- Cognition Dynamic (Briggs & Reinig, 2010; Snowden, 2002) (Table 17); and

- Networking Dynamic (Ahuja et al., 2012; Nissen, 2006; Turner & Makhija, 2006) (Table 18).

Table 14

KFlow Classification Schema Attributes

Attribute Name	Attribute Property & Rationale	Attribute Values
LifeCycle	A composite attribute of several life cycle models infused with a contingency perspective where resultant life cycle *attribute* has the purpose of aligning “the different knowledge activities in terms of a process or progression (e.g., knowledge is created first, then applied, and lost ultimately perhaps)” with various knowledge flows (KFlow) (Nissen, 2006, p. 232).	Not Applicable[a] Unknown Create Share Apply Formalize
Reach	“Addresses the level of social aggregation associated with knowledge… operationalize[d] as the breadth of knowledge flows and stocks through an enterprise [ICAS instance]…[within] discrete aggregation levels (e.g., individual, group, organization)” (Nissen, 2006, p. 233). Enhanced to capture sphere of connection influence to specific ICAS *flow* dynamics.	Not Applicable[a] Individual Group[b] Organizational Interorganizational[c]
Duration	ICAS TbKM knowledge activity life cycle (KFlowT) duration. Meaningfully captures a KFlow life cycle within a larger ICAS time interval between two ICAS instances.	Not Applicable[a] Unknown Hours Days Weeks Months Years

Attribute Name	Attribute Property & Rationale	Attribute Values
Frequency	Not an original knowledge flow parameter (Nissen, 2006); however, used to capture additional characteristic for correlating to ICAS Network dynamics. Unknown represents insufficient contextual reference. A continuum from very frequent, multiple times per day, consistently within strong hemophilic Ties, to very infrequent, periodic as necessary, *and* not a strong Tie relationship social network dynamics.	Not Applicable[a] 0 Unknown 5 Very Frequent 4 Frequent 3 Less Frequent 2 Infrequent 1 Very Infrequent
KType	ExK or TaK or Both with emphasis on primarily ExK with qualifying TaK or primarily TaK with some degree of qualifying ExK. Mixed knowledge included primarily for ordinal data type integrity. This represents the type of knowledge object in flux or in flow. Differentiating ExK as actual knowledge, i.e., including meta-information to enhance understanding and application relevance.	Not Applicable[a] ExK/Information ExK TaK ExK\TaK TaK\ExK Cultural
Degree of Completeness	Completeness determines value of TaK or ExK in context to SM Process and SG and also influences shape of BIT good idea ogive (arched curve) as ration of good ideas/bad ideas. There is no neutral ground. Knowledge is either some degree of complete or some degree of incomplete, in relation to SM Process and individual cognitive Understanding Boundary, i.e., problem definition.	4 Complete 3 Mostly Complete 2 Mostly Incomplete 1 Incomplete
Degree of Complexity	Diversity is considered to frame knowledge relatedness in terms of complexity. Highly diverse knowledge is complex knowledge from multiple SMEs, functional areas, and/or disciplines (Turner & Makhija, 2006). Non-diverse knowledge is considered simple knowledge, non-complex.	4 Highly Diverse 3 Diverse 2 Non-Diverse 1 Highly Non-Diverse

Note: [a]An NVivo® default attribute value. [b]Micro-meso social networks (Kozlowski & Chao, 2012; Ahuja et al., 2012). [c]Defined to capture future, broader market space, regional, or national emergent ICAS *flow* dynamics inherently containing knowledge flows (KFlow) to better value resultant intellectual capital (IC); not used in current research.

The ICAS organization requires a complex balancing dynamic to maintain an optimum level of complexity, i.e., emergent ICAS optimum complexity. Balanced or optimum complexity is prerequisite to continuously creating organizational intelligence as maximized organizational performance (Bennet & Bennet, 2004). A balance should be maintained between unified shared purpose and divergent thinking that leads to innovation and improvisation (Bennet & Bennet, 2004; van Wijk et al., 2012).

Organizational values embedded within the ICAS organization may "*encourage creativity* [emphasis added] and proactivity or may *restrict behavior* [emphasis added]" (Bennet & Bennet, 2004, p. 63). Whether organizational need requires a break in cultural paradigms or stability to maintain continuity to control disruptive change, organizational values should establish self-organizing capabilities in both cases. This complex and emergent organizational balancing dynamic is required by all organizations (Bennet & Bennet, 2004; Senge, 1994). Without some degree of balancing dynamic there is simply chaos (Weichhart, 2013).

Maintaining balance between multiple, complex ICAS tensions requires rhetorically congruent messages flow throughout the organization, anchored in the cultural and social subsystems (Hatch & Cunliffe, 2012; Jacks et al., 2012; Turner & Makhija, 2006). A balancing dynamic therefore includes some form of organizational control dynamic, e.g. a control framing mechanism, to

- keep appropriate tension between innovation and planning directives (Flaherty & Pappas, 2012; Turner & Makhija, 2006; Yu et al., 2014);
- balance organizational activities between exploration and exploitation in context to innovation and performance (Lopez-Nicholas & Merono-Cerdan, 2011; van Wijk et al., 2012);
- balance needs between stakeholders in both local and global contexts (Padova & Scarso, 2012; Sharma & Good, 2013);
- balance knowledge creation with the application of knowledge, e.g. knowledge stocks and flows, tacit versus explicit (von Krogh et al., 2012);
- balance between various forms of semantic links (Yang & Shan, 2008; Zhuge, 2011; Zhuge, 2014)
- balance competing roles within management teams between strategy champions and recipients of change, stability and uncertainty (Sharma & Good, 2013; Taylor, 2013); and
- balance organizational assets against a portfolio of opportunities, as well as opportunities within a portfolio (Theodore, 2014; van Wijk et al., 2012).

I considered three primary balancing needs would drive the ICAS organizational balancing dynamic, framing all the ICAS tensions that generate complex and sometimes countervailing forces (Bennet & Bennet, 2004). Included are organizational balancing needs, leader balancing needs, and knowledge worker balancing needs governed by specific organizational controls (Bennet & Bennet, 2004; Turner & Makhija, 2006). I considered the resultant confluence of tensions within a balancing dynamic as a potential set of complimentary tensions (Nissen, 2006), versus explicitly diametrical or countervailing forces (Bennet & Bennet, 2004).

Table 15

Balancing Dynamic Classification Schema Attributes

Attribute Name	Attribute Property & Rationale	Attribute Values
Organizational Need	Co-evolving adaptation with environment while maintaining ICAS cohesion, "a close ecological fit with that environment." (Bennet & Bennet, 2004, p. 188). A subset representation of ICAS organizational forces where each balancing construct requires potential (*static*) or *dynamic* ICAS activity, linked to ICAS *flow*. Links TbKM activity to ICAS emergent self-organizational characteristics *optimum complexity* and *shared purpose*.	Not Applicable[a]
		Resource Allocation
		Tactical vs. Strategic
		Strategic vs. Tactical
		Information vs. Knowledge
		Knowledge vs. Information
		Maintain Optimum Complexity
		Stakeholder Expectation
		Corporate vs. Localized Operation
		Localized Operation vs. Corporate
		Cost vs. Strategic Value
		Strategic Value vs. Cost

Attribute Name	Attribute Property & Rationale	Attribute Values
Leader Need	Micro-meso organizational knowledge work balance between individual and team (Kozlowski & Chao, 2012; Bennet & Bennet, 2004). Shifts co-evolving adaptation activity into specific activities within the ICAS. Links to BIT *goal congruence* and *solution space* (Briggs & Reinig, 2010).	Not Applicable[a] Control vs. Autonomy Optimizing Resources
Knowledge Worker Need	Individual judgments, decision-making style, learning style, cognitive abilities, and relationship networks frame the individual knowledge worker's ability boundary. Co-evolving adaptation to maintain individual stability with micro-meso social cohesion requires a "high level of trust, camaraderie, and collaboration, coupled with…recognition [perception] of organizational alignment" (Bennet & Bennet, 2004, p. 192). Links directly to BIT *goal congruence* and ICAS *shared purpose*.	Not Applicable[a] Acquiring vs. Contributing Knowledge Contributing Knowledge vs. Acquiring Action vs. Cognitive Rest Cognitive Rest vs. Action Group vs. Individual Learning Individual Learning vs. Group

Attribute Name	Attribute Property & Rationale	Attribute Values
Micro-Meso TbKM Need	This attribute extends ICAS balancing dynamic (Bennet & Bennet, 2004) with additional group focused learning activity, requirements (Kozlowski & Chao, 2012). Provides for differentiating individual cognitive activity and SM from group level cognitive boundary alignments (Ackerman, 2000). Group change or stability captures balancing dynamic during organizational change, while continuity or change focuses more at the micro-meso level. The primary force focus determines which form of change or not is applicable (Kozlowski & Chao, 2012).	Group SM Need Group Learning Group Change vs. Stability Group Stability vs. Change Group Change vs. Continuity Group Continuity vs. Change
Preeminent Dynamic	Identify which Balancing Dynamic has pre-eminent influence within the ICAS Flow forces generated. At this level, differentiating only which Balancing Dynamic is Dominant and which are Subordinate, captured in Subordinate Priority.	Not Applicable[a] Organizational Need Dominant Leader Need Dominant Knowledge Work Need Dominant Micro-Meso TbKM Need Dominant Equi-Dominant

Attribute Name	Attribute Property & Rationale	Attribute Values
Subordinate Dynamic	Captures which Balancing Dynamic is most directly subordinate in a given ICAS Flow dynamic context. I am capturing only most significant influencing Balancing Dynamics within a specific ICAS Flow context to better inform KFlow activity.	Not Applicable[a] Organizational Need Dominant Leader Need Dominant Knowledge Work Need Dominant Micro-Meso TbKM Need Dominant Equi-Dominant

Note: [a]An NVivo® default attribute value.

I assigned the NVivo® classification schema Balancing Dynamic to three Parent/Child Node sets. The first Parent/Child Node set included a) Clan Controls (CMC), Process Controls (CMP), and Outcome Controls (CMO) Child Nodes under Parent Node Control Mechanisms, itself a Child Node under ICAS Parent Node Knowledge. A second Node set included EChange and EComplexity Child Nodes under ICAS Parent Node Emergent Environment. The third Node set included EOptimum Complexity and EShared Purpose Child Nodes under ICAS Parent Node Emergent Self-Organization.

I further assigned Activity classification schema to Knowledge Child Nodes a) TbKM Work Activity (KWrk), b) Knowledge Transfer (KT), and c) Knowledge Exchange (KE). Networking Dynamics classification schema was assigned to Knowledge Network (KNets) Child Node under ICAS Parent Node Knowledge, as well as Cultural Subsystem (CSS) Child Node under ICAS Parent Node Organizational Sub-Systems.

The cumulative effect was an ICAS flow tension continuum representing both complementary and diametrical tensions in relation to specific IFlow forces. Therefore, I was able to effectively capture distinct nuances of complimentary and diametrical tensions between various KNets and KWrk dynamics within any given ICAS instance.

Capturing these complex nuances using Relationship Nodes linked to specific participant perceptions, my preliminary second phase design, I would have created significant additional structural complexity. Relationship Nodes are simply not designed for the level of Node complexity I required (Bazeley & Jackson, 2012). However, the full potential to visualize an ICAS instance required a set of meaningful force vectors. Classification attributes provided the optimum design alternative to most effectively capture and visually represent complex balancing tensions. Concurrently, spreading vector tensions across multiple ICAS Node assignments simplified Node design.

As a result, I found that dependent upon ICAS emergent dynamics, balancing tensions can be both opposing and complimentary at the same time within an ICAS instance. Perhaps the best analogy would be an oceanic rip current. A confluence of ICAS forces, especially cumulative ICAS potential forces in combination with specific ICAS instance active forces, create unique ICAS pressures.

Sufficient ICAS cumulative pressure may eventually find an IFlow release within specific KFlows. Balancing dynamics in relation to KFlows are most meaningfully visualized when linked to knowledge networks (KNets), where the classification schema Networking Dynamics meaningfully represents perceived network architecture, microdynamics, and micro-foundations (Ahuja et al., 2012; Amani, 2010). Although discovered, ICAS rip currents were beyond the scope of current research.

By focusing on the ICAS instance organizational control mechanisms individually, i.e., clan, process, and outcome controls, while concurrently viewing organizational control's collective influence upon ICAS balancing dynamics and IFlow, ICAS organizational tensions were isolated by specific force foci in relation to ICAS micro-meso social network dynamics, within a TbKM activity. Balancing dynamics within an ICAS instance defined in Table 15 are discussed in greater detail in my final findings in Chapter 5.

Table 16

Activity (TbKM) Classification Schema Attributes

Attribute Name	Attribute Property & Rationale	Attribute Values
Social Context	TbKM activity within a primarily social context or activity emphasis more on work activity and business at hand (Linger et al., 2007; Ahuja et al., 2012).	Not Applicable[a] Primarily Social Primarily Work Mixed

Attribute Name	Attribute Property & Rationale	Attribute Values
Purpose	A meaningful subset of organizational activities. Typically, an organizational activity will have multiple reasons to be within the knowledge work discourse (Linger et al., 2007); however, TbKM *purpose* attributes provide opportunity to identify the most salient initiating reason, representing a force locus as a key feedback loop root cause setting force origin either in clockwise change loop or counter-clockwise dynamic equilibrium loop, or some specific learning feedback loop (See Figure 4) (Linger et al., 2007; Bennet & Bennet, 2004, pp. 282-284; Senge, 1994).	Not Applicable[a] Closure Communication[b] Control Coordination[c] Execution (Ops) Feedback Ideation Initiate (Trigger) Monitoring Planning Review Training
Degree of Structure	Although the ICAS organization should have structure to maintain cohesion, balancing tensions exist between varying types of structural cohesion qualities to include: being *adaptable*, allowing adaptive re-organizing; *dynamic* or self-organizing; *flexible*, able to accept changes, and; *rigid* or inflexible. In the current TbKM work activity context, based on individual perception, individual, micro-meso social, or macro-organizational context, which structural characteristic appears most visible?	Not Applicable[a] Adaptable Dynamic Flexible Rigid

Attribute Name	Attribute Property & Rationale	Attribute Values
Degree of Freedom	A continuum of creative liberty and independent decision-making autonomy available to micro-meso TbKM, ranging from completely outside typical organizational process and outcome controls to directly governed by (Flaherty & Pappas, 2012), with clan controls uniquely governing social work group dynamics with balance between process and outcome (Turner & Makhija, 2006). Links TbKM activity to organizational control structures and ICAS emergent self-organization characteristics.	Not Applicable[a] Completely Autonomous Loosely Controlled Extremely Governed
Degree of Formality	Whether primarily social or work activity, either could be formal or informal. Provides for capturing cultural norms where social network or aggregation is formal or informal.	Not Applicable[a] Formal Informal
Degree of Definition	A continuum between clearly defined and formal, as with mature levels of process definition, or; simply well-established but undocumented, a part of organizational memory (OM) requiring ICAS *flow* and KFlow, or; a commonly accepted practice, or informally defined within organizational norms (social subsystem), an OM object not necessarily requiring either ICAS flow or KFlow, to; improvisational as ad-hoc.	Not Applicable[a] Ad-hoc Undefined Informally Defined Formally Defined
Degree of Complexity	A continuum of complexity from extremely simple skills required with clearly defined task outcomes to extremely difficult to complex tasks requiring many skills and significant experience, or simply difficult in context to skills and experience, to the wicked problem (Briggs & Reinig, 2010). Links most directly to ability boundary, SG support, and SM process and enablers.	Not Applicable[a] Simple Difficult Complex Wicked

Note: [a]An NVivo® default attribute value.

Table 17

Cognition Dynamic Classification Schema Attributes

Attribute Name	Attribute Property & Rationale	Attribute Values
Intelligence	“A measure of a person’s capacity to learn and reason as well as ability to recognize relationships and patterns among facts and phenomena” (Briggs & Reinig, 2010, p. 128). High intelligence includes systems thinkers. Low intelligence includes average IQs. Within ICAS dynamics, identifies key innovation and improvisation knowledge.	Not Applicable[a] High intelligence Average intelligence Low intelligence
Understanding	Related to working memory *chunking* activities, influences perception of problem complexity and potential solution ideas. Used to frame type of information and knowledge, as well as accessibility to knowledge network, including organizational memory objects in form of explicit knowledge (ExK).	Not Applicable[a] TaK/KE Available TaK/KT Available ExK Accessible ExK Unavailable TaK Unavailable
Attention	“Limits of working memory, people cannot think about all of the concepts in their knowledge network simultaneously” (Briggs & Reinig, 2010, p. 131). Spreading activation allows “people [to] follow a train of thought, despite limits of working memory (p. 132). Links to knowledge networks (KNets). Without knowledge networks providing new ideas, active cognitive inertia inhibits new ideas. Extreme ambiguity potentially can diminish creativity or quickly exhaust working memory. Defined problems tend to initiate a normal level of beneficial spreading activation.	Not Applicable[a] Complexly Ambiguous Problem Spreading Activation Beneficial Active Cognitive Inertia Unavailable Memory Mental Exhaustion

Attribute Name	Attribute Property & Rationale	Attribute Values
Experience Level	Domain expertise as a function of training, experience, and practical lessons learned, including failures as well as success. Expertise is linked to intelligence to form *ability* (Briggs & Reinig, 2010). Domain and organizational expertise differentiates between deep and narrow experience sets from deep and broad experience sets. Domain experts are considered decision-making influencers whereas domain masters, with equivalent or marginally less experience, simply provide significant insight into solution space.	Not Applicable[a] Domain Expert Organizational Expert Domain Master Journeyman Novice

Note: [a]An NVivo® default attribute value.

Organizational ICAS networking dynamics transcend traditional structural and informational subsystem dynamics, in the sense of physical IT infrastructure as underpinning IS (Ahuja et al., 2012; Dalkir & Liebowitz, 2011). Similar to IT infrastructure, ICAS networking dynamics shape and govern the flow of data, information, and knowledge for SM (Amani, 2010; Boisot & Sanchez, 2010). Additionally, ICAS networking dynamics shape organizational knowledge culture and social norms (Sanda & Johansson, 2011; Taylor, 2013; van Wijk et al., 2012).

In an ICAS networking context, the equivalent of data, information, and knowledge embedded within some type of IS are represented by emergent organizational IFlows and micro-meso socially networked KFlows. An ICAS network (a) enables knowledge and memory object flow as well as data movement; (b) shapes SM and SG TaK and ExK packages as well as SM information, and; (c) structures and embeds various organizational control forces as codified knowledge, i.e., ExK (Ahuja et al, 2012; Turner & Makhija, 2006; Weick, 2012).

Knowledge networking concepts similar to traditional network infrastructures apply in the sense of moving relevant decision-making information (Dalkir & Liebowitz, 2011). Concurrently, unique ICAS attributes are required to frame the unique types of decision-making, information-equivalent knowledge objects embedded within organizational contexts (Amani, 2010; Borgo & Pozza; Padova & Scarso, 2012). Knowledge object framing and movement manifest within emergent forms of IFlows, comprised of KFlows, and flow controls (Ahuja et al., 2012; Boisot & Sanchez, 2010; Turner & Makhija, 2006). All IFlows pass through the culture of the organization and manifest the cultural subsystem as a networked culture (Bennet & Bennet, 2004; Dalkir & Liebowitz, 2011; Jacks et al., 2012).

The networked culture shape directly influences the degree of permeability, i.e., shapes the ICAS organization's IBoundary within an ICAS IFilter mechanism (Bennet & Bennet, 2004; Hatch & Cunliffe, 2012). The shape of the networked culture is also shaped by types of organizational controls in force embedded within and passing through any given IFlow dynamic (Amani, 2010; Becker, 2007; Boisot & Sanchez, 2010; Flaherty & Pappas, 2012).

Complex ICAS KNet dynamics representing organizational functional characteristics concurrently with ICAS emergent forces required many complex NVivo® classification schema attributes and associated attribute values. KNets are the loci for all emergent and active ICAS force flows. KNets also retain potential ICAS energy within a complex array of heterophilic and homophilic ego-bridges uniquely related to specific nodal assortive inertias (Ahuja et al., 2012). I considered KNet nodal assortive microfoundation inertias as a primary force loci representing IFlow potential energy, linked to specific KNet KFlow segments, each uniquely influencing active IFlow dynamics.

To simplify Networking Dynamic NVivo® Classification schema design, however, I used four social networking dynamics to include "network microdynamics, architecture dimensions, microfoundations, and primitives" (Ahuja et al., 2012, p. 440). Therefore, dynamically interconnected ICAS KNet dynamics effectively relate specific organizational subsystem phenomena to IFlows and KFlows.

KFlow complexity has been infused into theoretical designs representing complex social and informational networks (Ahuja et al., 2012; Amani, 2010). The relationship between social connection strength and type in an ICAS KNet perhaps most meaningfully represents perspectives of multiple KFlow types in any given ICAS instance (Langley et al., 2013; Lee et al., 2010; Lipparini et al., 2013) (see Table 18). Perhaps the most meaningful link between strength and type of connection can be understood in terms of

> Ties between actors [that] could constitute several distinct *flows* [emphasis added] simultaneously in the form of multiplex ties. Moreover, the formation, dissolution, or morphing of ties between [KNets] nodes can in turn lead to changes in structure, or the *pattern* [emphasis added] of ties… Current networks of relations reflect both the past social structure and the accumulation of historical experience through past network ties. (Ahuja et al., 2012, pp. 435-441)

Table 18

Networking Dynamic Classification Schema Attributes

Attribute Name	Attribute Property & Rationale	Attribute Values
MicroD Diversity	A continuum from primarily domain specific relationships, limited social ties, minimal social diversity (hemophilic [*sic*]) to primarily organizational and diverse social networked relationships (heterophilic [*sic*]). Inter-disciplinary relationships and affiliations, may be meaningfully linked to higher order cognition activity.	Not Applicable[a] Highly Heterophilic Diverse Connections Balanced Similar Connections Highly Homophilic
MicroD Prominence Attraction	Perceived quality of networked relationship as highly desirable to less desirable in terms of perceived affiliation benefit. Perceived benefit may change over time, in value dependent upon shared purpose and goal congruence, and/or diminish in strength dependent upon relationship foundation(s) perishability.	Not Applicable[a] Highly Desirable Desirable Neutral Undesirable Highly Undesirable
MicroD Brokerage[b]	Form of social capital creating stronger *ties*, or purposefully diminishing other *ties*. An active *causal force*, representing an ICAS *flow* or KFlow trigger, resulting in network node structure changes and potential systemic shifts in ICAS network dynamics, dependent upon node influence (actor), number and types of network ties, and current and past network structures.	Not Applicable[a] Domain Specific Value Organizational Value Personal Value Professional Career Value

Attribute Name	Attribute Property & Rationale	Attribute Values
MicroD Tie Type	A continuum of closing and initiating relationships in context to relationship age. Not all patterns are captured, as Closing AND Bridging Old while Closing AND Bridging New in any AND combination of Old/Old or New/New can be linked meaningfully for simplicity to primary purpose as either a closing or a bridging focus. Exception is Bridging both Old and New concurrently. Links to ICAS *innovation* and *creativity* in context to networked relationships to isolate *force foci*.	Not Applicable[a] Closing Old Tie Closing New Tie Bridging Old Tie Bridging New Tie Closing Old/Bridging New Tie Bridging Old/Bridging New Tie
MicroF Agency	Role played in network dynamic between actors and in context to ego-network, other egos in context to creating bridges, i.e., alters, between egos. Primary purpose of role being played. Creating alters should diminish, *plug*, ego-based network advantages, *holes*. Structure relates to network architecture dynamics and is in context to control dynamics. Motivation and ability to shape relationships.	Not Applicable[a] Create Structure Change Structure Remove Structure Create Alter Remove Alter
MicroF Opportunity	Nodal Assortment Driven to create proximity, common goals, shared purpose (links to BIT cognitive goal congruence and ICAS shared purpose; Tie Pattern Driven to create transitivity, repetition, referral (links ICAS flow *to* organizational memory and networked knowledge objects). At group level can create cliques.	Not Applicable[a] Node Assortative Tie Pattern
MicroF Inertia	"Nodal Assortment Driven: habits, networking propensity, collaborative expertise. Tie Pattern Driven: social norms, interorganizational routines" (Ahuja et al., 2012, p. 436). Later links to organizational control structures, especially within *clan controls* (Turner & Makhija, 2006).	Not Applicable[a] Nodal Assortative Tie Pattern

Attribute Name	Attribute Property & Rationale	Attribute Values
MicroF Random	Random network inertia from external, i.e., exogenous, network force. Link to emergent environmental uncertainty and increased complexity as with the case of an acquisition or merger specific to networked relationships (Ahuja et al., 2012). Enhanced as a metaphor to include emergent ICAS forces resulting from *flow*, but not directly related to organizational networking dynamics, yet impacting or influencing shape and/or structural dynamics of knowledge network. Emergent	Not Applicable[a] Network Internal Network External Emergent Internal Emergent External
NetPrim Node	Nodes, ties, and structures are dynamically interwoven network primitives where nodes represent actors (Ahuja et al., 2012). Emerging structures should include *spaces* as well as nodes, and redefine individual as a memory object within mental space, including symbols (Zhuge, 2014). Cognitive boundary is memory object (mind) relating to ego-network dynamics, i.e., mind-to-mind alters. Organizational control as a network primitive node allows control *flow* activity to be identified as a knowledge network *object*, a focal point marker. Significantly enhanced metaphor.	Not Applicable[a] Organizational Control Cognitive Boundary Social Physical Space Cyber Space Socio-Cyber Space
NetPrim Tie	Embedded relationship type. Hierarchical represent authority; Affective represent social or strong emotional; market represent competitive transactional relationships, and; referential represents certification relationships, validation or confirmation relationship.	Not Applicable[a] Market Referential Hierarchical Affective

Attribute Name	Attribute Property & Rationale	Attribute Values
NetPrim Structure	Although we may have a physical social node, i.e., physical micro-meso social dynamic, the structure resulting from node relationships may be control, communication, coordination, or command (Bennet & Bennet, 2004). What type of tie purpose links two nodes? Communication in this context represents any form of data, information, and knowledge, TaK or ExK, either SM or SG. Avoids differentiating information and ExK, as both are typically perceived synonymous.	Not Applicable[a] Centralized Command Distributed Control Micro-Meso TbKM Coordination Communication
EgoNet Centrality	Variance on tie patterns for focal node in ego-network alter dynamic. Decreasing holes relates to filling network gaps and reduces brokerage opportunity, or leveraging network ties for personal agency gain at cost of organizational benefit.	Not Applicable[a] Increasing Centrality Decreasing Centrality Increasing Holes Decreasing Holes
EgoNet Constraint	Ego-network inhibitor (Ahuja et al., 2012), macro-network IFlow inhibitors (Bennet & Bennet, 2004). Constraints may trigger ICAS network disconnects or ICAS network disconnects can create meso-micro social networking constraints. Misapplied clan controls can create constraints, as can process and outcome controls misalignment (Turner & Makhija, 2006). Highly embedded misaligned controls in a network can constrain actor from moving outside that social dynamic. ICAS flow is an emergent force outcome, whereas KFlow can be a more directly initiated to shape organizational activity. Extending attribute to metaphor construct to capture KFlow and IFlow impact as a *positive* force in terms of alignments.	Not Applicable[a] Highly Embedded KFlow Inhibitor ICAS Flow Inhibited Control Misalignment KFlow Focus Alignment ICAS Flow Focus Alignment Control Focus Alignment

Attribute Name	Attribute Property & Rationale	Attribute Values
ICASNet Distribution	Variance of or degree of distribution of ties across nodes. Relates to organizational power distribution and organizational control priorities. Complex tie distribution added to capture network nodes as spaces in evolving cyber-social complex networks that includes symbol spaces (Zhuge, 2011). Forced tie distribution added as a concept to capture organizational control dynamics that override controls requiring explicit ties be established to maintain ICAS tension balance, i.e., a tactical imperative mandating resource reallocations (Bennet & Bennet, 2004).	Not Applicable[a] Complex Tie Distribution Highly Diverse Tie Distribution Moderately Diverse Tie Distribution Limited Diverse Tie Distribution Forced Tie Distribution
ICASNet Connectivity	Represents the diameter of the network. As networks increase in node size and structure complexity, tie distribution may become increasingly complex, diminishing SG capabilities, reducing knowledge flows, and diminishing effective decision-making. Primary focus is establishing a continuum framework for identifying how nodes connect logically over time, where increasing social ties will reduce logical connection length even within complexly distributed Ties.	Not Applicable[a] Highly Complex Path Highly Meshed Path Highly Distributed Path Complex Path Meshed Path Distributed Path Highly Direct Path Direct Path Non-Existent Path Unreachable Path

Attribute Name	Attribute Property & Rationale	Attribute Values
ICASNet Clustering	Relates to clustering of groups, domain experts, or clique formation. Relates to network segmentation, and types and volume of subnet masks, i.e., ICAS network partitions. A continuum from highly clustered to highly diverse or heterogeneous.	Not Applicable[a] 5 Highly Clustered 4 Clustered 3 Mixed Clustering 2 Diversified 1 Highly Diversified
ICASNet Density	Actual ties in relation to maximum possible ties. "Higher network density may be reflective of network closure, a condition that in turn may be associated with development of norms" Ahuja et al., 2010, p. 437). May also inhibit new idea generation. I am additionally linking density as an *ideation potential* metaphor within a networking dynamic. Highly dense clustering diminishes optimum ideation (Briggs & Reinig, 2010) while minimally dense clustering fosters optimum ideation, linked to knowledge flows (Nissen, 2006).	Not Applicable[a] Highly Dense Ties Dense Ties Minimally Dense Ties
ICASNet Assortivity	"Degree to which similar nodes connect to each other" (Ahuja, 2010, p. 437). A continuum from highly positive like node connections are predominant to highly negative where high- and low-degree node connections are predominant.	Not Applicable[a] 5 Highly Positive 4 Positive 3 Balanced 2 Negative 1 Highly Negative
ICASNet Flow Types	Ambiguously defined (Ahuja et al., 2012). Used with enhanced ICAS network dynamics to capture focus of network flow purpose. Differentiating types of flow that create unique ICAS forces between multiple participants within an ICAS instance provides opportunity to explore specific flow dynamics from a network perspective.	Not Applicable[a] SG Flow SM Flow Ideation Flow ICAS Culture Flow KFlow

Attribute Name	Attribute Property & Rationale	Attribute Values
ICASNet Flow Multiplexity	"Multiple ties with different contents, relates to type of structure, between the same set of nodes" (Ahuja et al., 2010, 438). Allows for capturing multiple communications between nodes across a single connection (multiplexed). Focus is sender node communication content. When linking two or more nodes, i.e., organizational participants, this attribute should be consistent between two, but type of structure and purpose of tie may be coded uniquely but become one type of network connection multiplexing.	Not Applicable[a] 5 Highly Multiplexed 4 Multiplexed 3 Mixed Design 2 Separated 1 Highly Separated

Note: [a]An NVivo® default attribute value. [a]Capturing historical brokered relationships, network ties and structure, requires access to longitudinal data, beyond the scope of this study.

I maintained an iterative spiral of coding, including interpretation, discovery, reflection, additional research, and re-interpreting ICAS characteristics with NVivo® Nodes, Classification schemas, and Relationship Types (now represented as specific schema attributes) (Hutchison et al., 2010). This activity became a continuously evolving dialog between researcher context, original participants, and original theory contexts. Capturing the rationale used within the research dialog is an essential and foundational activity for establishing research reliability (Birks et al., 2013; Hutchison et al., 2010; Wagner et al., 2010).

The following representative dialogs illustrate my double-hermeneutic journey as "an epistemic script of bricolage" (Boxenbaum & Rouleau, 2012, p. 281). The bricolage as a discovery experience evolved my conceptualization of ICAS characteristics based on theoretical foundation transformation to enhanced ICAS metaphor (Bazeley & Jackson, 2013; McKemmish et al., 2012). NVivo® memo entries were used to capture this dialog as well as additional insights into NVivo® Classification schema attribute definitions and values (Bazeley & Jackson, 2013).

As a series of multiple dialogs interleaved, additional bricolage created new metaphor meaning around all ICAS characteristics and existing theoretical foundations (Boxenbaum & Rouleau, 2012). Consider the following interleaved dialog, for example: Within an enhanced ICAS framework, IFilter and IBoundary become blurred (Bennet & Bennet, 2004), during the SM dynamic (Kozlowski & Chao, 2012; Maitlis & Lawrence, 2007; Weick, 2012), when concurrently

- knowledge stocks (Nissen, 2006) as lessons learned become embedded in organizational memory (Jackson, 2012) as ICAS memory objects available for exchange (Louis-Sidney et al., 2012);
- organizational memory emerges from SM and SG linked to individual cognitive abilities (Ackerman & Halverson, 2000; Briggs & Reinig, 2010; Boisot & Sanchez, 2010);
- memory objects also become filtering attributes inherent within a perception of organizational reality (Kozlowski & Chao, 2012), dependent upon memory object availability and accessibility (Joia & Lemos, 2010; Louis-Sidney et al., 2012); and
- organizational networking contains embedded controls, both social and structured, formal and informal (Amani, 2010; Ashoori & Burns, 2013; Boisot & Sanchez, 2010; Minbaeva et al., 2012; Turner & Makhija, 2006).

In this context organizational subsystem dynamics as ICAS forces are collectively active in IFilter activity and should pass through designed and emergent ICAS IBoundary surrounding and shaping KWrk (Hatch & Cunliffe, 2012; Bennet & Bennet, 2004). Bricolage as epistemic script permeated all aspects of design, coding, and analysis spanning first and second phase data collection, culminating in new insights, metaphors, and questions (Boxenbaum & Rouleau, 2011). The following questions are representative of many that emerged from "the epistemic script of bricolage [that] frames organizational theories as fluid constructs that undergo transformation," emphasizing *improvisation* of thought (Boxenbaum & Rouleau, 2011, p. 281).

Considering BIT (Briggs & Reinig, 2010), when, therefore, and within which ICAS instance focal point(s) ($f_p..f_{pn}$), at which specific point(s) in time ($t_{0..}t_n$) during an ICAS instance do various IFlow and KFlow dynamics surrounding the ideation process most significantly moderate individual understanding boundary? And how, subsequently, do emergent forces from this dynamic most significantly influence SM within the solution space boundary, and how significant is this relationship to a positive or negative IFilter force dynamic? The locus or loci of these ideation boundary dynamics could reside in

- specific area(s)s of organizational activity, e.g., a TbKM activity (Linger et al., 2007);
- specific SM and SG activity(s) within a SM process (Maitlis & Lawrence, 2007);

- organizational IFlow surrounding emergent self-organization (Bennet & Bennet, 2004); and/or
- KFlow (Nissen, 2006), at a confluence point where IFlow and KFlow are dynamically connected (Ahuja et al., 2012).

Individual and micro-meso SG can be triggered, enabled, or hindered (Maitlis & Lawrence, 2007). I have differentiated the process of SG as outside of the individual SG–SM (SG–SM) dynamic, influenced by many surrounding ICAS forces (Choo, 1998; Weick, 2012). As such, the SM process as an individual and group activity, although at times involving a KNet, typically involves some micro-meso and group-internal KWrk iterative activity within which the individual(s) make sense of any given phenomenon or decision-space (Briggs & Reinig, 2010; Kozlowski & Chao, 2012; Maitlis & Lawrence, 2007). In this context, SM should manifest in the SG (SG) process as a SG enabler and lack of SM should manifest as a SG inhibitor. The process of SM determines to what degree, if any, TaK created through individual SM will be shared collectively in SG through KE or KT (Ahuja et al., 2012; Boisot & Sanchez, 2010; Weick et al., 2012).

These and many other relationships were explored as a result of coded participant relationships to multiple ICAS Nodes leveraging the power of NVivo® Classification schemas (see Table 19). Each coded participant reference was uniquely coded to a Child Node under each listed NVivo® Node, linking each specific coded reference to a) participant, b) question, and c) specific coded reference number. All coded participant references were assigned a reference sequence number, e.g., P01 Q01 R001 representing the first coded reference for Participant 01. Child Nodes assigned to ICAS Node then linked specific coded references with specific Classification value assignments directly to coded source (See Figure 20).

Participant Node coding prior to classification assignments occurred for 11 participants for all questions. I was uncertain during preliminary axial coding whether all participant coded references would be necessary to validate my proposed ICAS KM framework. However, all participant coded Reference Nodes were coded to ICAS Nodes, as previously discussed. Coding Participant 01 generated 28 unique Reference Nodes, P02 20 Reference Nodes, continuing sequentially through each Participant and culminated at P11 Q15 with a final coded Reference Node of P11 Q15 Reference 233. However, only P01 was coded with classifications (Table 19).

Table 19

Participant 01 Classification Schema Node Assignments

		Participant 01 Coded References														
NVivo® Node Name	Classification Schema	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
Ability Boundary (BIT)	Cognition Dynamic							R015			R020		R024			
Attention Boundary (BIT)	Cognition Dynamic							R014/15						R025		
Exhaustion Boundary (BIT)	Cognition Dynamic															

		Participant 01 Coded References														
NVivo® Node Name	Classification Schema	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
Goal Congruence Boundary (BIT)	ICAS Flow	R002			R005									R025		
Solution Space Boundary (BIT)	Activity					R011		R014						R025		
Understanding Boundary	Cognition Dynamic	R001/02				R009										
(Environment) EChange	Balancing Dynamic					R011										
(Environment) EComplexity	Balancing Dynamic															
(Environment) EUncertainty	Cognition Dynamic	R001														
(Self-Organization) EKnowledge Centricity	ICAS Flow	R001/02						R014								
(Self-Organization) EMultidimensionality	ICAS Flow							R014								

		Participant 01 Coded References														
NVivo® Node Name	Classification Schema	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
(Self-Organization) EOptimum Complexity	Balancing Dynamic															
(Self-Organization) EShared Purpose	Balancing Dynamic	R001/02				R009								R025	R027	
ICAS Flow (IFlow)	ICAS Flow	R001/02	R003		R005/06/08	R011			R016	R017		R021/22	R024	R025	R027	
Clan Controls	Balancing Dynamic					R009						R022		R025	R026	
Outcome Controls	Balancing Dynamic					R011										
Process Controls	Balancing Dynamic									R017/19			R021		R027	
Ecosystem Framework	Networking Dynamic															
Exchange (KE)	Activity	R002												R025	R026	

NVivo® Node Name	Classification Schema	Participant 01 Coded References														
		Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
Explicit (ExK)	Cognition Dynamic	R001		R004		R011		R015								
Flow Time (KFlowT)	KFlow Dynamic	KFlow Time was absorbed into KFlow Dynamic classification schema with Flow Time attributes representing KFlow duration (Nissen, 2006).														
Flow	KFlow Dynamic	R001/02	R003	R004	R005/06/08	R011		R014/15	R016	R017		R021/22	R024	R025	R026/07	
Networks (KNets)	Networking Dynamic	R001/02			R005/07				R016			R021/22		R025	R027	
Stocks (KStock)	KFlow Dynamic					R011										
Tacit (TaK)	Cognition Dynamic	R002						R014					R024	R025		
Transfer (KT)	Activity	R001	R003/04	R004	R008	R011		R014/05	R016	R017/19	R020		R024		R027	
Work Activity (KWrk)	Activity	R001/02	R003	R004	R005/06	R011		R014	R016					R025		
(OI)Actions	Balancing Dynamic															

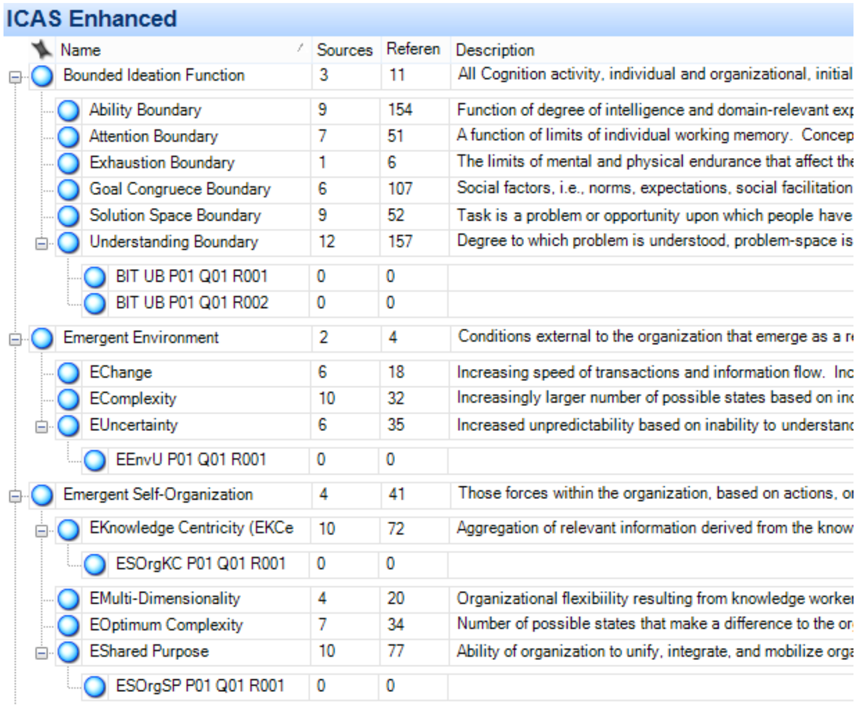
		Participant 01 Coded References														
NVivo® Node Name	Classification Schema	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
(OI)Creativity	Cognitive Dynamic							R014						R025		
(OI)Decisions	Balancing Dynamic															
(OI)Problem Solving	Cognition Dynamic							R014								
Organizational Memory (OM)	Cognition Dynamic					R011		R015								
Cultural Subsystem	Networking Dynamic					R009										R025
Functional Subsystem	Balancing Dynamic	R001			R006					R017						
IS Subsystem	Networking Dynamic	R001/02				R011		R015		R019					R027	
Political Subsystem	Balancing Dynamic					R011										
Social Subsystem	Activity	R002			R005/07			R014						R025		

		Participant 01 Coded References														
NVivo® Node Name	Classification Schema	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
Permeable Boundaries (IBoundary)	Networking Dynamic								R016					R025		
Selectivity (IFilter)	Activity															
(SG)Enabler	Activity					R009		R014	R016			R022/23		R025	R027/27	
(SG)Inhibitor	Activity							R015		R017/19						
(SG)Trigger	Balancing Dynamic					R011		R014					R024	R025	R026	
(SM)Enhancer	Cognition Dynamic					R009/11		R014	R016			R022	R024	R025	R026	
(SM)Process	Cognition Dynamic	R001/02				R009/11		R015		R019	R020	R021/23		R025	R027	
(Sysperanto) Element	No Assignment															
(Syserpanto) Lens (Slice)	No Assignment															

		Participant 01 Coded References														
NVivo® Node Name	Classification Schema	Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12	Q13	Q14	Q15
(Sysperanto) Property	No Assignment															

Figure 20 represents a sample of the NVivo® project ICAS Node coding of Participant 01 references during early third phase selective coding. Figure 22 represents the same snap shot after coding Participant 01 (P01) with ICAS Parent Nodes reconfigured to aggregate Child Node coding. Figure 21 represents the Child Node structure created for a sample of coded references for the first participant's response to each question.

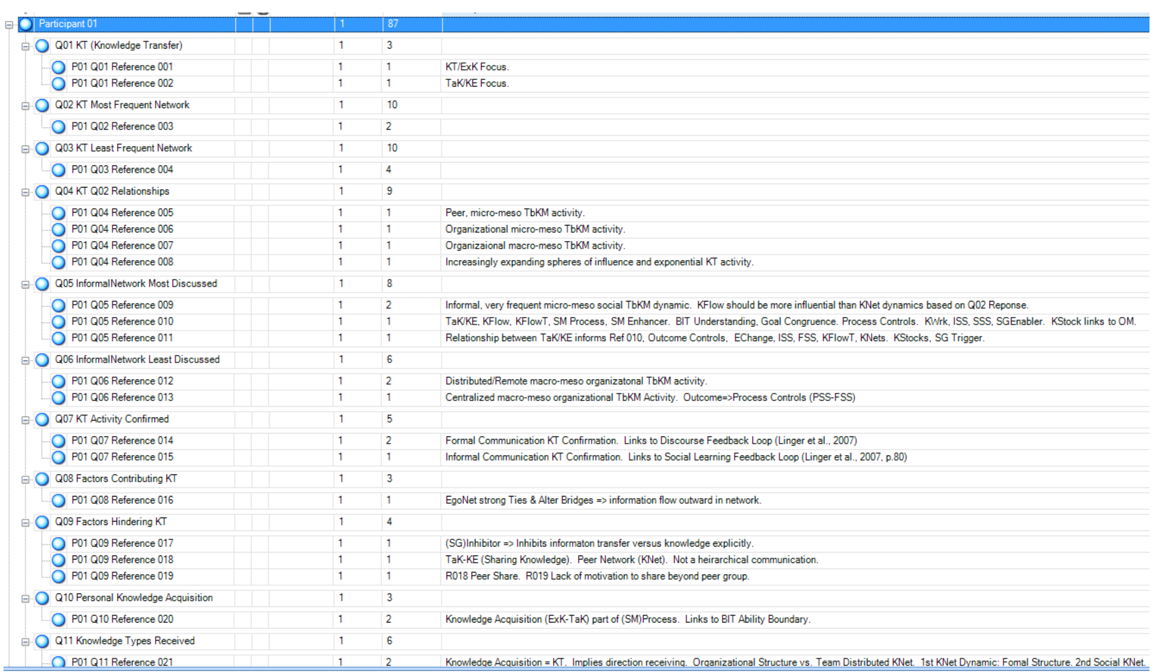
Coding each participant in similar manner with associated Node classification assignments would have created a similar Child Node structure for all participants, with a similar ICAS Childe Node structure illustrated in Figure 22. However, additional coding of participants beyond the first participant was not necessary for current research purposes. An illustrative sample of the resultant ICAS Child Node structures coded for Participant 01 (P01) created the necessary flexibility for final attribute coding (See Figure 22).



ICAS Enhanced

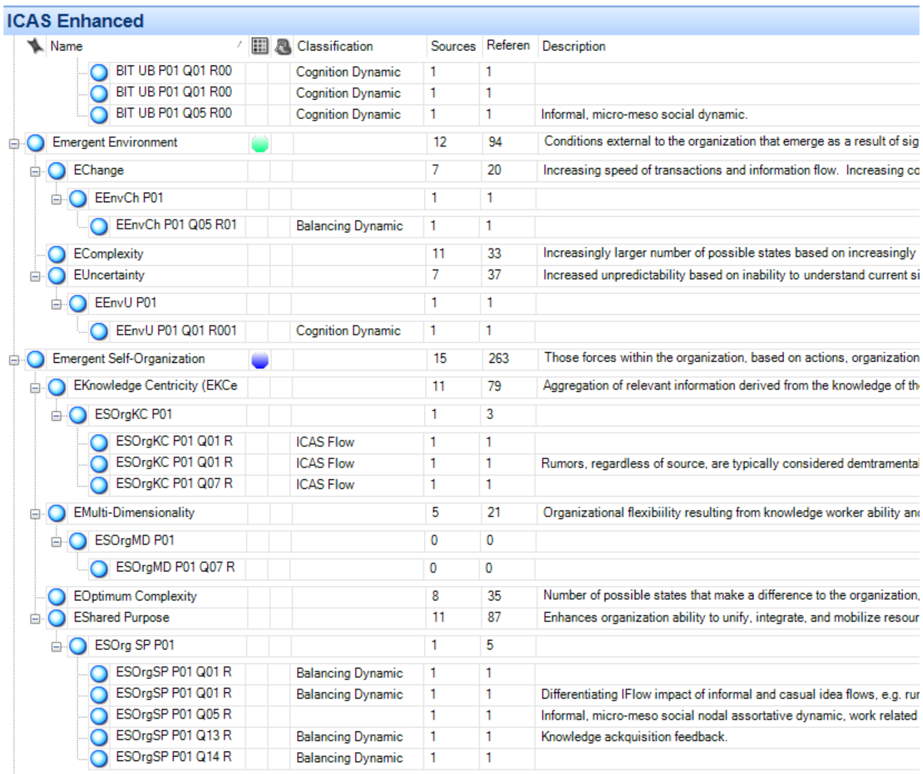
Name	Sources	Referen	Description
Bounded Ideation Function	3	11	All Cognition activity, individual and organizational, initial
Ability Boundary	9	154	Function of degree of intelligence and domain-relevant exp
Attention Boundary	7	51	A function of limits of individual working memory. Concep
Exhaustion Boundary	1	6	The limits of mental and physical endurance that affect the
Goal Congruece Boundary	6	107	Social factors, i.e., norms, expectations, social facilitation
Solution Space Boundary	9	52	Task is a problem or opportunity upon which people have
Understanding Boundary	12	157	Degree to which problem is understood, problem-space is
BIT UB P01 Q01 R001	0	0	
BIT UB P01 Q01 R002	0	0	
Emergent Environment	2	4	Conditions external to the organization that emerge as a r
EChange	6	18	Increasing speed of transactions and information flow. Inc
EComplexity	10	32	Increasingly larger number of possible states based on inc
EUncertainty	6	35	Increased unpredictability based on inability to understanc
EEnvU P01 Q01 R001	0	0	
Emergent Self-Organization	4	41	Those forces within the organization, based on actions, o
EKnowledge Centricity (EKCe	10	72	Aggregation of relevant information derived from the know
ESOrgKC P01 Q01 R001	0	0	
EMulti-Dimensionality	4	20	Organizational flexibiility resulting from knowledge worke
EOptimum Complexity	7	34	Number of possible states that make a difference to the or
EShared Purpose	10	77	Ability of organization to unify, integrate, and mobilize orgá
ESOrgSP P01 Q01 R001	0	0	

Figure 20. NVivo® Participant 01 ICAS node reference coding sample.



Participant 01	1	87	
Q01 KT (Knowledge Transfer)	1	3	
P01 Q01 Reference 001	1	1	KT/ExK Focus.
P01 Q01 Reference 002	1	1	TaK/KE Focus.
Q02 KT Most Frequent Network	1	10	
P01 Q02 Reference 003	1	2	
Q03 KT Least Frequent Network	1	10	
P01 Q03 Reference 004	1	4	
Q04 KT Q02 Relationships	1	9	
P01 Q04 Reference 005	1	1	Peer, micro-meso TbKM activity.
P01 Q04 Reference 006	1	1	Organizational micro-meso TbKM activity.
P01 Q04 Reference 007	1	1	Organizaional macro-meso TbKM activity.
P01 Q04 Reference 008	1	1	Increasingly expanding spheres of influence and exponential KT activity.
Q05 InformalNetwork Most Discussed	1	8	
P01 Q05 Reference 009	1	2	Informal, very frequent micro-meso social TbKM dynamic. KFlow should be more influential than KNet dynamics based on Q02 Reponse.
P01 Q05 Reference 010	1	1	TaK/KE, KFlow, KFlowT, SM Process, SM Enhancer. BIT Understanding, Goal Congruence. Process Controls. KWrk, ISS, SSS, SGEnabler. KStock links to OM.
P01 Q05 Reference 011	1	1	Relationship between TaK/KE informs Ref 010, Outcome Controls, EChange, ISS, FSS, KFlowT, KNets. KStocks, SG Trigger.
Q06 InformalNetwork Least Discussed	1	6	
P01 Q06 Reference 012	1	2	Distributed/Remote macro-meso organizatonal TbKM activity.
P01 Q06 Reference 013	1	1	Centralized macro-meso organizational TbKM Activity. Outcome=>Process Controls (PSS-FSS)
Q07 KT Activity Confirmed	1	5	
P01 Q07 Reference 014	1	2	Formal Communication KT Confirmation. Links to Discourse Feedback Loop (Linger et al., 2007)
P01 Q07 Reference 015	1	1	Informal Communication KT Confirmation. Links to Social Learning Feedback Loop (Linger et al., 2007, p.80)
Q08 Factors Contributing KT	1	3	
P01 Q08 Reference 016	1	1	EgoNet strong Ties & Alter Bridges => information flow outward in network.
Q09 Factors Hindering KT	1	4	
P01 Q09 Reference 017	1	1	(SG)Inhibitor => Inhibits informaton transfer versus knowledge explicitly.
P01 Q09 Reference 018	1	1	TaK-KE (Sharing Knowledge). Peer Network (KNet). Not a heirarchical communication.
P01 Q09 Reference 019	1	1	R018 Peer Share. R019 Lack of motivation to share beyond peer group.
Q10 Personal Knowledge Acquisition	1	3	
P01 Q10 Reference 020	1	2	Knowledge Acquisition (ExK-TaK) part of (SM)Process. Links to BIT Ability Boundary.
Q11 Knowledge Types Received	1	6	
P01 Q11 Reference 021	1	2	Knowledge Acquisition = KT. Implies direction receiving. Organizational Structure vs. Team Distributed KNet. 1st KNet Dynamic: Fomal Structure. 2nd Social KNet.

Figure 21. NVivo® Participant response coded child nodes.



ICAS Enhanced

Name			Classification	Sources	Referen	Description
BIT UB P01 Q01 R00			Cognition Dynamic	1	1	
BIT UB P01 Q01 R00			Cognition Dynamic	1	1	
BIT UB P01 Q05 R00			Cognition Dynamic	1	1	Informal, micro-meso social dynamic.
Emergent Environment				12	94	Conditions external to the organization that emerge as a result of sig
EChange				7	20	Increasing speed of transactions and information flow. Increasing cc
EEnvCh P01				1	1	
EEnvCh P01 Q05 R01			Balancing Dynamic	1	1	
EComplexity				11	33	Increasingly larger number of possible states based on increasingly
EUncertainty				7	37	Increased unpredictability based on inability to understand current si
EEnvU P01				1	1	
EEnvU P01 Q01 R001			Cognition Dynamic	1	1	
Emergent Self-Organization				15	263	Those forces within the organization, based on actions, organization
EKnowledge Centricity (EKCe				11	79	Aggregation of relevant information derived from the knowledge of th
ESOrgKC P01				1	3	
ESOrgKC P01 Q01 R			ICAS Flow	1	1	
ESOrgKC P01 Q01 R			ICAS Flow	1	1	Rumors, regardless of source, are typically considered demtramenta
ESOrgKC P01 Q07 R			ICAS Flow	1	1	
EMulti-Dimensionality				5	21	Organizational flexibility resulting from knowledge worker ability an
ESOrgMD P01				0	0	
ESOrgMD P01 Q07 R				0	0	
EOptimum Complexity				8	35	Number of possible states that make a difference to the organization,
EShared Purpose				11	87	Enhances organization ability to unify, integrate, and mobilize resour
ESOrg SP P01				1	5	
ESOrgSP P01 Q01 R			Balancing Dynamic	1	1	
ESOrgSP P01 Q01 R			Balancing Dynamic	1	1	Differentiating IFlow impact of informal and casual idea flows, e.g. rur
ESOrgSP P01 Q05 R				1	1	Informal, micro-meso social nodal assortative dynamic, work related
ESOrgSP P01 Q13 R			Balancing Dynamic	1	1	Knowledge ackquisition feedback.
ESOrgSP P01 Q14 R			Balancing Dynamic	1	1	

Figure 22. NVivo® final Participant 01 ICAS node reference coding.

During final axial interpretation activities, I focused on the ICAS instance formula creation and exploration. I used NVivo® Matrix Coding Queries and Cluster Analyses to explore the many emergent forces surrounding KE and KT in context to SM and SG, linked to IFlow and KFlow. The SG process was found to more directly embed within KFlow, where SG involves both TaK and ExK (Sharma & Good, 2013), but also includes IFlow activities surrounding KFlow dynamics (Bennet & Bennet, 2004).

Thus, Nissen (2006) considered KFlow a function of a knowledge stock combined with the movement of that stock as a function of TaK–ExK conversion through flow time (KFlowT) and space (reach) via KE or KT, with an emphasis on KT as an information flow mediating knowledge flows (See Figure 7). I shifted emphasis away from KT and coded KFlow in terms of TbKM process, activity, and control actions in context to propagating a knowledge cycle. As a result, I emphasized both KT and KE in context to both TaK and ExK, where ExK became primary information for future SM activity.

KFlow, KFlowT and knowledge explicitness were captured separately via participant reference coding, as a combination of KFlowT Node and KFlow Dynamic attribute values, with degree of explicitness thus distinct between TaK and ExK. I originally perceived this level of differentiation between KFlow and KFlowT as providing greater granularity. Granularity within the ICAS instance represented by NVivo® Matrix Coding Queries created the opportunity to capture specific correlations between Node, Classification schema attribute value, and participant responses, both individually and in aggregate that provided unique perspectives, i.e., ICAS instance slices. Slice interpretations are discussed in greater detail in my findings.

In summary, I began axial coding with a foundational set of 57 ICAS Nodes coded to foundational research, 180 participant Case Nodes, a conceptual framework for Classification schemas, and an awareness of emerging metaphors and requirements to create links I could model within an NVivo® project. Early axial coding activities included formalizing a set of NVivo® Classification schemas that provided visualizations of IFlow dynamics in the form of NVivo® compound coding queries. These visualizations, discussed in detail in my findings, enhanced my understanding of IFlow surrounding KWrk and ICAS social networking dynamics within KNets, KFlows, and IFlows. The resultant ICAS metaphor was captured in the ICAS IFlow formula ($f(ICAS\ Flow)$).

As relationship types were added to the ICAS instance constructs, I conceptualized the ICAS Instance formula ($f(ICAS\ Slice)$) representing a unique perspective of the ICAS organization at any given moment in time. The anticipated potential of the Sysperanto slice to capture unique ICAS characteristic relationships became a visual reality during axial coding. The result was an enhanced set of metaphors as a foundation for further conceptualizing various ICAS dynamics, ICAS dynamics mostly unseen by individual participant yet significantly interwoven with their perceptions of TbKM activities. In the next phase, selective coding, I expanded visualizations of these often hidden micro- and macrolevel ICAS emergent forces.

NVivo® Visualizations: Third Phase Selective Coding

I used second phase interpretations as input into third phase selective coding. Selective coding focused on pattern analysis. Pattern analysis evolved pattern generalizations that extended “theoretical design insights” (Nissen, 2006, p. 237). Pattern analysis within an NVivo® project includes matrix coding queries to identify new “higher order concepts” (Hutchison et al., 2010, p. 295; Bazeley & Jackson, 2013). The equivalent of higher order concepts represent final enhanced ICAS metaphors capturing new insights based on multiple unique perspectives of the same phenomenon, i.e., the ICAS instance (Birks et al., 2013; Kozlowski & Chao, 2012; Wagner et al., 2010).

I accomplished “triangulation through second-order [phase] analysis [that] included multidimensional [multi-Node] classification and visualization of dynamic knowledge using … patterns … and an augmented case description [NVivo® memos]” (Nissen, 2006, p. 237). I designed third phase coding to focus on patterns to provide unique insights into organizational ICAS characteristics and emergent behaviors (Boxenbaum & Rouleau, 2011; Hutchison et al., 2010; Walker et al., 2013).

I accomplished third-phase triangulation using second phase triangulation as a guiding framework. For third phase triangulation, I replaced second-phase multidimensional Node classifications with third-phase patterns generated by multiple views of the ICAS instance in relation to a single participant's perspective, as well as multiple perspectives concurrently, evaluating each in relation to participant's original research context. As a result, maintaining grounded theory coding rigor provided the requisite foundation for addressing the two primary research questions (Birks et al., 2013; Nissen, 2006).

To explore ICAS dynamics, visualized through an enhanced ICAS framework, I triangulated metaphor discoveries from phase two coded participant observations with two primary theoretical foundations that included:

1. The SM gap and SG dimension themes representing perceived SM—SG activity as both group and individual process where SM and SG dynamically interwoven activities were visualized such that SG could not occur explicitly independent of SM (Maitlis & Lawrence, 2007; Sharma & Good, 2013).
2. The dynamic knowledge visualization and resultant KFlow propositional model where organizational performance was directly related to knowledge flow dynamics (Nissen, 2006).

I began selective coding with a focus on organizational SG (Sharma & Good, 2013; Smerek, 2011; Weick, 2012). Subsequently, I shifted focus to dynamic knowledge patterns in relation to organizational performance, most effectively captured within OI dynamics (Bennet & Bennet, 2004; Nissen, 2006). I concluded selective coding by focusing ICAS instance slices on ICAS balancing dynamics (Bennet & Bennet, 2004; Nissen, 2006).

Through preliminary slice interpretations from second phase coding, I correlated KFlow, in context to a knowledge cycle involving TaK and ExK, to the emergent process of SG as a focal point directly within specific organizational TbKM activity, e.g. mentoring, team work, inspection, assignment, evaluation, and training. Concurrently, I linked TbKM activity (KWrk) to specific IFlow, including emergent change (EChange). Slice interpretations thus provided insights that began to address prior research unknowns with additional clarity. Prior to ICAS instance slice interpretations, Maitlis and Lawrence (2007) identified several remaining unknowns surrounding SG (SG):

> We know little, however, about the conditions associated with SG in organizations—where, when, or why it occurs—despite the fundamental nature of these issues... Even less is known about the conditions that might facilitate SG by those stakeholders and leaders motivated to engage in it….Though this work suggests the importance of organizational change as a trigger for leader SG, these studies report only one or a few case studies. They cannot therefore establish this relationship with any certainty, examine whether *change* [emphasis added] might be part of a larger class of triggers, or reveal other possible triggers of leader SG. Similarly, although studies of stakeholder SG suggest that it may occur when stakeholders have an issue they wish to sell or an interpretation of events they

> want to legitimize…, previous research designs leave largely unaddressed the triggers of stakeholder SG. (2007, pp. 57-59)

Maitlis & Lawrence (2007) designed their case study methodology leveraging the power of grounded theory coding to address these unknowns. A series of second-order themes were aggregated into three dimensions representing the stakeholder SG process as a perception or anticipation of a SM gap, a discursive ability, and a series of SG process facilitators (Maitlis & Lawrence, 2007). However, specific understandings surrounding systemic dynamics that create reinforcing loops during change events could not be visualized and required further research (Maitlis & Lawrence, 2007; Sharma & Good, 2013).

Subsequently, with ICAS instance visualizations, I found clearly defined organizational structures to be fundamentally linked to organizational ICAS dynamic processes necessary to provide optimum SG opportunity (Minbaeva et al., 2012; Ramezan, 2011). Four key SG capacities bounded by organizational structure include

- capacity for reflexivity at leadership level;
- integrative complexity and emotional complexity at the micro-meso social level emphasizing leadership capacity; and
- behavioral complexity at an individual cognitive level, but only in context to direct leadership action (Sharma & Good, 2013).

Thus, organizational structures represent one additional type of SG trigger (Maitlis & Lawrence, 2007). However, both structure and dynamic processes, e.g., reinforcing feedback loops as an additional and fundamental SG trigger, are necessary to create meaningful SG between managers and team members, as well as team member and larger organizational context (Boisot & Sanchez, 2010; Sharma & Good, 2013; Tortoriello et al., 2012).

Yet, specific ICAS dynamics creating reinforcing loops surrounding such an ICAS SM–SG framework remain undiscovered (Sharma & Good, 2013; Smerek, 2011; Weick, 2012). Behavioral complexity has been linked directly to ideation activity, both individually and within a micro-meso social dynamic that includes TbKM KWrk (Briggs & Reinig, 2010; Kozlowski & Chao, 2012). Behavioral complexity in relation to cognitive activity could thus be interpreted as a dynamic process linked to surrounding ICAS emergent forces (Bennet & Bennet, 2004; Weick, 2012).

The construct of structure and dynamic process can be visualized akin to the paradoxical relationship between knowledge itself as tacit or explicit, represented as object and flow, both existing as a flux continuum within a complex TaK–ExK–KT–KE evolutionary spiral of cognitive activity (Briggs & Reinig, 2010; Nonaka & Takeuchi, 1995; Nissen, 2006). Understanding any ICAS-related paradox requires multiple concurrent perspectives of an ICAS instance to capture the many varied, distinct, and yet interwoven emergent and organizationally structured KWrk dynamics (Bennet & Bennet, 2004; Chae et al., 2005; Linger et al., 2007).

I then explored a single participant response to TaK, ExK, and KFlow with multiple coded references. I queried assigned social networking classification attributes specific to KNet dynamics, effectively capturing more explicit micro-meso social contexts for both SM process and SG process. I accomplished this using NVivo® Matrix

Coding as well as Cluster Analyses visualizations. The resultant ICAS IFlow–KFlow patterns related SG–SM patterns in relation to KNet dynamics that included specific KFlow characteristics.

Engaging in the exchange of knowledge through individual and group behaviors in relation to both SM and SM has been interpreted as a function of clan controls, but requires opportunity (Flaherty & Pappas, 2012; Sharma & Good, 2013; Turner & Makhija, 2006). Leaders should make these opportunities available within a complex social networking dynamic where meaningful tensions exist between organizational goals and leader needs (Ahuja et al., 2012; Kozlowski & Chao, 2012; Sharma & Good, 2013; Taylor, 2013). And, in the small group setting, balancing tensions requires appropriate clan controls formed as part of group norming behaviors (Ahuja et al., 2012; Kozlowski & Chao, 2012; Sharma & Good, 2013; Turner & Makhija, 2006).

A primary condition to enable leader SG was the “performance of the organization in an *issue domain* [emphasis added]” (Maitlis & Lawrence, 2007, p. 73). Leaders were provided an acceptable foundation for engaging in SG exclusively during periods of strong organizational performance (Maitlis & Lawrence, 2007). However, influencing organizational dynamics surrounding SG as an issue domain required deeper insights into organizational change dynamics in relation to organizational performance characteristics (Maitlis & Lawrence, 2007; Sharma & Good, 2013). Broader organizational performance characteristics inherently include OI comprised of right decisions, creativity, optimum problem solving, and right actions (Bennet & Bennet, 2004; Nissen, 2006).

However, OI in context to leader-member SG–SM process is a series of concurrent micro-meso social member-member and macro-meso organization-member SG–SM processes (Sharma & Good, 2013). Organizational intelligence also includes complex and emergent micro- and macro-meso social interactions (Ahuja et al., 2012; Kozlowski & Chao, 2012; Sharma & Good, 2013; Smerek, 2011). And, it is these complex and emergent interactions woven into reinforcing feedback loops that remain ambiguous, undiscussed, and/or not clearly defined (Ahuja et al., 2012; Kozlowski & Chao, 2012; Sharma & Good, 2013; Smerek, 2011).

I found ICAS instance patterns created the requisite additional clarity necessary to begin exploring ICAS reinforcing feedback loops. Understanding reinforcing feedback loops should include systems dynamics to capture the many concurrent and complex processes in context to SM‒SG activities in any given ICAS instance (Argote, 2012; Kozlowski & Chao, 2012; Linger et al., 2007; Maitlis & Lawrence, 2007). As patterns emerged, key ICAS emergent forces and dynamics became more clearly visible in relation to specific ICAS Node relationships.

I thus coded IFlow to participant responses to capture macro-meso organizational behaviors and characteristics associated with TbKM activity. Each emergent characteristic and force relates to organizational performance in context to SG-SM, individually and collectively, concurrently as separate processes and as a collective process. I ran a series of multiple queries to verify an ICAS instance, based on other ICAS dynamics involved in SM at any point in time.

One query captured coded SM and SG as separate nodes, and a second captured SG nested within TbKM activity, as part of the SM process. Although SG is an integral dynamic contributing to SM, viewing SG from multiple perspectives, i.e., through multiple ICAS lenses, I discovered many new insights into the SG dynamic in relation to multiple levels of ICAS activity.

I found that the type of IFlow dynamic frames the context of organizational performance, shaping the SG-SM dynamic through emergent ICAS selectivity, IFilter. The context of organizational performance, i.e., OI, within an ICAS instance was found to be a function of SG and SM activities around specific cultural norms and social behaviors governed by clan controls in relation to specific group knowledge-work, i.e., TbKM activity. With NVivo® modeling of captured enhanced ICAS Node relationships, I captured more meaningful insights into ICAS organizational influencing dynamics inherent in reinforcing feedback loops surrounding the SM-SG process.

Concurrently, various types of TbKM activities were seen to directly link specific micro-meso social dynamics to creating or triggering knowledge in flux over time as a function of flow time, life cycle stage (create, share, apply), reach, and explicitness of knowledge (TaK => ExK) (Nissen, 2006). I coded knowledge networking dynamics at Node KNets in terms of process, activity, or control action classification values in relation to propagating a knowledge cycle over time (KFlowT), also represented by a unique set of classification attributes.

KFlowT and explicitness were captured separately, with explicitness broken out between TaK and ExK. In essence, KFlowT and KFlow captured knowledge cycle characteristics using the KFlow dynamic classification values. Concurrently, coded knowledge network dynamics (Node KNets) representing micro- and macro-meso social behaviors captured additional influencing organizational dynamics. Nissen (2006) recognized inherent limitations when classifying knowledge flow dynamics as well as creating any resultant knowledge visualization (See Figure 7):

> We admit to the relative crudeness of this classification table [first-order analysis of stocks and flows]. For instance, each knowledge flow was inherently dynamic, yet the table representation itself is static. The four, dimensional constructs used for classification [flow time, explicitness, reach, and life cycle] are quite coarse, with discrete categories employed to represent continuously changing dynamic phenomena…. this visualization is also admittedly crude. It depicts *statically* [emphasis added] knowledge flows that were inherently *dynamic* [emphasis added]. And it fails to capture *dynamic interactions* [emphasis added] between the different knowledge flows and stocks identified in our discussion above. [However,] it enables multidimensional visualization of *ten* [emphasis added] diverse knowledge flows identified in the field [see Figure 7]. (pp. 244-246)

Knowledge was conceptualized as an organizational activity enhancing organizational performance and improving operational effectiveness (Nissen, 2006). To begin enhancing understanding of dynamic interactions between various knowledge flows and stocks, I considered the ideation solution space boundary, a continuum between simple, clearly defined and understood tasks to extremely complex and wicked tasks that are not clearly defined, difficult to understand, and typically include ambiguously defined outcomes (Briggs & Reinig, 2010).

All knowledge-based activity within a TbKM activity subsystem involves knowledge, by definition (Argote, 2012; Bennet & Bennet, 2004; Linger et al., 2007). I found organizational dynamic interactions in this context most effectively captured by linking IFlow dynamics to KFlow dynamics. Cognitive activities surrounding ideation are both individual and involve micro-meso social SM–SG dynamics (Ahuja et al., 2012; Briggs & Reinig, 2010; Kozlowski & Chao, 2012; Weick, 2012).

By capturing new insights regarding IFlow dynamics in relation to KNet dynamics, I found there were significantly greater than ten knowledge flows. For example, certain knowledge-based activities within a micro-meso, socially-connected, and complex knowledge network were found to generate organizational knowledge flows expressly for a) governance and control, b) knowledge network dynamic reconfiguration, c) ICAS organizational balancing, and d) enhanced macro-meso SG-SM. Yet, these represented but a subset of ICAS organizational knowledge flows typically in force during an ICAS instance.

Each type of KFlow has unique trigger dynamics and focal point for force origin. Nissen (2006) identified one type of governance and control KFlow, the command KFlow as one of ten observed knowledge flows. There are others at lesser macro-meso and micro-meso organizational context. Within a micro-meso TbKM control dynamic, clan controls (Turner & Makhija, 2006) can be separated from IBoundary micro-meso and macro-meso organizational controls, i.e., process and outcome controls (Flaherty &

Pappas, 2012). When this additional visibility becomes available, additional governance and control KFlow types emerge.

To illustrate, certain IFlow dynamics were visualized as triggers for specific KFlows resulting from SM‒SG gaps when ICAS organizational balancing involves shifting organizational priorities or load balancing available resources. Shifts in organizational structures trigger KFlow with force focus specifically to change cultural and social dynamics, norms, and behaviors within complex social and cultural subsystem dynamics (Tortoriello et al., 2012; van Wijk et al., 2012). In this context, *all* knowledge flows represented should pass through ICAS permeable boundaries (IBoundary). When this occurs, ICAS selectivity (IFilter) emerges as a KFlow–IFlow bridging mechanism.

As a result, certain KFlows require organizations establish unique characteristics for both ICAS IBoundary and IFilter optimum complexity, concurrently requiring unique organizational control configurations (Ahuja et al., 2012; Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Turner & Makhija, 2006). Creating separate Child Nodes for each control mechanism (CM)—Outcome (Node CMO), Process (Node CMP), and Clan (Node CMC)—provided opportunity to capture specific organizational balancing dynamics unique to specific organizational, leader, and knowledge worker need for each control (Bennet & Bennet, 2004; Turner & Makhija, 2006).

I enhanced the ICAS balancing dynamic (Bennet & Bennet, 2004) with an additional balancing focal point, i.e., the micro-meso TbKM knowledge needs (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012). Control dynamics were linked to networking dynamics at Node IBoundary and TbKM activity dynamics at Node IFilter.

By applying Networking Dynamic classification schema to both KNets and IBoundary, I was able to correlate micro-meso knowledge network dynamics with ICAS macro-meso knowledge network dynamics. Each unique Networking Dynamic unique networking attribute could be applied to each coded reference at multiple Nodes, including TbKM foundational activity. Consequently, KNet and IBoundary forces were uniquely visualized for interpretation separately and collectively in relation to IFilter dynamics.

As each coded reference represents some aspect of knowledge work, Node TbKM was always coded with NVivo® Classification Activity attributes. Classification schema Activity attributes were also applied to Node IFilter, as ICAS filtering activity occurs concurrently at the individual level and micro-meso social level (Bennet & Bennet, 2004; Briggs & Reinig, 2010; Kozlowski & Chao, 2012). Activity classification attributes were not limited to TbKM activity, but were created to capture varying levels and types of ICAS emergent activity. As a consequence, I was able to capture individual and macro-meso KWrk activity dynamics more effectively within ICAS Instance visualizations.

Under conditions of rapid change, conflicting KFlows may create unique ICAS tensions. By viewing multiple perspectives of an ICAS instance, emergence of countervailing and reinforcing feedback loops become more clearly understood in terms of ICAS emergent force focal points, IFlow shapes and ICAS tensions. Coding individual responses to begin to frame ICAS instance dynamics was problematic, as a single individual response, i.e., a single interview question answer, generated multiple coded references, in some cases uniquely representing unique ICAS perspective(s) and characteristics. The result was 50-200 unique ICAS coded attributes spanning approximately 5-10 ICAS Nodes per coded reference.

Therefore, I coded only the most visible Node classification attributes triangulated to original themes and participant responses. This coding activity provided significant additional insight into ICAS organizational dynamics (Birks et al., 2013; Denk et al., 2012; Fielding, 2012). The result was multiple perspectives, i.e., classification attributes for the same classification schema applied to multiple Nodes for one coded participant response. Such meaningful complexity effectively provided opportunity for concurrent analysis of individual, micro-meso, and macro-meso social TbKM dynamics in relation to one or more ICAS emergent forces.

For example, an ICAS emergent tension could be reflected as a knowledge worker need as well as a micro-meso TbKM need while concurrently an organizational need at a macro-meso TbKM level. Classifying the same reference to both a) clan control as a knowledge worker need, and b) process or outcome control as an organizational need, was accomplished by assigning attributes from the Balancing Dynamic classification schema to each control uniquely for specific participant coded responses.

In summary, complex patterns involving more than five to seven views concurrently, selected from a potential multimillion set of possible ICAS views, began to saturate cognitive ability. All views during selective coding were represented by the ICAS formula that contained a minimum of the three foundational Nodes involving ICAS IFlow, KFlow, and TbKM activity (KWrk). These three Nodes alone provided sufficient complexity for analysis and interpretation. However, additional Nodes were applied to each view appropriately to isolate key dynamics and relationships based on the three foundational Node dynamics. Insights gained from several of the collective pattern representations discovered during third-phase coding are discussed at length in my findings.

Member Checking

Deville (2012) originally “validated accurate transcription, capture of observations, and meaningful preliminary analyses” (Deville, 2012, p. 74). Participants were provided opportunity to review their responses as well as coded transcripts (Deville, 2012). Deville confirmed participant’s “transcribed responses and analyses were valid and accurate” (Deville, 2012, p. 74). I provided additional member checking equivalent activity by confirming my findings resonated with original participant’s perceptions and original interpretations (Houghton et al., 2013). Deville interpreted participant’s perceptions of KT dynamics in terms of themes and patterns (2012, pp. 85-92).

Appropriately, Deville (2012) followed a sound phenomenological research methodology by providing extensive member quotations as representative or illustrative of specific themes and/or patterns (Gioia et al., 2013). I used these captured representative quotations to accomplish an equivalent member checking activity for current research ICAS patterns and visualizations (Chang et al., 2013; Gioia et al., 2013). With a hybrid hermeneutical phenomenological study with grounded theory coding, coupled with source QIMS integral to first phase coding, I also captured representative quotations from scholarly sources representing key theoretical foundations.

Bracketing

SM as a conception of reality and perceptions of that same reality are intricately interwoven (Boxenbaum & Rouleau, 2011; Snowden, 2002; Weick, 2012). Bracketing my presuppositions regarding the emergent nature of organizational ICAS activities allowed me to set aside my personal reality of participant experiences (Chang et al., 2013). As a result, a detached focus allowed my SM to be framed within each participant's perception of their KT phenomenon. As such, a spiraling hermeneutic took place between researcher and each participant until I found a place of sensible meaning (Laverty, 2003). This evolving dialogue required significant energy and time bridge my SM activities with participant transcript, both written and audio, to visualize each participant's unique KT SM.

A double-hermeneutical bricolage evolved between researcher, participant, original organizational context, original researcher, and current research context where I was immersed as an active participant (perception) in the original organizational context (concept); yet, I maintained detachment from my prior presuppositions (Boxenbaum & Rouleau, 2011; Tufford & Newman, 2012). This took place with each participant's perception of KT reality within their original organizational setting within a single organizational context.

My understanding of original organizational context and ICAS dynamics evolved during three phases of coding and analysis. This iterative spiral or evolutionary understanding positively enhanced my SM activity (Birks et al., 2013; Denk et al., 2012; Wagner et al., 2010). The result was enhanced metaphor interpretation of several emergent ICAS dynamics, forces, and characteristic relationships (Birks et al., 2013; Boxenbaum & Rouleau, 2011).

In essence, first phase open coding and analysis framed an initial context to explore the practical elements of this SM process as a researcher. Discovering a place of SM origin provided SM and SG between researcher and participant to spiral towards a shared understanding, or place of sensible meaning (Laverty, 2003; Weick, 2012). This SM origin took the form of asynchronous dialogue with historical participants via NVivo® queries and created an inherent degree of appropriate bridge between my perceptions of ICAS reality and participant perceptions of KT (Bazeley & Jackson, 2013; Hutchison et al., 2010).

As an asynchronous bricolage, I had greater opportunities for reflection, where additional reflexive activity required careful attention to meaningful bracketing (Boxenbaum & Rouleau, 2011; Chang et al., 2013; Walker et al., 2013). I allowed the bricolage experience to frame new metaphor meanings that were informed by prior theoretical and personally experiential understandings of ICAS emergent activities. However, evolving metaphor meanings were not framed or bounded by these same personal experiences, theoretical foundations, and research outcome expectations (Birks et al., 2013; Wagner et al., 2010).

NVivo® Node creation and NVivo® Classification schema development with subsequent second phase attribute coding to specific content within participant responses was cognitively demanding and required significant time set aside specifically for reflection. As a result, there was considerable opportunity for reflexive activity to allow bias towards pre-conceived expectations (Elliot et al., 2012; Walker et al., 2013). Prior expectations included the researcher's existing SM process where prior SG activity, i.e. eight years of KM research, created a mental model of subject matter content, in terms of SM application to current research subject's responses.

To avoid potential outcome bias during reflexive activity, I developed a field journal using NVivo® memos (Hutchison et al., 2010; Wagner et al., 2010; Walker et al., 2013). Continuous time-stamped entries created very explicitly captured definitions of NVivo® Nodes along with rationale for structuring those Nodes, as well as subsequent restructuring rationale (Gioia et al., 2013). NVivo® Memos were created for each primary research theoretical framework, capturing observations in context to Node definition, child node tree structuring, classification schema definitions, and coding outcomes (Gioia et al., 2013; Walker et al., 2013).

The resultant NVivo® field journal provided the necessary frame of reference to maintain desired bracketing while allowing for double-hermeneutic SM of shared understanding with new research insight (Bazeley & Jackson, 2013; Feldman & Orlikowski, 2010; Weick, 2012). I found that bracketing constructs, in essence, should be coded in the NVivo® project by design. This includes planning for careful and consistent documenting of Node definition, structure, restructuring, NVivo® Classification design, and attribute interpretation for all participant response coding (Bazeley & Jackson, 2013; Chang et al., 2013; Hutchison et al., 2010). Every facet of NVivo® project evolution, from initial set up design choices to final participant response coding resulted in journaling activity, whether in NVivo® memo or documented directly in research results.

Findings

Within the original two research questions are embedded several primary concepts surrounding emergent ICAS organizational dynamics. The first question focused on exploring seminal research on knowledge life cycles and knowledge dynamics within an organizational context. I found historical foundations significantly influenced enhanced understanding of ICAS knowledge dynamics. My expectation is that all historical and seminal knowledge management theory should find touch points within an enhanced ICAS knowledge ecosystem.

The second research question focused very specifically on key theoretical foundations from an inter-disciplinary perspective that collectively might inform enhanced ICAS KM framework design. I layered and synthesized new insights and understandings from contemporary research into historical foundations to frame an enhanced perspective of ICAS organizational dynamics. The outcome of both questions was focused on discovering new insight into emergent ICAS forces, in terms of both shape and influence as well as focal point(s) within various emergent ICAS dynamics.

I anticipated new insights specifically in terms of emergent ICAS force focal point(s). New ICAS force insights should provide management additional opportunities to better shape and frame emergent ICAS dynamics within a learning organization. With this overarching research objective in mind, I set out to explore contemporary and historical theoretical foundations that might enhance understanding of foundational ICAS KM ecosystem dynamics (See Figure1 and Figure 2) (Bennet & Bennet, 2004; Linger et al., 2007).

I explored both sets of research question concepts within a set of an enhanced ICAS KM ecosystem set of metaphors (See Figure 5, Table 1, and Table 19) that included

- IFlow dynamics linked to micro- and macro-meso TbKM activity subsystem dynamics (Ahuja et al., 2010; Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Linger et al., 2007);
- KFlow dynamics in relation to various organizational control mechanisms that included process, outcome, and clan controls (Ahuja et al., 2012; Boisot & Sanchez, 2010; Flaherty & Pappas, 2012; Lipparini et al., 2013; Nissen, 2006; Turner & Makhija, 2006);
- Organizational control mechanisms in relation to IFlow dynamics, specifically in terms of IFlow influencing or establishing TbKM activity system ICAS IBoundary and an emergent ICAS IFilter (Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Kozlowski & Chao, 2012; Linger et al., 2007; Turner & Makhija, 2006);
- IFilter and IBoundary dynamics linking and/or isolating key organizational SG–SM dynamics within a micro-TbKM activity subsystem (TbKM KWrk), embedded within macro-meso organizational units, i.e., macro-TbKM activity subsystems (Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Kozlowski & Chao, 2012; Linger et al., 2007; Maitlis & Lawrence, 2007; Weick, 2012);
- organizational intelligence as a function of organizational performance linking ICAS emergent activities and behaviors, i.e., creativity, problem solving, right

decisions, and right actions, to individual and micro-meso ideation dynamics (Bennet & Bennet, 2004; Briggs & Reinig, 2010; Linger et al., 2007; Nissen, 2006); and

- emergent organizational subsystem dynamics linking organizational memory (OM) as both object and flow to IFlows specifically in context to shaping or influencing, or being shaped or influenced by, emergent (informal social) and structured (formal organizational) KNet dynamics (Ahuja et al., 2012; Boisot & Sanchez, 2010; Hatch & Cunliffe, 2012; Jackson, 2012; Soda & Zaheer, 2012; Taylor, 2013).

Associated with the two primary research questions were a series of six interview dialogs, with an initiating question for each dialog space. The original design was to include live participants in the dialog spaces. This design was modified by necessity to link interview question dialog spaces to historical participant dialogs, as there were no live interview subjects.

Within my original design, the first three interview questions focused explicitly on participant's understanding of a) knowledge in general, b) organizational knowledge specifically, and c) subsequently their intentional knowledge-creating and knowledge-sharing activities. The next two interview questions focused on broader organizational dynamics surrounding knowledge creation and sharing, individually and organizationally. The last interview question was designed to seek deeper insight into knowledge flow triggers, enablers, and inhibitors in context to larger emergent organizational flows, i.e., IFlow dynamics.

To maintain original design integrity, I intentionally researched hybrid methodology designs that would provide the necessary framework to maintain live participant interview dialog integrity within historical participant responses. This critical methodology objective was essential for maintaining the quintessential bricolage necessary to understand original participant perceptions of ICAS organizational dynamics. Original participant perceptions were translated into specific Node coding. I could then interpret perceptions more appropriately as metaphors (Brinks et al., 2013; Boxenbaum & Rouleau, 2011; Wagner et al., 2010).

I found during continuous review of original participant transcripts (Deville, 2012), then listening to participant audio files, then listening and reading concurrently, that a balance between bracketing and immersion evolved in a meaningful double-hermeneutic as I then linked each to original researcher field notes for each participant response (Boxenbaum & Rouleau, 2011; Wagner et al., 2010).

As a result, I discovered Deville's (2012) original participant questions OQ1-OQ7 effectively captured a meaningful equivalent set of concepts relating to my first three current interview questions, CQ1-CQ3. Likewise, the remaining set of original research participant questions OQ8-OQ15 effectively captured meaningfully equivalent concepts relating to my last three interview questions, CQ4-CQ6. Explicitly lacking in the majority of original research participant responses to Q8-Q15 was their perceptions of the broader ICAS emergent organizational dynamics at play around their individual and organizational knowledge transfer activities.

Deville (2012) focused on a specific subset of ICAS organizational activities, specifically the KT activity within a micro-meso social organizational network. I focused on broader ICAS emergent dynamics surrounding specific organizational knowledge-work activities that included KE and KT activity within a KT–KE dynamic. What I found implicitly within original participant responses, explicitly in a few, were key indicators that provided opportunities to link their individual perceptions of knowledge activity to broader ICAS organizational dynamics. However, to further interpret these indicators, I needed accurate and specific correlations, and I needed to use the most appropriate correlation measure.

NVivo® Visualizations: Correlation Coefficients

Even though statistical coefficients are not independently significant when interpreting NVivo® Node Analyses visualizations, I wanted to ensure I was encoding the most meaningful statistical coefficient for validating coding integrity as well as ensure interpretations had the highest degree of accuracy for the type of data being analyzed (Bazeley & Jackson, 2013; Choi, Cha, & Tappert, 2010). I compared Pearson product-moment correlation coefficient to Jaccard's similarity coefficient and Sørenson's index coefficient, derived from the three correlation formulas available within an NVivo® Node Cluster Analysis (Bazeley & Jackson, 2013).

Jaccard's similarity index most meaningfully measures distance from central cluster based on the union of two vectors representing two ICAS Nodes, and was found most relevant when measuring variable distance (Lin, Hao, Changsheng, & Wei, 2014; Choi et al., 2010). As such, Jaccard's similarity index with a value range $0 \leq r \leq 1$ has been considered a non-correlational measure (Choi et al., 2010). Sørenson's index, another binary distance measure and Cosine-based, was also considered a non-correlational measure (Choi et al., 2010).

Pearson correlation, however, was found to measure the highest degree of correlation when considering negative matches, significant for determining both positive and negative tensions within an ICAS emergent dynamic. Pearson's phi-like coefficients measure linear dependence within a $-1 \leq p \leq +1$ range, where $p = +1$ represents a strong positive correlation, and $p = -1$ a strong negative or inverse correlation (Choi et al., 2010). The most meaningful coefficient for interpreting ICAS Node relationship in terms of Node cluster to Node vector distance and tension strength can be represented by Pearson product-moment correlations (Choi et al., 2010). I therefore selected Pearson product-moment correlation coefficient measures for all NVivo® Node Cluster analyses in all phases of analysis and interpretation.

ICAS Metaphor Visualizations

Findings represented here are a representative subset of total findings. Visualizations representing the enhanced organizational ICAS framework as Node patterns, i.e., the ICAS instance formula ($f(ICAS\ Slice)$), is extremely complex (See Figure 19). Consequently, meaningful representations of ICAS emergent dynamics could be portrayed within multimillion possible pattern set generated by the ICAS instance formula. It is quite simply beyond time feasibility to expound on all discovered findings within the current research project. None the less, the representative subset of total findings should sufficiently demonstrate the potential value-add of integrating interdisciplinary theory into an enhanced framework representing ICAS organizational dynamics and emergent behaviors.

The initial challenge was identifying a beginning point where the most unique and salient revelations became meaningful conceptualizations, and subsequently visualized as understandings (Gioia et al., 2013; Weick, 2012). The key was finding the point at which a particular concept cue became framed to establish a meaningful predicate for any given specific ICAS emergent dynamic (Kozlowski & Chao, 2012; Weick, 2012). The resultant challenge was many cues being framed concurrently across many patterns representing multiple emergent and designed ICAS organizational dynamics. The difficulty involved, even with detailed field notes, separating and isolating SM cues specifically emergent within coding phases and subsequently during analysis to meaningfully represent a reasonable origin point for discussion.

The earliest points of cue origin, in this context, occurred during initial and subsequent review of original participant responses, both in audio and transcript format, in essence adding thingness to the proposed workflow enhanced ICAS KM framework (Heidegger, 2006; Wagner et al., 2010). These earliest cues occurred concurrently during ICAS Node design within the NVivo® project, within first phase open coding (Gioia et al., 2013; Ongstad, 2014). Deville (2012) focused on organizational KT activity within a social networking activity. Earliest cues were formed during analysis of participant responses and Deville’s original field notes and interpretations surrounding knowledge transfer within socially complex and networked relationships.

Therefore, I began visualizing my findings in this same context, within the KT–KE dynamic. I began by cognitively visualizing the KT–KE dynamic connection to KFlow in relation to individual and micro-meso social KNets (Ahuja et al., 2012; Boisot & Sanchez, 2010; Kozlowski & Chao, 2012). I envisioned the resultant KNet dynamic would require KFlow within IFlow through an IBoundary to fully engage the social dynamics within the KNET at an organizational level (Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Linger et al., 2007).

An additional challenge was finding meaningful theoretical foundations to describe all visualized dynamics within a cohesive and theoretically sound framework, even for a reduced subset of ICAS Node relationships representing the KT–KE dynamic. Research remains collectively weak in one sense, and exhaustively comprehensive in another, in this context. Research remains weak in relation to comprehensive ICAS emergence while fairly comprehensive in relation to specific and isolated emergent ICAS activity, within specific organizational contexts. My analysis and interpretation quest began with discovering the most meaningful research touch points to construct a grounded analysis and interpretation platform for enhancing the ICAS theoretical foundation.

Theoretical foundations from exhaustive literature review provided a conceptually enhanced organizational ICAS framework (See Figure 5). However, specific ICAS mechanisms required very specific coding schemas (Bazeley & Jackson, 2013; Birks et al., 2013; Denk et al., 2012; Hutchison et al., 2010). Thus, the earliest cues emerged during open coding while linking theoretical foundations to ICAS Nodes prior to coding participant responses. In this preliminary dyad linkage, i.e., theoretical foundation linked to ICAS Node(s), the complexity of ICAS Node interaction began to manifest in the earliest NVivo® queries and analyses, specifically NVivo® Cluster Analysis 3D visualizations (Bazeley & Jackson, 2013). I began with a simple word coding Node Cluster Analysis with a maximum word spread (See Figure 23).

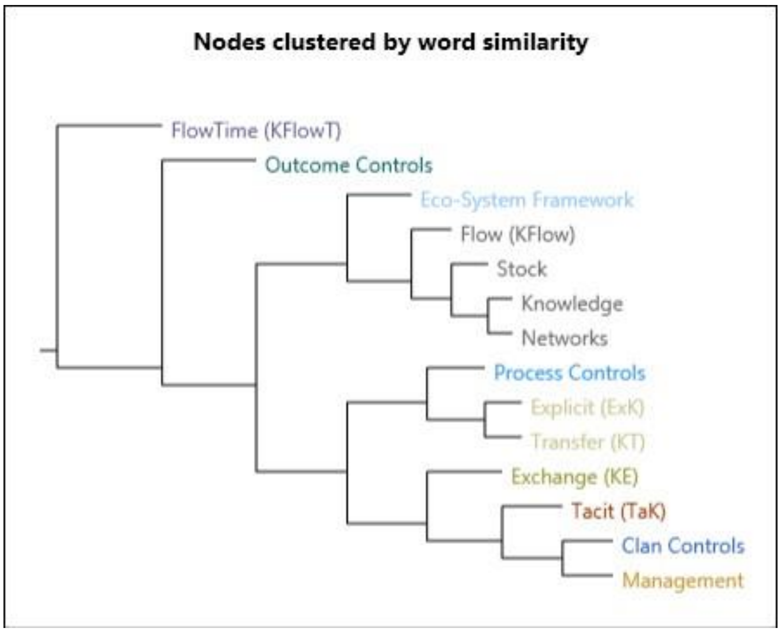


Figure 23. Initial NVivo® node cluster analysis of ICAS nodes.

NVivo® Node Cluster Analysis visualizations provided meaningful Pearson product-moment correlations between all queried Nodes when looking for clustered relationships, based on strength of similar word coding or Node coding (Bazeley & Jackson, 2013). The preliminary Node Cluster Analysis by word similarity visualized 14 parent-child Node relationships and generated 92 Pearson correlation coefficients. At this point, very early in NVivo® project origins, parent Nodes were considered of equal value with child Nodes, and research was coded to both, as child Nodes did not aggregate to parent Node, by design.

I wanted to explore parent and child Node relationships early on, to ensure Node design was optimally representing the ICAS enhanced (See Figure 5). Original design intentionally isolated child Nodes by not aggregating coding to parent Nodes. I wanted to explore the potential value of coding to both parent and child Nodes, using source references as a test. Some source reference content of significant value, therefore, was coded to both parent and child Node. As a result, Pearson correlation coefficients generated for this first NVivo® Node Cluster Analysis were not deemed statistically significant, but simply exploratory.

I subsequently found coded references to parent Nodes to not be as meaningful as child Node coding when running Node Cluster queries or analyses for visualization. Parent Nodes clustered subordinate to child Nodes did contain none the less some degree of initial exploratory value. Thus, Figure 23 remains part of phase one open coding interpretations, as the primary value of cluster queries is for exploration of relationships, rather than provide statistically significant and explanatory evidence (Bazeley & Jackson, 2013). As a result of the first Node visualization (See Figure 23), the parent Node \Knowledge\Management containing Child Nodes Process Controls (CMP), Outcome Controls (CMO), and Clan Controls (CMC), was re-labeled \Knowledge\Control Mechanisms. Any subsequent visualization representing a collective ICAS control mechanism would then have a more meaningfully labeled corresponding parent Node.

After all selected source journals were coded, I ran the next queries as a set of NVivo® Node Cluster Analyses, with both available clustering options, a separate query for identical Nodes with a) clustering by coding similarity (See Figures 24 and 25), and b) clustering by word similarity with a maximum word spread (See Figures 26 and 27). Each Node Cluster Analysis generated 55 Pearson correlation coefficients. Both Cluster Analyses have multiple 3D views (See Figures 25 and 27), rotated and placed side by side underneath each analysis dendrogram (See Figures 24 and 26). Collectively, this provided enhanced visualization of various planes of ICAS Node relationships (Bazeley & Jackson, 2013).

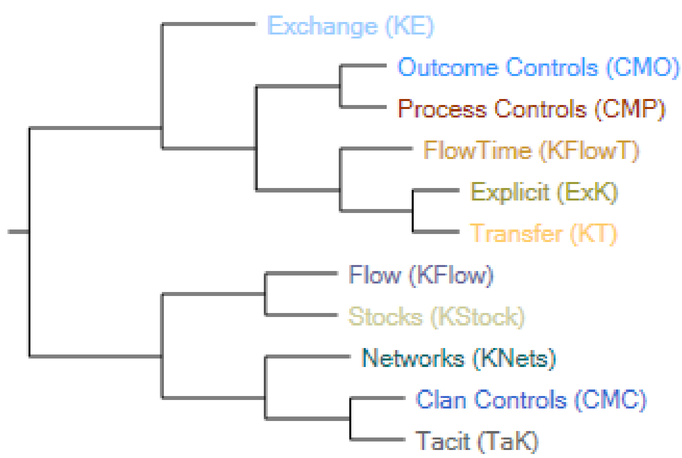


Figure 24. Second NVivo® node cluster dendrogram for coding similarity.

Figure 25. Second NVivo® node cluster analysis for coding similarity.

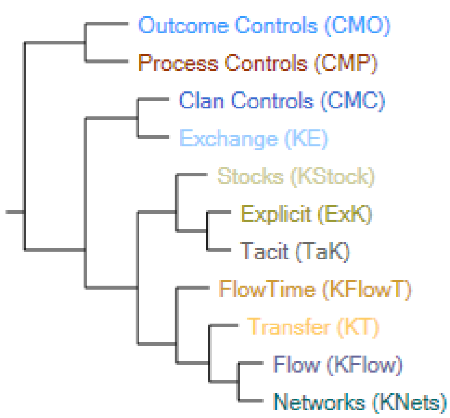


Figure 26. Second NVivo® node cluster dendrogram for word similarity.

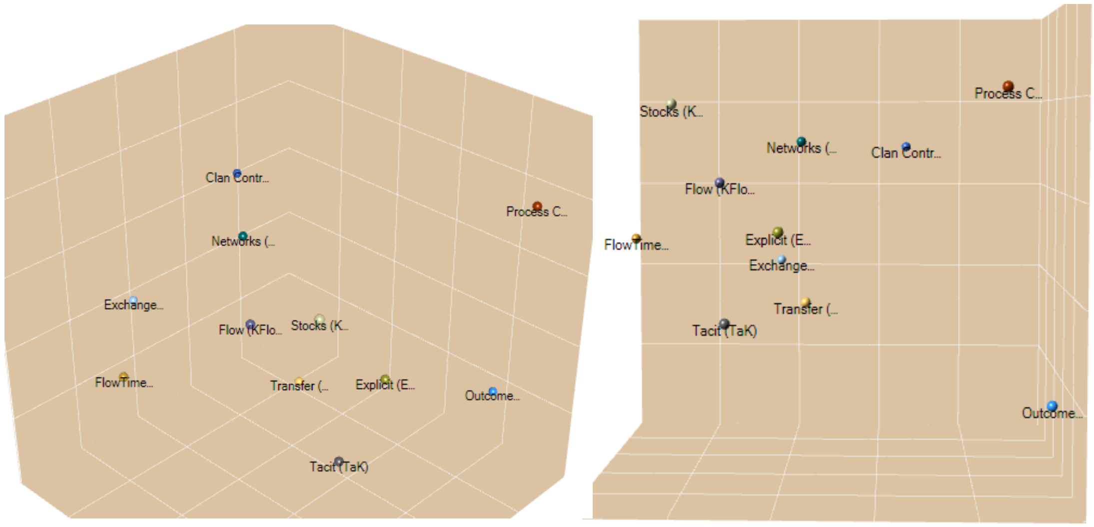


Figure 27. Second NVivo® node cluster analysis for word similarity.

The most significant Pearson correlation coefficients (*p*) in context to interpreting KT–KE preliminary Node relationships are listed in descending Pearson correlation coefficient strength in Table 20, corresponding to word similarity analysis, and in Table 21, corresponding to coding similarity analysis. Though not statistically significant per se in open coding interpretation, Pearson correlations none the less do provide unique insights into relationship tensions, although lacking the added validity provided by subsequent multidimensional scaling (Bazeley & Jackson, 2013). Correlation coefficients remained significant within open coding interpretation, as both visual interpretation and statistical coefficients should be interpreted in aggregate (Bazeley & Jackson, 2013). The added validity of multidimensional scaling was considered during third phase interpretations.

Table 20

Knowledge Nodes: Word Similarity Pearson Correlation Coefficients

\ICAS Enhanced\Node A	\ICAS Enhanced\Node B	Pearson's (p^a) coefficient Word Similarity (Figure 26)
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.951696
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.931377
Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.917743
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.913854
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.913749
Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.904416
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.904050
Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.896111
Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.893153
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	0.889693
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	0.886461
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.871730
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	0.868731
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	0.865548

\ICAS Enhanced\Node A	\ICAS Enhanced\Node B	Pearson's (p^a) coefficient Word Similarity (Figure 26)
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	0.864863
Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.861359
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	0.853286
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	0.844840
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.832053
Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	0.829482
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	0.820538
Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.816902
Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	0.814820
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	0.807262

Note: [a]Pearson correlation coefficient generated by NVivo® Node Cluster Analysis.

Table 21

Knowledge Nodes: Coding Similarity Pearson Correlation Coefficients

\ICAS Enhanced\Node A	\ICAS Enhanced\Node B	Pearson's (p^a) coefficient Coding Similarity (Figure 26)
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Process Controls (CMP)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Outcome Controls (CMO)	0.759257
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.752618
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.676123
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	0.607808
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.577350
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	0.542857
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Process Controls (CMP)	0.542857
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Outcome Controls (CMO)	Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	0.518563
Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.512989
Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.507833
Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.507093
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Process Controls (CMP)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.507093
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Process Controls (CMP)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.507093

\ICAS Enhanced\Node A	\ICAS Enhanced\Node B	Pearson's (p^a) coefficient Coding Similarity (Figure 26)
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.507093
Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.500000
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	0.487950
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Process Controls (CMP)	Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	0.485714
Nodes\\ICAS Enhanced\\Knowledge\FlowTime (KFlowT)	Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	0.478091
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Stocks (KStock)	0.478091
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Outcome Controls (CMO)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Clan Controls (CMC)	0.458349
Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Outcome Controls (CMO)	Nodes\\ICAS Enhanced\\Knowledge\Explicit (ExK)	0.458349
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Control Mechanisms\Process Controls (CMP)	0.438187
Nodes\\ICAS Enhanced\\Knowledge\Transfer (KT)	Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	0.434524
Nodes\\ICAS Enhanced\\Knowledge\Tacit (TaK)	Nodes\\ICAS Enhanced\\Knowledge\Exchange (KE)	0.41833
Nodes\\ICAS Enhanced\\Knowledge\Networks (KNets)	Nodes\\ICAS Enhanced\\Knowledge\Flow (KFlow)	0.414644

Note: [a]Pearson correlation coefficient generated by NVivo® Node Cluster Analysis.

I took early NVivo® Node Cluster Analyses including the above results and went to literature to resolve ambiguities and find conceptual clarification for shifting ICAS

Node relationships. Concurrently, I wanted to identify specific NVivo ® Classification attribute definitions for axial coding.

The earliest set of Node Cluster Analyses (See Figures 23, 24, and 26) yielded several significant perspectives of an ICAS instance simply based on preliminary open coding that linked existing theoretical foundations to specific ICAS Nodes. These early views were primarily for a) coding validation purposes, b) practical understanding of NVivo® Analysis output, c) Node relationship validation and interpretation in context to NVivo® Analysis results, and d) based solely on existing literature, linking ICAS Nodes specifically to KT–KE dynamics.

In the first Node Cluster Analysis (See Figure 23), focusing on control mechanisms surrounding KT–KE including parent Nodes, I found ExK directly linked to KT while TaK was embedded within or most directly linked to KE, weakly governed by clan controls, when KFlow is specifically governed by outcome and process controls. I anticipated this outcome (Turner & Makhija, 2006). During earliest interpretation activity, I did not want to prematurely exclude a potentially meaningful visual relationship, a relationship that might require parent Node inclusion. Though NVivo® project design emphasized only child ICAS Node and stand-alone parent Node relationships, I did not want to create a potential limit. More importantly, I needed to validate project design.

At this point, I interpreted project design of ICAS Nodes to accurately represent a meaningful foundation for queries and analyses, with statistical significance, only when child Nodes remained unbound from parent Node when viewing coded source references.

As a result, Parent Nodes containing Child Nodes were excluded from all subsequent queries and analyses reports.

The exclusion of parent Node that had child Nodes became a validated design outcome of NVivo® project determined most meaningful for representing organizational ICAS dynamics (Bazeley & Jackson, 2013; Hutchison et al., 2010). It was not relevant therefore to code any further references, theoretical source or future participant response, to any parent Node that contained child Nodes. I subsequently un-coded the existing journal source references to parent Nodes with child Nodes.

I proceeded by interpreting all Node Cluster Analyses results from several perspectives. Firstly, I interpreted the results in terms of lack of literature to support the dynamics of micro-meso social controls specifically referencing clan control dynamics, as only one meaningful source uniquely articulated this control (Turner & Makhija, 2006). However, clan controls remain closely linked to TaK (Figure 24) and to KE (Figure 26).

TaK remained closely linked to KE in all views based on Pearson correlation coefficients. Node Cluster Analyses based on Node coding provided the most meaningful visualization and Pearson correlation coefficients when only one source among many references included unique term(s) or concept(s). This was the case with clan controls (Turner &Makhija, 2006). Where multiple sources used identical or similar terms, word coding Node Cluster Analyses proved more significant.

At this point, it is important to note there were no classification assignments to any Node references. Thus, each NVivo® Node Cluster Analysis provided meaningfully accurate and statistically significant results for exploratory purposes, albeit presenting seemingly contradictory correlations. Although correlation coefficients linked TaK more meaningfully with KE, while linking ExK with KT, these early correlations were based simply on coded research references, references often with significant ambiguity and lack of clarity in meaningful separation of tacit and explicit knowledge. Yet, these significant correlations remained consistent as participant responses were subsequently coded during third phase activity.

Secondly, I interpreted the results in context to a preponderance of inter-disciplinary literature specifically and explicitly articulating process and outcome controls, based on NVivo® Node Cluster Analysis using word similarity. Although seemingly problematic when interpreting coded results within an NVivo® project, most significantly perhaps for grounded theory coding, I found the two Node Cluster Analyses perspectives coding similarity and word similarity provided complementary versus contradictory results. Accordingly, both should be and were meaningfully considered during open coding to inform preliminary concept relationships (Bazeley & Jackson, 2013).

Lastly, a third perspective resulted from reflexive activity around Node coding, i.e., coding a single theoretical framework with concepts to multiple ICAS Nodes. It was at this point of interpretation where initial cues emerged providing possible enhanced metaphor meaning for ICAS Nodes, specific Nodes representing ICAS emergent dynamics surrounding knowledge-work activities (KWrk). Interestingly, these cues were strongly influenced by statistical significance generated from Pearson correlation coefficients for both coding similarity and word similarity Node Cluster analyses. The real value of Pearson correlation coefficients during open coding was in relation to extending Nodes as concepts to Nodes as metaphors (Boxenbaum & Rouleau, 2011).

Outcome controls specifically target organizational governance and coordination activities in terms of organizational knowledge related to outcomes (See Figure 8). Outcome control (CMO) is most meaningful when ExK related to outcomes is a) clearly defined, b) unambiguous, and c) complete while TaK related to process for achieving that outcome is more incomplete and may be ambiguous (Flaherty & Pappas, 2012; Turner & Makhija, 2006).

When this ExK–TaK condition exists in an ICAS instance, process controls (CMP) should work in balance with outcome controls (CMO) to convert TaK that is incomplete and perhaps ambiguous to ExK that is more complete and cohesive (Turner & Makhija, 2006). Clan controls work most significantly around TaK (Turner & Makhija, 2006). I interpreted visualizations as meaningfully representing these various control mechanism relationships to all knowledge, TaK as well as ExK.

However, when I expanded ICAS Node influences to explore preliminary ICAS IFlow dynamics, I found both ExK and TaK shifted in influence to both knowledge flow (KFlow) (Nissen, 2006), and IS subsystem dynamics (Hatch & Cunliffe, 2012) (See Figure 28). I wanted to explore IFlow dynamics influence on the shape of the KT–KE dynamic when all ICAS Nodes excluding Bounded Ideation Theory (BIT) were considered in this dynamic. I anticipated exploring the added dynamic of cognitive processes in more depth during axial coding in context to coded participant responses.

The primary concern for phase one open coding was ICAS Node relationship validation based on coded theory. Secondarily, I needed to ensure I could interpret what the NVivo® project was presenting as visualizations.

A total of 527 Pearson correlation coefficients were generated from a summary comprehensive ICAS Node Cluster analysis after coding all selected sources (See Figure 28). Rather than list all coefficients exhaustively, I simply reference the most salient during interpretation discussions that follow. I considered most of these coefficients in the form of linked relationships, e.g., $Node_A$ influencing $Node_X$, influenced by $Node_Y$, while both $Node_X$ and $Node_Y$ influence $Node_Z$.

I found it was most meaningful to link several ICAS Node relationships together to fully interpret an ICAS relationship as a dynamic interaction of forces. I had two visualizations concurrently visible, one for coding and one for word similarity each in 3D form. As a result, I could rotate each visualization while interpreting statistical relationships, while concurrently reflecting on theoretical foundations to inform each interpretation.

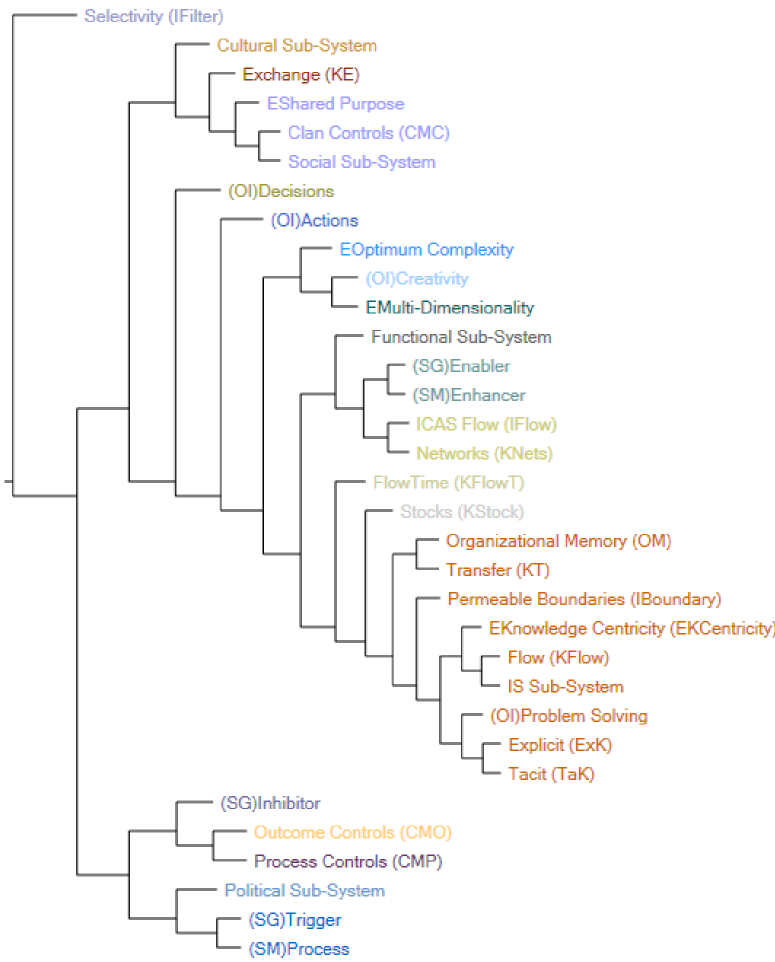


Figure 28. Third NVivo® cluster analysis dendrogram: ICAS flow dynamics.

Complex visualizations tended to be extremely dense and although providing limited benefit did present unique perspectives of Nodes residing on outer planes. Visualizations in 3D are not included with Figure 28, simply the dendrogram representation, as compressed 3D visualizations obscure the denser inner plane relationships. It is neither feasible in terms of time nor of significant additional explanatory value to discuss all relationships I investigated. As such, the relationships presented are primarily for the purpose of documenting how initial open coding interpretations evolved enhanced ICAS metaphors for phase two axial coding.

As a result of open coding of theoretical foundations (See Figure 28), I found KT influenced organizational memory (OM) ($p = 0.895089$) through KFlow ($p = 0.906892$) by IBoundary ($p = 0.891353$), where IBoundary was influenced by TaK ($p = 0.890966$) while directly influencing ExK ($p = 0.878167$). Additionally, KFlow directly influenced OM ($p = 0.906892$) while IBoundary directly influenced KFlow ($p = 0.891353$). Interestingly, IBoundary most strongly influenced ICAS OI, specifically Child Node OI Creativity ($p = 0.864698$), as an emergent ICAS force, when compared to other OI characteristics (Bennet & Bennet, 2004). Additionally, both ExK and TaK most significantly influenced Node (OI) Problem Solving ($p = 0.911536$, $p = 0.925203$), respectively), but within the construct of ICAS IBoundary framing.

Organizational intelligence Node Creativity was influenced by ICAS *flow* dynamics (IFlow) ($p = 0.781265$) and KFlow ($p = 0.866105$), each influencing (SG) Enabler ($p = 0.894308$, $p = 0.862546$, respectively) and (SM) Enhancer ($p = 0.867602$, $p = 0.875798$, respectively). IFlow appears to more directly influence positive SG, whereas KFlow appears to more directly influence positive SM.

This relationship was not surprising as SM has been closely linked as a cognitive process to micro-meso social TaK exchange (KE) (Briggs & Reinig, 2010; Kozlowski & Chao, 2012). I was not surprised to see KE influencing organizational culture ($p = 0.731981$), while more directly being influenced by social dynamics, i.e., the social subsystem of the organization (p = 0.849478), (Jacks et al., 2012; Lee et al., 2010; Sharma & Good, 2013).

ICAS emergent IFilter did not appear as a correlation coefficient until the 454th correlation, where knowledge stocks (KStock) were seen to influence IFilter activity (p = 0.598356). IFilter then emerged as an influencing force somewhat weakly in relation to KFlow (p = 0.542113), influenced by TaK (p = 0.536348), while influencing ExK (p = 0.518384). I found the first correlation involving knowledge stocks, e.g. repositories, quite interesting, and the later set of relationships interesting but not surprising.

The late appearance with marginally positive correlation strength was not surprising in the sense there is only one source that specifically and explicitly references the ICAS filtering dynamic, and that external source was not directly coded to any ICAS Node. I only coded those sources I could capture internally within NVivo®, i.e., journal articles that directly correlated in research as equivalent ICAS flow dynamics.

However, I was sensitive during coding to ensure that specific concepts relating to ICAS IFilter dynamics were coded to various ICAS Nodes, where appropriate. Terms and concepts were varied, in this context. Still, I was extremely encouraged to see the tension relationships that did emerge, and in the direction of those tensions. As mentioned previously, there are no outliers in a holistic ICAS framework, either in terms of research or in relation to participant observations. Each participant perception should find a meaningful place within the ICAS dynamic, as each is integral to the evolution of any given ICAS instance (Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Linger et al., 2007; Yang & Shan, 2008).

During open coding, I interpreted the primary role or essence of emergent ICAS organizational IFilter force as one of signal attenuation, much like a radio receiver. Without appropriate signal attenuation, there is simply static, directly linked to SM (SM). Without meaningful organizational selectivity, organizations become chaotic (Bennet & Bennet, 2004):

> Shared purpose and current organizational tactics make visible what signals the organization is interested in…. If people are clear about priorities…they will be able to quickly evaluate incoming signals…. *Shared knowledge* [emphasis added] will usually be grounded in the tacit knowledge of individuals…and cannot become wholly explicit…. [However,] knowledge repositories (explicit knowledge, i.e., data and *information*…) [emphasis added] play a big [very significant] role in knowledge sharing…. As different subsystems [within the ICAS organization] evolve and change, the selection ability should remain strong. When the selection function loses its coherence the organization deteriorates, potentially into confusion. (p.47)

As a result, I found (SG) Inhibitor influenced by process controls (CMP) (p = 0.720499) and outcome controls (CMO) (p = 0.701349) quite meaningful (Bennet & Bennet, 2004; Boisot & Sanchez, 2010; Turner & Makhija, 2006). Deville (2012) implicitly interpreted both types of organizational controls as an inhibitor to knowledge transfer:

> [Deville] In discussing what [participant x] felt hinders knowledge transfer in the organization, Participant [x] stated:

> [Participant] Of course, we are a hierarchical organization, so there's rank, there's precedent, all the *bureaucratic* [emphasis added] items that go with our organization. Which, you know, imposes a sense of formality on certain communications and that I think *inhibits* [emphasis added] information transfer. (p. 79)

Deville (2012) interpreted inhibitor in context to social networking dynamics surrounding vertical knowledge transfer (KT) within his organization as bound to organizational structure. In a military organization this is most meaningfully associated with legitimate power structures and hierarchical governance, e.g., power-based phenomena integral to the political subsystem dynamic associated with specific organizational controls typically considered within the functional subsystem (Hatch & Cunliffe, 2012; Turner & Makhija, 2006).

In essence, I simply and conceptually represented this governance dynamic with more specificity to the (SG) Inhibitor and Political Subsystem Nodes within an enhanced ICAS visualization that linked specific control mechanisms to specific SG–SM dynamics. As a result, within just one coding phase, I was able to more explicitly capture and validate multiple ICAS emergent dynamics surrounding hierarchical organization, bureaucratic, and precedent, as well as other SG–SM relationships (Bennet & Bennet, 2004; Maitlis & Lawrence, 2007).

Having saturated preliminary analysis, I proceeded to finalize phase one interpretations. I simply began summary reflection and interpretation by exploring why and how various ICAS Node relationships shifted, from a theoretical perspective expressed within existing research. Consequently, I went to theoretical foundations in literature to interpret Figure 28 dendrogram results, in conjunction with Figures 24, 25, 26, and 27, collectively.

I originally conceptualized and linked KT and KE as an equivalent set of activities within a knowledge flow dynamic. As such, I considered KT–KE dynamic as tightly coupled in a symbiotic relationship (Boisot, 1998; Choo, 1998; Nonaka & Takeuchi, 1995). Wherever the knowledge flow cycle begins and regardless of its end point at some future flow time, both KT and KE were seen as active around both TaK and ExK knowledge.

I anticipated the KT–KE dynamic would involve some spiral of TaK–ExK evolution within a social networking framework where KFlow would enable TaK–ExK transformations (Becker, 2007; Brodbeck et al., 2007; Nissen, 2006). I found this relationship substantiated in some form by all analyses visualizations of the foundational ICAS instance (See Figures 23, 24, and 26), the purely theoretical instance based on coded research.

However, within a design construct where KT–KE dynamics link TaK–ExK in a meaningful knowledge life cycle, the conceptual differentiation between KT and KE becomes blurred, even transparent in a sense. I had a visual and meaningful differentiation in Node relationship visualization from NVivo® Node Cluster Analyses, based on ICAS Nodes selected to create just a few different views or perspectives of a single ICAS instance, based solely on literature. Yet, I wanted to translate the differentiation between perspectives, or analysis visualizations, into a single coherent Node visualization.

Not surprisingly, contemporary and historical literature often remained vague when linking key relationships between these two sets of knowledge life cycle dynamics, i.e., KT–KE dynamics and TaK–ExK dynamics. In one significant historical study on SM activity, TaK was mentioned two times and ExK in context to knowledge two times, and one of those times for each simply in quoted reference (Weick et al., 2005).

In another significant study, TaK and ExK were aggregated simply into a single concept, i.e., knowledge, neither TaK nor ExK being referenced directly (Maitlis & Lawrence, 2007). In a more recent work, when discussing knowledge objects, differentiating TaK and ExK objects occurred explicitly with only four references to each type of knowledge (Borgo and Pozza, 2012). In all cases, neither KT nor KE were referenced explicitly in terms of SM *or* in terms of object type (Borgo & Pozza, 2012; Maitlis & Lawrence, 2007; Weick et al., 2005).

KT and KE were often aggregated into the general concept of KT, differentiating KE only implicitly as knowledge-sharing (Murray & Peyrefitte, 2007). Where explicit differentiation occurred, KE was linked directly to both knowledge sharing *and* knowledge KT but only to larger organizational-level KFlows, by implication by-directional (Minbaeva et al., 2012). In these literature cases, no clear distinctions were drawn between KT–KE linked to specific TaK–ExK relationships. Not until I returned to more historical works did I find an explicit and clearly defined differentiation between

KT–KE activity linked to specific TaK–ExK dynamics (Turner & Makhija, 2006) (See Figure 8).

This KT and KE blurring in relation to TaK and ExK was visible within many participant responses. Perhaps one of the more meaningful representations of this blurring manifest with Participant 02 when Deville asked OQ14, regarding most frequent KT method and OQ15 regarding least frequent KT method:

> [OQ14 Most Frequent KT] [Participant] A lot of it is on the phone. With organizations it has to be on the phone, but when I'm here within this organization itself, it's face-to-face. I always get out and walk about and talk. I'm not one to just sit at my desk all day. [Deville] And why is that? Why do you choose those methods to communicate most frequently? [Participant] Just my upbringing back when I came in to the military in the late seventies, early eighties it was management by objective, getting up and walking around and observing ….getting out and seeing people face-to-face rather than trying to just do it by the phone or do it by email.
>
> [OQ15 Least Frequent KT] [Participant] I would probably say phone. I mean recently although we said that it may be the most, I prefer phone less, E-mail is documentation…. I don't remember that conversation…well, I can tell that you're lying about it…. hey I sent you an email on such and such a date. I've got a read document that says you read it. (Deville, 2012, Participant 02 Transcript)

Although the participant responded to both KT questions as KT choices, I interpreted response to OQ14 as an exchange where participant knowledge as TaK was shared (KE) via dialog with organizational members, i.e., a TaK–KE dynamic. Therefore, I interpreted and coded participant response to OQ14 as representative of the TaK–KE dynamic within a social context. I interpreted and coded participant response to OQ15 as more closely associated with an ExK–KT dynamic where confirmation of KT required validation. In the former dialog, TaK–KE dynamic, I considered this part of the SM process in terms of identifying SM gaps (Maitlis & Lawrence, 2007; Sharma & Good, 2013).

However, although I also coded participant response to OQ15 as part of the SM process during axial coding, I coded this directly to ExK-KT confirmation activity during selective coding using a unique classification attribute within KFlow. This coding sensitivity was carried throughout participant coding to all responses, carrying axial coding interpretations into selective coding classification relationships. Bridging coding with reflection provided opportunity to meaningfully separate KT and KE activity, as well as TaK and ExK involved in both.

In addition to KT and KE, as well as TaK and ExK blurring, when I attempted to link KNets to TaK–KE and ExK–KT dynamics, another blurring and ambiguity surfaced. A significant study identified knowledge as something accumulated where information became an infused influencer, both contained at nodes, i.e., actors, within a social networking dynamic (Ahuja et al., 2012).

However, the networking dynamics although clearly defined and dimensioned referenced neither TaK nor explicit knowledge ExK directly, but simply knowledge in some cumulated form (Ahuja et al., 2012). Within a socially complex networking dynamic, information, implied as ExK, was understood to be a type of social network influencer (Ahuja et al., 2012). I thus coded influencer within an SG-SM dynamic.

It was not simply that TaK–ExK differentiation did not exist albeit implied, rather the differentiation between KT–KE in dynamic tension was also only implied, and typically isolated to a few areas of discussion (Ahuja et al., 2012). Similarly, rules and routines, seen as attractors, were considered part of a TaK–KE activity between actors within a complex cognitive SM process (Boisot & Sanchez, 2010). Yet, neither TaK, KE, nor SM was articulated directly and explicitly in this context. I found only when literature shifted from dynamic nodes to emergent network structures, within a more historical work, did the differentiation become more explicit (Amini, 2010).

Cognitive exchange was seen to take place in context to values, within an emergent value network when creating new values (Amini, 2010). The value network with new values was considered a change dynamic, linked to an organizational social subsystem (Amini, 2010). This was one of the few and direct linkages I found explicitly bridging individual cognitive activity to organizationally local cultural subsystem dynamics, and only by implication social subsystem dynamics (Amini, 2010; Hatch & Cunliffe, 2012). Within this emergent cultural dynamic, however, only values and information were seen to be exchanged, and there were only two direct references to specific and explicit information transfer, and none directly to knowledge transfer (KT) activity (Amini, 2010).

Only in the seminal work of Choo (1998) was cultural knowledge described explicitly and comprehensively within a KT dynamic. Yet, in a more contemporary socially-valued KNet, KT as an activity was only referenced two times meaningfully and explicitly, and then only as an abstract concept linking both exchanged values and information in some tangible–intangible and actual–symbolic transfer activity (Amini, 2010). Shared values were, however, explicitly linked multiple times to clan controls as part of a Process TaK–Outcome TaK dialog (Turner & Makhija, 2006).

The practical application of dialog knowledge outcome was to bring incomplete ExK informing both types of TaK, i.e., process and outcome, into a "common interpretation of both process and outcome knowledge″ with shared value and understanding (Turner & Makhija, 2006, p. 205). I found clan controls most effectively linked cultural knowledge transfer to ICAS IFlow dynamics as part of the ICAS organization's cultural subsystem (Bennet & Bennet, 2004; Choo, 1998; Hatch & Cunliffe, 2012; Turner & Makhija, 2006).

I thus returned to the one historical work where KT–KE dynamics and TaK–ExK dynamics concurrently became explicitly differentiated and explicitly linked, meaningfully representing ExK, TaK, and cultural knowledge (Turner & Makhija, 2006; Choo, 1998). The complex, emergent, and socially networked dynamics surrounding explicit KT–KE dynamics and TaK–ExK dynamics, however, were not considered in either work, only the types of supporting organizational structures, e.g., communities of practice (CoPs) (Turner & Makhija, 2006). For Turner and Makhija (2006), applicable as well as to most research I synthesized, analyzing surrounding ICAS dynamic complexity was simply beyond the scope of research focus.

And, in a subsequent contemporary work, considering organizational activities and structures that deliberately shape organizational KFlows in context to social and cultural dynamics, TaK and ExK differentiation were referenced only several times (Lipparini et al., 2013). Interestingly, the few explicit references were almost exclusively in context to historical and seminal referenced works (Lipparini et al., 2013).

Lack of explicit references differentiating various social and cultural organizational behaviors in context to explicitly referenced KT–KE and TaK–ExK dynamics remains problematic (Jacks et al, 2012). When compounded with lack of explicit reference linking KT–KE and TaK–ExK dynamics to social and cultural behaviors within a complex social networking dynamic, creating meaningful visualizations becomes increasingly problematic (Lipparini et al., 2013; Turner & Makhija, 2006).

As a result, interpreting emergent and complex ICAS behaviors and characteristics required meaningful fusion of multiple current and historical theoretical frameworks. The collective interpretation required additional intuitive interpretation as much as analytical interpretation (Birks et al., 2013; Boxenbaum & Rouleau, 2011; Ongstad, 2014). Thus, I engaged in bricolage towards metaphors as my fundamental reflexive activity for extending existing theoretical foundations, especially within a grounded theory coding construct (Boxenbaum & Rouleau, 2011).

In one significant study exploring cognitive and organizational challenges around a large volume of knowledge objects within a complex and socially dynamic KNet, the concept of TaK and ExK became further obfuscated, as did the relationship between TaK and KT and KE (Padova et al., 2012). TaK was recognized as a valuable commodity within the minds of employees, but dynamic or active only in context to a personal strategy (Padova et al., 2012). Padova et al. (2012) may have found the Boisot I-Space beneficial, in this context (Boisot & Sanchez, 2010).

TaK in essence was part of a deal-making social dynamic where TaK became an influencer within the socially networked relationship (Padova et al., 2012). However, this form TaK was considered ExK, i.e., as information, within a value-sharing network nexus of rules (Boisot & Sanchez, 2010). Such ExK thus becomes integral to creating bridged alters within a more comprehensively framed complexly emergent social ego-network dynamic (Ahuja et al., 2012; Boisot & Sanchez, 2010).

As illustrated, research often blurs ExK and information. However, when both TaK and ExK are blurred conceptually as information within contemporary research, aggregating research to create metaphors remains a challenging activity. It should not be surprising then that organizational members would find similar concepts confusing, as discovered by Deville (2012). One of the first themes to emerge around participant perceptions of organizational KT represented a conceptual blur between knowledge and information within a socially networked dynamic, i.e., Theme 2, Knowledge = Information (Deville, 2012).

All participants blurred conceptualizations between ExK and information, in several cases ExK, TaK, and flux knowledge collectively as information. Compounded with similar blurs within research, I interpreted the knowledge-information blur—TaK, ExK, and /or flux knowledge as information—spanning organizational participant and research perceptions, as validating part of my earliest design parameters of an enhanced ICAS framework. I visualized SM and SG as more actively and directly involving information flows vs. explicit KT or KE activity, although surrounding KFlow is significant (See Figure 5).

Thus, additional classification attributes for ICAS Node KFlow included knowledge type attribute value ExK/Information. I was not surprised, in this context, to see Node ICAS IFilter (See Figure 28) become a significant bridge between specific SG–SM activities in terms of knowledge conversion.

In summary, during phase one open coding I retained significant building blocks from a wide representative of inter-disciplinary perspectives to resolve ambiguities, as well as inform a comprehensive set of enhanced ICAS metaphors during axial coding. I considered several dozen NVivo® Node Cluster Analyses visualizations, with only a few represented here to capture fundamental building block relationships. As a result, NVivo® ICAS Nodes as enhanced ICAS metaphors represented KT–KE dynamics with visual, structural, and analytical cohesion.

A key outcome of axial coding was enriched enhanced ICAS characteristic definitions and relationships, such as IFlow, KFlow, SG–SM dynamic, organizational controls, and most specifically perhaps a fundamental blurring of IFilter and IBoundary. I moved on to selective coding, interpreting outcomes by exploring the KT–KE dynamic around original coded KT themes (Deville, 2012). I also focused on the SG–SM dynamic.

Enhanced Knowledge Transfer Themes

I took second phase interpretations and more meaningfully aligned those with theoretical foundations by coding ICAS classification attributes to specific participant responses. A significant transition of thought was necessary to evolve metaphors represented in the ICAS model into a fluid organizational context to more effectively capture the complex, adaptive, and emergent characteristics of the ICAS in motion.

Throughout open and axial coding, theoretical foundations were synthesized to develop classification attributes infused with rich metaphor context. ICAS metaphors provide any given ICAS Node with an explicit set of participant perception touch-points. In this context during axial coding, classification attribute values began to conceptually link specific participant responses and implied ICAS organizational dynamics with specific ICAS Node relationships. During selective coding, specific conceptual links were translated into attribute coded and explicit relationships.

Original project design included evolution of ICAS classification attribute values that would meaningfully represent some of the more subtle emergent forces and characteristics within the ICAS organization. As discussed, many emergent organizational ICAS characteristics remain blurred and hidden, partially understood, or simply not understood. As such, certain ICAS emergent relationships yet remain incomplete in terms of understanding surrounding complex organizational characteristics.

Incomplete understanding manifests specifically when interpreting complex relationships in terms of specific ICAS emergence under specific conditions. ICAS Node design including theoretical foundations and classifications that could be shared between multiple ICAS Nodes was for the express purpose of potentially shedding light on some of these obscured, blurred, or hidden areas of ICAS organizational emergent behaviors.

For purpose of illumination and discovery, I thus returned to the original six themes developed by Deville (2012). Theme 1 (T1) represented the combined influence of formal and informal networks based on "significant statements in participant's responses" (Deville, 2012, p. 75). A single sample of many Matrix Coding Query results, in this case linking just KFlow and KNets ICAS Child Nodes to the aggregated T1 Theme, validated I had meaningfully captured specific participant responses with a level of meaningful coverage across all relevant ICAS Nodes (See Figure 29).

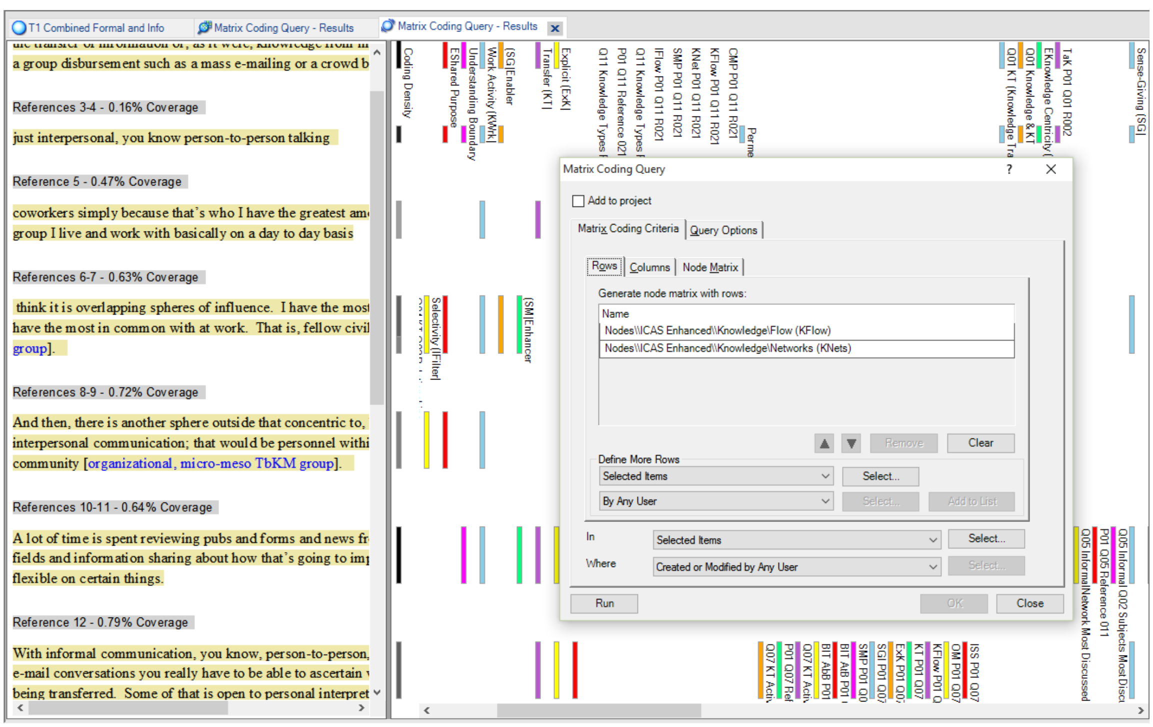


Figure 29. Theme 1 matrix coding query: KNets and KFlow.

As importantly, I confirmed specific response phrases from Participant 01 were meaningfully aggregated to Deville's (2012) KT T1 theme with added granularity necessary to interpret specific ICAS relationships. I validated a robust ICAS Node structure with sufficient drill down capability to analyze very explicit and precise phrases from original participant responses (See Figure 30). Additionally, I validated the ICAS analysis framework to explore very specific phrases, classification attributes, and ICAS Node relationships while concurrently conceptualizing aggregate perceptions from any ICAS Instance Formula.

T1 Combined Formal and Info	Ma	T1 Combined Formal and Info	Mat	T1 Combined Formal and Info	Matrix Co
	A : T1 Coml		A : T1 Combi		A : T1 Combi...
1 : Bounded Ideation Function	14	79 : CMO P01 Q05 R011	1	193 : ISS P01 Q01 R002	1
2 : Ability Boundary	1	80 : Process Controls (CMP)	3	194 : ISS P01 Q05 R011	1
3 : BIT AbB P01	1	81 : CMP P01	3	195 : ISS P01 Q07 R015	1
4 : BIT AbB P01 Q07 R015	1	82 : CMP P01 Q09 R017	0	196 : ISS P01 Q09 R019	1
5 : BIT AbB P01 Q10 R020	0	83 : CMP P01 Q09 R019	1	197 : ISS P01 Q14 R027	1
6 : BIT AbB P01 Q12 R024	0	84 : CMP P01 Q11 R021	1	198 : Political Sub-System	1
7 : Attention Boundary	1	85 : CMP P01 Q14 R027	1	199 : PSS P01	1
8 : BIT AtB P01	1	86 : Eco-System Framework	0	200 : PSS P01 Q05 R011	1
9 : BIT AtB P01 Q07 R014	0	87 : Exchange (KE)	1	201 : Social Sub-System	3
10 : BIT AtB P01 Q07 R015	1	88 : KE P01	0	202 : SSS P01	2
11 : BIT AtB P01 Q13 R025	0	89 : KE P01 Q01 R002	0	203 : SSS P01 Q01 R002	1
12 : Exhaustion Boundary	0	90 : KE P01 Q13 R025	0	204 : SSS P01 Q04 R005	1
13 : Goal Congruece Bound...	5	91 : KE P01 Q14 R026	0	205 : SSS P01 Q04 R007	0
14 : BIT GC P01	2	92 : Explicit (ExK)	5	206 : SSS P01 Q07 R014	0
15 : BIT GC P01 Q01 R002	1	93 : ExK P01	3	207 : SSS P01 Q13 R025	0
16 : BIT GC P01 Q04 R005	1	94 : ExK P01 Q01 R001	1	208 : Permeable Boundaries...	2
17 : BIT GC P01 Q13 R025	0	95 : ExK P01 Q03 R004	0	209 : IB P01	0
18 : Solution Space Boundary	2	96 : ExK P01 Q05 R011	1	210 : IB P01 Q08 R016	0
19 : BIT SB P01	1	97 : ExK P01 Q07 R015	1	211 : IB P01 Q13 R025	0
20 : BIT SB P01 Q05 R011	1	98 : Flow (KFlow)	14	212 : Selectivity (IFilter)	2
21 : BIT SB P01 Q07 R014	0	99 : KFlow P01	9	213 : Sense-Giving (SG)	9
22 : BIT SB P01 Q13 R025	0	100 : KFlow P01 Q01 R001	1	214 : (SG)Enabler	4
23 : Understanding Boundary	5	101 : KFlow P01 Q01 R002	1	215 : SGE P01	1
24 : BIT UB P01	2	102 : KFlow P01 Q02 R003	1	216 : SGE P01 Q05 R009	0
25 : BIT UB P01 Q01 R001	1	103 : KFlow P01 Q03 R004	0	217 : SGE P01 Q07 R014	0
26 : BIT UB P01 Q01 R002	1	104 : KFlow P01 Q04 R005	1	218 : SGE P01 Q08 R016	0
27 : BIT UB P01 Q05 R009	0	105 : KFlow P01 Q04 R006	1	219 : SGE P01 Q11 R022	0
28 : Emergent Environment	3	106 : KFlow P01 Q04 R008	0	220 : SGE P01 Q11 R023	0
29 : EChange	2	107 : KFlow P01 Q05 R011	1	221 : SGE P01 Q13 R025	0
30 : EEnvCh P01	1	108 : KFlow P01 Q07 R014	0	222 : SGE P01 Q14 R026	0
31 : EEnvCh P01 Q05 R011	1	109 : KFlow P01 Q07 R015	1	223 : SGE P01 Q14 R027	1
32 : EComplexity	0	110 : KFlow P01 Q08 R016	0	224 : (SG)Inhibitor	2
33 : EUncertainty	1	111 : KFlow P01 Q09 R017	0	225 : SGI P01	2
34 : EEnvU P01	1	112 : KFlow P01 Q11 R021	1	226 : SGI P01 Q07 R015	1
35 : EEnvU P01 Q01 R001	1	113 : KFlow P01 Q11 R022	0	227 : SGI P01 Q09 R017	0
36 : Emergent Self-Organiza...	10	114 : KFlow P01 Q12 R024	0	228 : SGI P01 Q09 R019	1
37 : EKnowledge Centricity (...	4	115 : KFlow P01 Q13 R025	0	229 : (SG)Trigger	2
38 : ESOrgKC P01	2	116 : KFlow P01 Q14 R026	0	230 : SGT P01	1
39 : ESOrgKC P01 Q01 R001	1	117 : KFlow P01 Q14 R027	1	231 : SGT P01 Q05 R011	1

Figure 30. Theme 1 matrix coding query: P01 classification coding sample.

I proceeded to generate a Matrix Coding Query against all Themes to identify which specific participant response phrases were coded to that Theme, from which questions specifically. A sample mapping of Participant 01 coded responses for attribute coding for Deville's (2012) six KT Themes illustrates the potential to analyze a particular Theme (column) to explore all coded references from any participant, as well as look at a specific attribute value across all six themes (See Figure 31).

T1 Combined Formal and Info | Theme Matrix Coding Query -

	A : T1 Combined Formal...	B : T2 Formal Structures...	C : T3 Knowledge = Info...	D : T4 Knowledge As Ac...	E : T5 Value Face to Face	F : T6 Verification_Confi...
148 : KT P01 Q08 R016	0	1	0	0	1	0
149 : KT P01 Q09 R017	0	1	0	0	0	0
150 : KT P01 Q09 R019	1	1	1	0	0	0
151 : KT P01 Q10 R020	0	0	1	1	0	1
152 : KT P01 Q12 R024	0	0	0	1	0	0
153 : KT P01 Q14 R027	1	0	1	1	0	0
154 : Work Activity (KWrk)	6	3	4	2	4	1
155 : KWrk P01	6	3	4	0	4	1
156 : KWrk P01 Q01 R0...	1	0	1	0	0	0
157 : KWrk P01 Q01 R0...	1	0	1	0	0	0
158 : KWrk P01 Q02 R0...	1	1	0	0	0	0
159 : KWrk P01 Q03 R0...	0	1	1	0	0	0
160 : KWrk P01 Q04 R0...	1	0	0	0	0	0
161 : KWrk P01 Q04 R0...	1	0	0	0	0	0
162 : KWrk P01 Q05 R0...	1	0	0	0	0	0
163 : KWrk P01 Q07 R0...	0	0	1	0	2	0
164 : KWrk P01 Q08 R0...	0	1	0	0	1	0
165 : KWrk P01 Q13 R0...	0	0	0	0	1	1
166 : Organizational Inte...	1	0	1	1	3	1
167 : (OI)Actions	0	0	0	0	0	0
168 : (OI)Creativity	1	0	1	1	3	1
169 : OIC P01	0	0	1	0	3	1
170 : OIC P01 Q07 R014	0	0	1	0	2	0
171 : OIC P01 Q13 R025	0	0	0	0	1	1
172 : (OI)Decisions	0	0	0	0	0	0
173 : (OI)Problem Solving	1	0	1	0	2	0
174 : OIPS P01	0	0	1	0	2	0
175 : OIPS P01 Q07 R014	0	0	1	0	2	0
176 : Organizational Me...	2	1	1	2	0	0
177 : OM P01	2	1	1	1	0	0
178 : OM P01 Q05 R011	1	0	0	0	0	0
179 : OM P01 Q07 R015	1	1	1	1	0	0
180 : Organizational Su...	8	4	7	3	3	1
181 : Cultural Sub-System	1	1	2	1	1	1
182 : CSS P01	0	0	0	1	1	1
183 : CSS P01 Q05 R009	0	0	0	1	0	0
184 : CSS P01 Q15 R025	0	0	0	0	1	1
185 : Functional Sub-Sy...	3	1	1	0	0	0
186 : FSS P01	2	1	1	0	0	0

Figure 31. NVivo® matrix coding query: sample of all Themes (P01).

As a result, each unique participant response phrase coded during axial coding was further coded to unique participant ICAS Child Nodes. Applying classification attributes thus facilitated more direct analysis by linking a specific participant perception of KT to an entire set of ICAS Node classification attributes, i.e., an ICAS instance, associated with just that one unique participant perception.

Every coded Participant 01 Child Node under a Parent/Child ICAS Node contains a specific classification attribute assignment for that coded reference, for that Node, unique to the perspective of that Node. The result for Participant 01 illustrates the additional visibility provided by the ICAS Node structure to further interpret specific response phrases to specific ICAS Node dynamics, and more importantly associate each of the coded Participant Question Responses, e.g., P01 Q05 R009, to very specific ICAS classification attributes (See Figure 30).

For example, KWrk classification schema Activity is associated with any KWrk subordinate Child Node, representing participant knowledge work. Additionally, Activity classification schema is also assigned to KE and KT, as both represent additional and unique ICAS activities. The activity is the same or conceptually equivalent, but at a different ICAS level, i.e., a type of ICAS emergent Activity linked directly to very specific ICAS KWrk Activity.

Thus, Activity coded to a KE–KT dynamic is coded uniquely to the organizational context of that specific related ICAS KFlow, whereas Activity in KWrk is related directly to specific individual tasks as well organizational activity characteristics. As individual KWrk Activity characteristics influence KE–KT Activity, KFlow emergence can be more meaningfully interpreted in relation to KE–KT influence.

Thus, I was able to separate multiple types of ICAS Activity meaningfully with the same coded participant reference by simply creating a Child ICAS Node for each participant classification attribute assignment uniquely for that Child Node. For example, one participant ICAS Child Node under KE, one under KT, and one under KWrk each produce unique Activity attributes dependent upon each level of ICAS activity. This complex but necessary coding relationship was created for each participant coded response, for each question, to all related participant Child ICAS Nodes.

In the case of Participant 01, Question 01, I created two specific unique references, one for ExK–KT dynamic and one for TaK–KE dynamic. With this simple combination of two discrete coded references to one Participant response, I was effectively able to capture four unique Activity perspectives within an ICAS Instance. One pair of Activity classifications was related to KWrk in context to ExK–KT and a second pair of Activity classifications was related to KWrk in context to TaK–KE.

I inspected which specific perception of Participant 01 most significantly influenced SG within Theme 1, for example. As a result, I was able to further explore what aspect of SG most significantly contributed to ICAS Flow or KFlow, or any other individual or collective set of ICAS Nodes in that same Theme.

More importantly perhaps, having run an equivalent Matrix Coding Query for each original KT Theme, I explored a participant's perceptions of SG against all KT Themes developed by Deville (2012). Additionally, with time, I could as easily looked at participant perceptions related to SG against any subset of all six Themes. As stated previously, because of the coding complexity within this framework, manual coding time constraints precluded coding beyond Participant 01, as well as exploiting the full analytical potential of the ICAS instance framework.

This complex classification coding construct could be interpreted as viral coding (Bazeley & Jackson, 2013). Viral coding simply adds complexity without meaningful additional analysis potential, and in fact often creates analysis problems when running queries (Bazeley & Jackson, 2013). However, the level of granular Node coding within the ICAS instance is quintessential to explore emergent ICAS dynamics from multiple perspectives. The inherent complexity by design has been minimized to degree possible without sacrificing any opportunity to explore any given ICAS slice.

The key is that an ICAS Instance as a slice visualization can represent a specific individual perception of any given organizational knowledge characteristic as well as any given organizational context surrounding the transfer of that knowledge, while concurrently representing significant ICAS emergent characteristics. Likewise, an ICAS slice can represent a specific ICAS dynamic relationship or emergent force, while concurrently analyzing individual perception of a specific ICAS force characteristic.

Additionally, considering the previous ICAS slice example, I could concurrently aggregate all participant perceptions of that same emergent force, or I could isolate participants as subsets, conceptually recombining participant subsets. A subsequent generation of the current ICAS instance could therefore potentially capture unique ICAS forces at operational, management, and executive level of ICAS Activity.

Although I explored only one participant in a small subset of possible visualizations and relationships, the potential exists to scale out and up across ICAS

Nodes while concurrently scaling in and down to specific participant perceptions. As importantly, I can scale out and up across multiple participant perceptions across multiple themes while concurrently scaling down into a very specific ICAS emergent classification attribute at a specific ICAS Node or within the collection of ICAS Nodes.

This is not viral, this is simply fundamentally necessary to begin to model in some qualitatively meaningful model the complex emergent dynamics and characteristics in motion within the ICAS organization. I considered this level of coding complexity as minimally sufficient to address the complex relationships represented within the ICAS Instance Formula, therefore quintessential vs. viral.

To create my ICAS final framework, I again followed a similar double-hermeneutic spiral, or perhaps more precisely created a final encompassing double-hermeneutic spiral revisiting and reinterpreting while further coding classification attributes to develop a final set of understandings that emerged during selective coding. It is not reasonable to move through every Theme originally developed by Deville, nor every Participant Response to all fifteen questions.

Although I did not explicitly code all 11 participants, I did conceptualize classification coding assignments for all 323 discretely coded participant responses where appropriate, and created meaningful field notes for further reflection and subsequent coding in follow-on research projects. I used the same rigorous reflection and interpretation spiral for all 323 coded participant responses, a) creating classification coding notes to specific ICAS Nodes to specific classification attributes, while b) further describing the relationship to surrounding ICAS Nodes and other classification attributes in each case (See Appendices A through K).

These interpretations were effectively used to synthesize conceptually multiple participant perceptions when creating final visualizations for interpretation. A meaningful subset of my interpretations is presented that provided significant insights into final visualizations representing knowledge transfer framing mechanisms. To illustrate, I will explore a subset of original participant direct responses (Deville, 2012), and interpret those responses in relation to an ICAS instance.

Participant 01 indicated his/her understanding of knowledge as an information transfer at an individual level with personal and social contexts to larger organizational contexts in terms of mass email distributions (Deville, 2012). Participant 07, however, emphasized the concept of *nuances* throughout his/her response to Question 01 (Deville, 2012). The specific terms and phrases of participant responses would most reasonably and perhaps typically be interpreted, therefore, in context to the original research problem, for example, in context to KT as formal or informal, Deville's Theme 1.

As my research problem encompasses a plethora of existing research problems beyond knowledge transfer in social contexts, I needed to interpret each participant response phrase in context to a very large set of additional known research problems from the perspectives provided by theoretical frameworks which span multiple disciplines.

To illustrate, I will compare a subset of T1 KT interpretations of Participant 01 Question 01 to a subset of interpretations of Participant 07 Question 01.

Participant 01 responded to Question 01 with the following response:

> I think knowledge transfer, as the name implies, is the transfer of information or, as it were, knowledge from individual to individual whether it's as a group disbursement such as a mass e-mailing or a crowd briefing or just interpersonal, you now person-to-person talking. It is just the movement of ideas, information, or even nonsensical stuff like rumors from person to person. (Deville, 2012)

Deville could have related this response specifically to any his five remaining Themes, i.e., T2, T3, T4, T5 and/or T6. Deville did not discuss which specific responses were linked to which specific Theme at a Participant to Question Response matrix level, as this level of specificity was not significant to Deville.

I not only needed this level of specificity, but I also needed to understand more precisely the different contexts of knowledge and information within an organizational ICAS IFlow dynamic. Participant 01 references movement of ideas, thus not simply information, although information is inherent to ideas. But more meaningfully ideas can be interpreted as knowledge, and more precisely TaK. Participant 01 qualified the type of flow containing knowledge in this context as more direct person to person. This level of interpersonal communication inherently involves a physical-social context. Group disbursement of information, i.e., mass e-mailing, however, can be interpreted as ExK, or could be interpreted literally as information.

I have discussed the blurred conceptualization of ExK and information. The context of the response should be interpreted in light of the original question, and purpose of original research, specifically in light of social dynamics surrounding KT as formal or informal, the current Theme being discussed. I thus interpreted this later type of cyber-formal information flow as an explicit knowledge transfer activity.

The challenge I encountered was moving beyond the blurred conceptualization of ExK and information. I had to accept axiomatically that in a ExK–KT dynamic inherently involving SM and SG messages, explicitly or implicitly, information is being packaged in a specific context to support recipient SM.

Premised upon this axiom, mass e-mailing is a type of SM information most meaningfully represented as ExK. Subsequently, the flow mechanisms defined as distribution lists within the organization's information subsystem (ICAS Child Node ISS) control the flow space of this type of formal communication. Using this same rationale, TaK flowing between people creating a KE that involves specific physical-social networking context is more directly influenced by emergent and defined characteristics of the organization's social subsystem (ICAS Child Node SSS).

Thus, within a simple response to a single question by one participant, I was able to conceptualize, based on open and axial coding, subtle differentiation between a TaK-KE and ExK-KT activity (See Figure 32). Additionally, using just Participant 01 coded with classification schema attributes, I had a simple visualization to interpret my resultant number of coded references by original Themes created by Deville (2012) (See Figure 33). I could also see how I had distributed participant coding across a subset of ICAS Nodes and visualize how those ICAS Nodes related to each of the original six KT Themes (Deville, 2012).

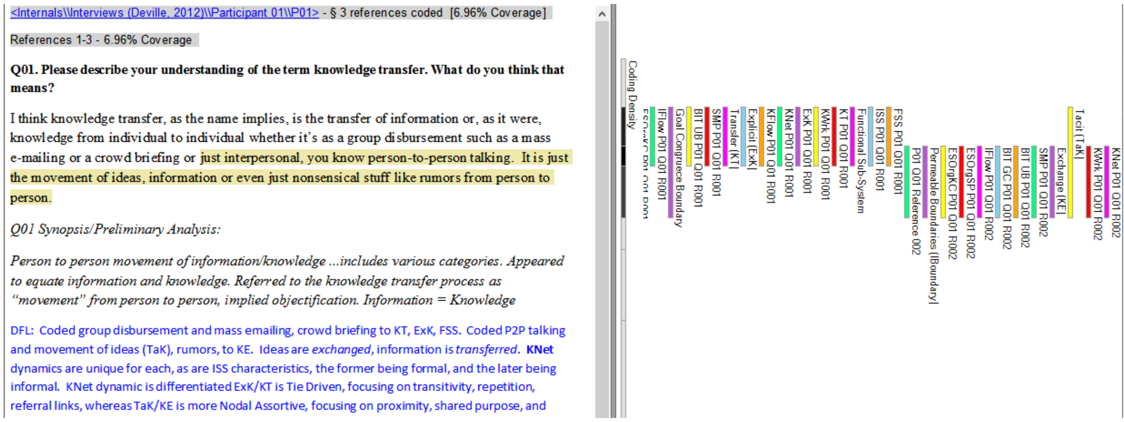


Figure 32. P01 classification coding sample: R001/R002.

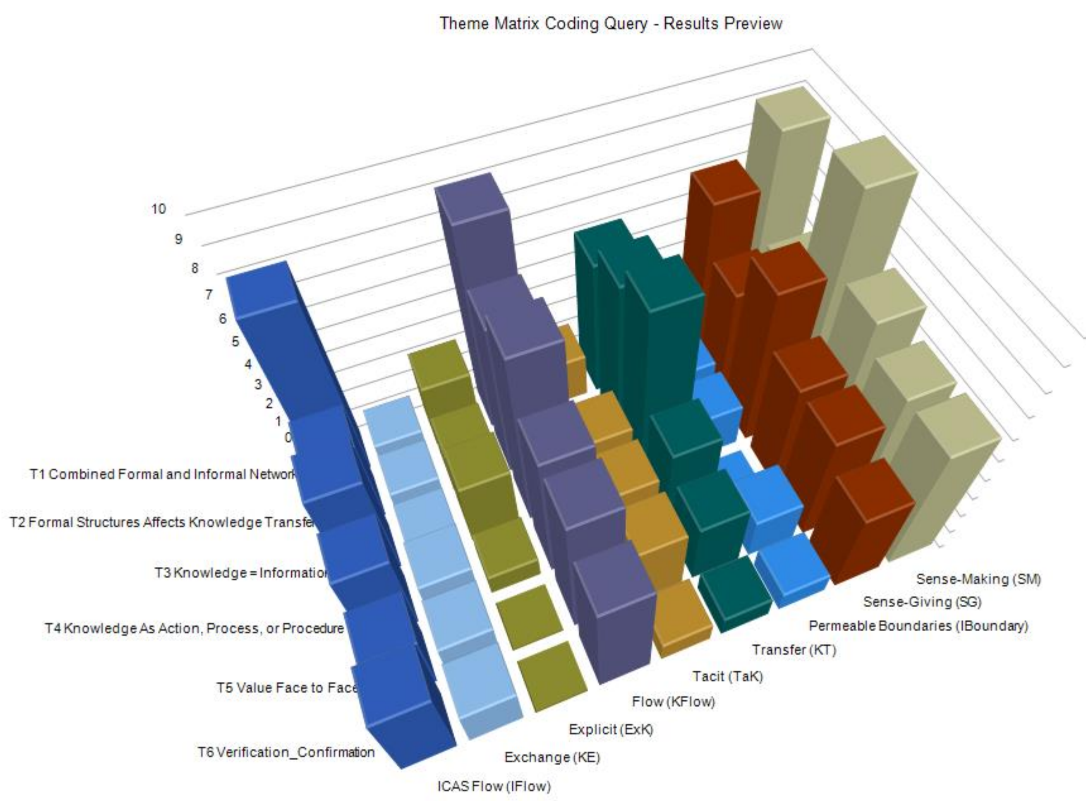


Figure 33. P01 Theme coding sample: ICAS node relationships.

What emerges from even this simple visualization is that there is significantly more TaK than typically interpreted as such by individuals within the organization. Although management may understand intuitively TaK is in motion with ExK, I have an ICAS representation to capture unique instances of each and juxtapose each against other key emergent ICAS characteristics, such as KFlow, KE, and KT, as well ICAS Flow, SM, and SG.

With the various matrices and visual interpretations for Participant 01 available, and shifting forward in thought, I used these visualizations to assist interpreting the following response to Question 01 by Participant 07:

> (laughs) I guess it's the transfer of knowledge from one individual to another. In your line of work I guess, since you're [Deville] studying how it transfers, it be at that level of transfer. In other words, is it truly understood or just superficially understood, what nuances are conveyed. And, I guess it goes back to the definition of what is knowledge. Are facts knowledge or is more application of facts knowledge? So, there are extreme nuances of that, which we're going to get into. Knowledge management is how corporations or governments or whatever control that knowledge, that management. And, not only is facts and figures, but also how it all goes together. And, those parts that can't be written down, how those are conveyed and managed. It's very in depth. (Deville, 2012)

As Deville (2012) reflected on Participant 07's response, captured in his field journal contained in NVivo® memos, he meaningfully intuited that KT as perceived by

Participant 07 involves varying levels of varying types of knowledge exchanges with subtle nuances at each level.

Although Participant 07's response is conceptually very content rich, such responses created complex interpretation challenges in terms of mapping specific phrases representing specific perceptions to one or more ICAS Nodes with specific classification attribute assignments. The challenge involved separating levels and types to begin, and then extrapolate a coherent coding. These types of responses provided an opportunity to move outside the more obvious relationships expressed by Participant 01 in his/her response to Question 01, and move to the more ephemeral as well as emergent areas of the ICAS organization.

Thus, some responses alluded to the more transient nature of knowledge in terms of perishability. Other responses, such as the response provided by Participant 07 to Question 01, provided an opportunity to explore more obscure areas of ICAS organizational emergence, in this instance organizational memory (OM). A key concept to be interpreted from Participant 07's response is that of subtle nuance in terms of management of knowledge, flow of knowledge in terms of conveyance, levels of knowledge, and types of knowledge, while considering the shift from subtle to extreme nuances.

I began by dividing this response along two streams of thought, one captured in P07 Q01 R128 and a second in P07 Q01 R129. Combining reflections by Deville based on his close proximity to the organizational unit under study with my understanding developed from open and axial coding, I interpreted nuances as subtle meanings conveyed in the form of meta-information or SM information to facilitate some shared understanding of knowledge.

As such, shared understanding is implied based on subsequent questions within the interview dialog. As stated previously, interpretation included interpreting phrases at the individual response level framed within that single response, but also meaningfully had to capture illuminations relevant to that response provided by other responses from Participant 07 throughout the bricolage. Likewise, as previously stated, this involved continuous audio interpretation, transcript interpretation, and concurrent interpretation of the two, involving listening and reading concurrently.

Considering the implications of nuance in a knowledge transfer context, I began to truly capture the thought of knowledge in flux as a paradox, more precisely the flux between TaK and ExK, specifically know how and know what (Chae et al., 2005). This specific paradox begins to shape the conceptual framing of organizational transactive memory (Chae et al., 2005).

Transactive OM has the potential to link real-time specific knowledge sources to the participant to enhance SM and provide additional SG (Jackson, 2012). Additionally, transactive OM has been seen to directly and positively influence organizational performance (Jackson, 2012). But, only if ICAS flows create those dynamic connections by directly providing a KFlow framing mechanism that translates organizational potential KFlow to a kinetic KFlow.

A key construct that developed within the dialog space that represents formal and informal structures (Theme T2) in relation to knowledge transfer networks (Theme T1) was that of social dynamics as a preferred transfer medium for tacit knowledge transfer. However, Deville (2012) observed there were specific hindrances to organizational KFlow, although they remained not clearly understood.

During concluding remarks, Deville (2012) stated “additional analysis of social networks could reveal points in the original knowledge where transfer occurs unhindered and where barriers prevent effective transfer” (p. 102). Intuitively, Deville was pondering boundaries and forces within an ICAS organization that inhibit potential KFlows from becoming positively kinetic KFlows. As with all that flows, KFlow can become constrained or blocked, thus creating an ICAS Flow potential force in form of potential KFlow. Significant ICAS potential flow pressures can create unexpected future kinetic IFlows.

With approximately 350 classification attribute values spanning six primary NVivo® Classification schemas, the number of possible charting opportunities provides drill down into specific characteristics to begin to address IFlow and KFlow inhibitors and enablers (See Figure 34). Considering boundaries, inhibitors, and flows, NVivo® Charts can be used to capture key NVivo® Classification schema attribute value relationships. I began by exploring the relationship between various types of KT (KType) along a y-axis, and the types of knowledge within a KNet Space along the x-axis as attribute values assigned to the ICAS KFlow Child Node for Participant 01 responses.

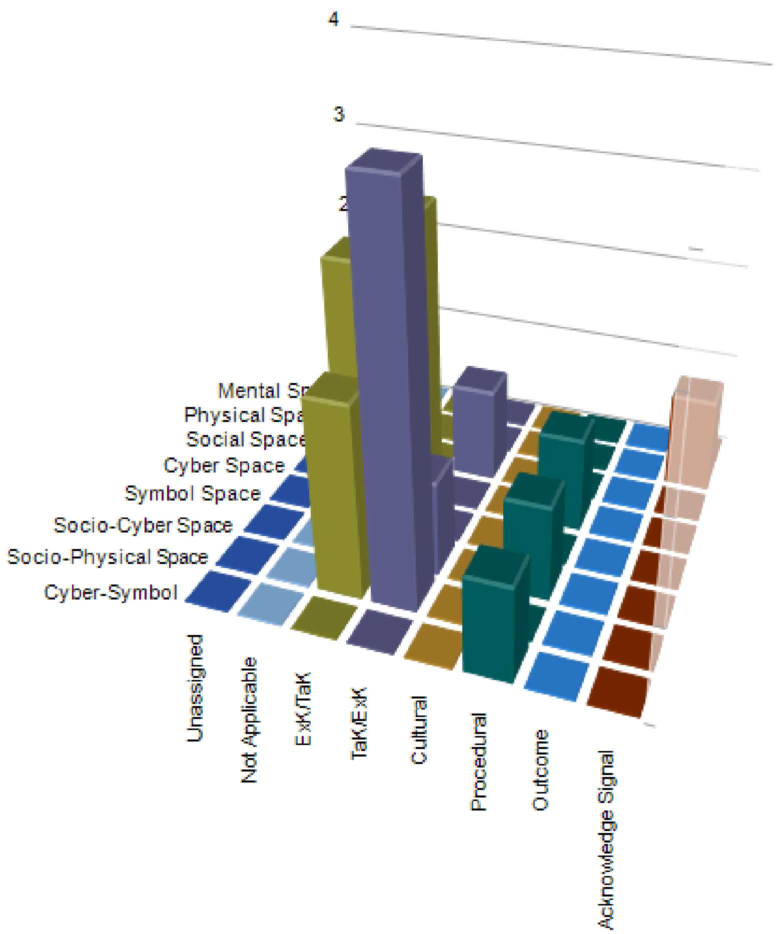


Figure 34. KFlow dynamic: KNet space-KT type chart.

Observing knowledge in flux is not necessarily a challenge. Understanding and interpreting knowledge in flux linked to specific emergent ICAS characteristics has been problematic within existing research. I specifically created the KNet Space classification attributes to begin to capture ExK being translated to TaK (ExK/TaK), as well as tacit knowledge being converted into some form of explicit knowledge (TaK/ExK). I also wanted the opportunity to identify specific types of knowledge in terms of organizational controls, primarily procedural and outcome. Additionally, I wanted to be able to interpret knowledge flowing through an ICAS Instance that was primarily cultural knowledge (Choo, 1998).

Interpreting participant responses, reflecting upon correlations developed during axial coding, with the additional benefit of classification attribute value assignments, several observations emerged. To convert ExK to TaK, ExK has to flow primarily through cyber space to move into a socio-cyber space subset of the cyber space network. From there, knowledge flows from person to person in the socio-physical space (Zhuge, 2014). TaK conversion to ExK should begin in the socio-physical space and then move into increasingly larger networking flows primarily within a socio-cyber space dynamic (Ahuja et al., 2012; Zhuge, 2014).

What appears most significant is a larger percentage of ExK is translated into TaK when compared to TaK translated into ExK, and subsequently not flowing outward into a larger IFlows. From axial coding interpretation I understood more clearly the relationship between TaK and clan controls within a socially complex micro-meso organizational work activity dynamic. In essence, this is a power phenomenon (Hatch & Cunliffe, 2012).

However, in this small subset of coded responses, specifically Participant 01, there is a significant gap in procedural knowledge available to guide TaK/ExK movement into the socio-cyber space from socio-physical space. This gap is precisely the purpose of clan controls (Turner & Makhija, 2006). As Participant 01 observed in his/her response to Question 08 regarding KT inhibitors, he/she felt no particular drive to move such knowledge upward through the chain of command (Deville, 2012). The missing driving force is that force provided by a specific application of clan controls to enable and enhance TaK/ExK movement as a KFlow (Turner & Makhija, 2006). Most importantly, we now have a way to visualize such needs.

Applying this simple interpretation exercise to an increasingly larger set of charting relationships, capturing SM and SG attributes, specific clan control attributes, as well as specific IFlow attributes surrounding this identical ICAS Instance, the added visualization power of the proposed enhanced ICAS KM framework manifests. For example, the visualization created to identify relationships between KFlow characteristics KNet Space and KFlow Type yields but one perspective. When considering this same ICAS Instance, i.e., Participant 01 perspectives, in context to IFlow dynamics, I can now explore KNet Space and KFlow Type in relation to IFlow Direction and IFlow Force Type (See Figure 35).

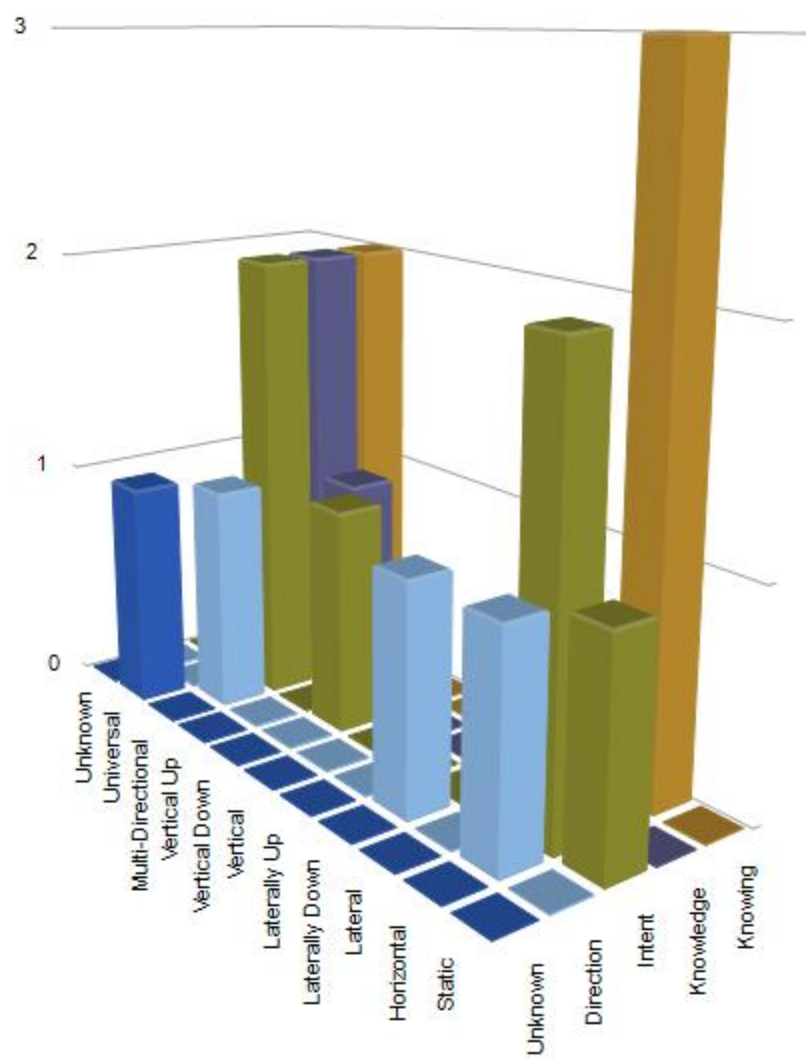
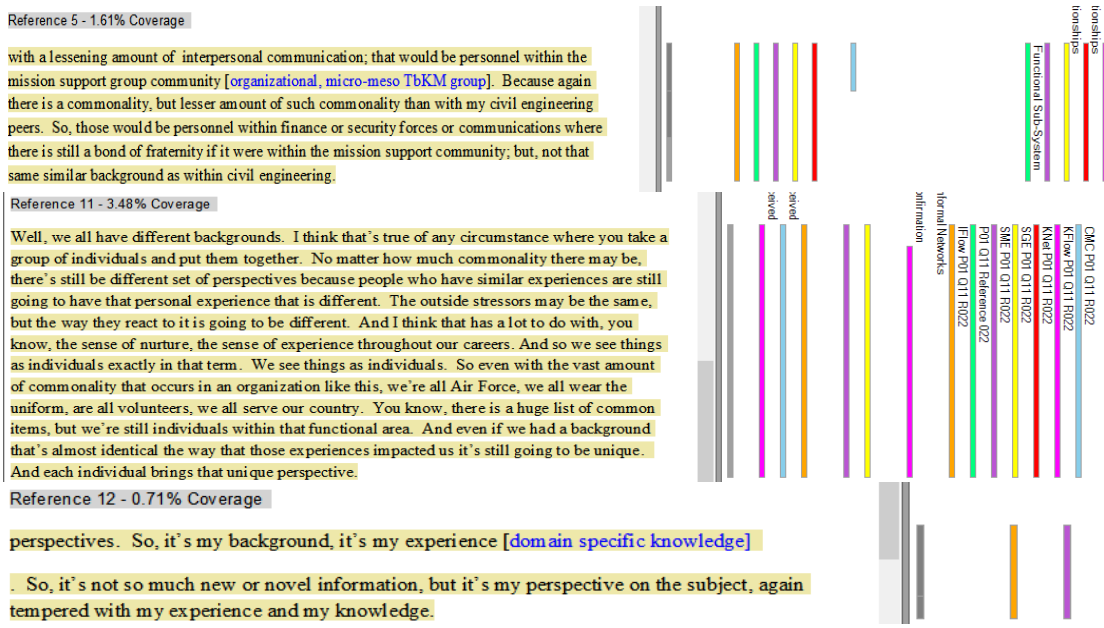


Figure 35. IFlow dynamic: IFlow direction-force type chart.

The z-axis represents various primary flow directions an IFlow can assume, while the x-axis represents the type of force exerted by that very specific IFlow. The number of coded references for Participant 01 is represented on the y-axis. For Participant 01, *knowing* primarily occurs within a horizontal KFlow while *knowledge* most frequently occurs within a multi-directional KFlow or a KFlow that based on participant perception, could be applicable to any direction. What I find most interesting is that SM takes place in that horizontal dialog space within a micro-meso context. The vertical column labeled *knowing* related to *horizontal IFlows* links to three specific coded and high-lighted references (See Figure 36).


Reference 5 - 1.61% Coverage

with a lessening amount of interpersonal communication; that would be personnel within the mission support group community [organizational, micro-meso TbKM group]. Because again there is a commonality, but lesser amount of such commonality than with my civil engineering peers. So, those would be personnel within finance or security forces or communications where there is still a bond of fraternity if it were within the mission support community; but, not that same similar background as within civil engineering.

Reference 11 - 3.48% Coverage

Well, we all have different backgrounds. I think that's true of any circumstance where you take a group of individuals and put them together. No matter how much commonality there may be, there's still be different set of perspectives because people who have similar experiences are still going to have that personal experience that is different. The outside stressors may be the same, but the way they react to it is going to be different. And I think that has a lot to do with, you know, the sense of nurture, the sense of experience throughout our careers. And so we see things as individuals exactly in that term. We see things as individuals. So even with the vast amount of commonality that occurs in an organization like this, we're all Air Force, we all wear the uniform, are all volunteers, we all serve our country. You know, there is a huge list of common items, but we're still individuals within that functional area. And even if we had a background that's almost identical the way that those experiences impacted us it's still going to be unique. And each individual brings that unique perspective.

Reference 12 - 0.71% Coverage

perspectives. So, it's my background, it's my experience [domain specific knowledge]

. So, it's not so much new or novel information, but it's my perspective on the subject, again tempered with my experience and my knowledge.

Figure 36. IFlow coded references: force type *knowing*.

Knowing, based on open and axial coding, has been defined within an enhanced IFlow metaphor as a combination participant and micro-meso cognitive boundaries aligned with SM (Sharma & Good, 2013; Kozlowski & Chao, 2012; Briggs & Reinig, 2010). Knowledge, however, specifically in context to an organizational level IFlow, has been defined as a primary networking force, as a function of competency, ICAS IFlow connections, and KFlow. IFlow Knowledge at this level of organizational context should be viewed differently than knowledge at the individual cognitive level, or even at the micro-meso socially complex problem-solving level, in that each knowledge represents a unique emergent force, either active or potential.

Not all knowledge within an ICAS can be viewed as identical, for the same reason I cannot look at a person based on ethnic background and equate that person's personality or qualities based on their ethnicity. Classification attributes *knowing* and *knowledge* have been conceptualized within an IFlow metaphor to differentiate between knowledge as know-what and the flux aspect of translating know-what into know-how, i.e., the act of knowing. From the perspective of Participant 01, the act of knowing most significantly occurs within the unique trust and social cohesion context of the micro-meso work unit, where common bonds provides for an open sharing of ideas coupled with past experience.

From research, this is reasonable. However, now the knowledge flux paradox is no longer obscured, but becomes visible. What is new and insightful, additionally, is the framework within an ICAS KM representation where knowledge flux and flow represent unique emergent ICAS knowledge relationships. Most importantly, I can look at the TaK/KE activity within a socio-physical space supported by socio-cyber networks and further explore that dynamic relationship in terms of influence on IFlow characteristics, or any of the remaining 55 ICAS Nodes in an ICAS Instance context. Now, I do not have to consider this insight in autonomy of other ICAS relationships, but I have a meaningful way to visually link this type of relationship with thousands of other relationships represented within 350 classification attributes spanning 57 ICAS Nodes.

ICAS Characteristics, Dynamics, and Emergent Behaviors

Considering just the limited relationships identified between KFlow and IFlow in a very small coded reference set from just four classification attributes, yet rich with potential discovery, I can consider SG-SM dynamics in more depth (Maitlis & Lawrence, 2007; Sharma & Good, 2013; Smerek, 2011). There are many ways I could approach this analysis visually, statistically, or some combination of both. I returned to quantitative statistical analysis to explore the ICAS Instance Formula in context to statistically significant relationships using NVivo® Node Cluster Analysis, from three perspectives (See Figure 37).

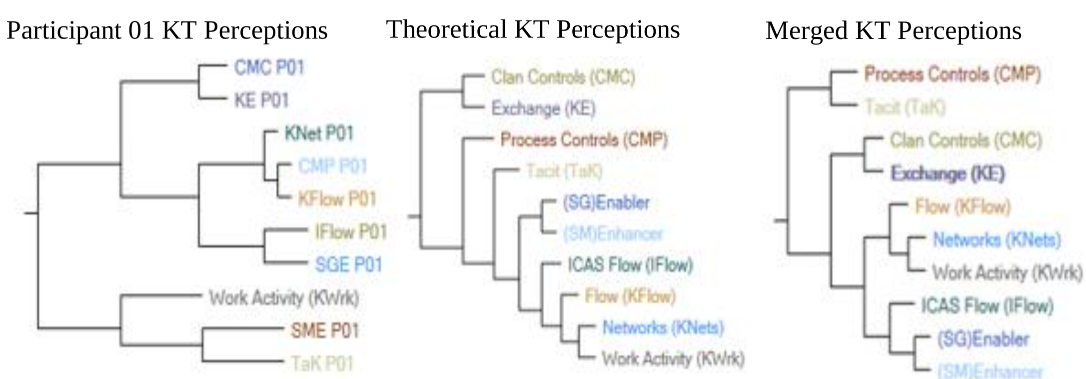


Figure 37. P01-theory-P01 ICAS influence: IFlow, KFlow, KWrk, and SM-SG dynamic.

The left perspective represents the significant relationships found simply by looking at Participant 01 perceptions of knowledge transfer within his/her organization. The middle perspective captures our original theoretical foundations from axial coding, i.e., the Parent/Child ICAS Nodes without Participant 01 perceptions coded to classification attributes. The middle perspective could be considered a theoretical baseline, in this context. The right perspective is what happens to the theoretical foundation when I applied the influence of Participant 01 perceptions. From axial coding, I understand there is a significant set of Pearson correlations linking all these Node relationships within each respective perspective.

As I considered the middle representation, based on theoretical foundations, the strongest correlation occurred between (SM)Enhancer most significantly and directly influencing (SG)Enabler ($p = 0.972758$). KWrk most significantly and directly influenced KNets ($p = 0.935832$), while concurrently significantly and directly influencing KFlow ($p = 0.933596$). KNets also significantly and directly influenced KFlow ($p = 0.932363$).

Working down through the significant and direct correlations, process controls (CMP), within the control mechanism cluster of outcome, process and clan controls, was seen to least significantly and directly influence KFlow ($p = 0.723397$), although remaining a significant statistical correlation. Clan controls (CMC) were found to more directly influence (SG)Enabler ($p = 0.840414$) and (SM)Enhancer ($p = 0.83999$), when compared to process controls (CMP) influence on (SG)Enabler ($p = 0.798884$) and (SM)Enhancer ($p = 0.782659$).

What was surprising was the more significant direct influence of TaK on KFlow ($p = 0.912677$). KFlow appeared to significantly influence (SM)Enhancer ($p = 0.862232$), while IFlow appeared to more significantly influence (SG)Enhancer ($p = 0.894908$). I anticipated clan controls to significantly influence KE. However, I found KE significantly influenced clan controls ($p = 0.861715$), while KNets more directly influenced KE ($p = 0.865947$). After reflection, I considered this statistic to provide a unique insight into the relationship between KNets and control mechanisms within a

KFlow, as KFlow relates to IFlow. These findings are consistent with anticipated theoretical relationships, based on axial coding.

As I considered the baseline visualization in context to SM–SG dynamic, I found characteristics of KNets influencing and shaping KFlow, while KNets influenced the shape and force of IFlows, which subsequently influenced the shape of KFlow. IFlow and KNets appeared to work in an emergent relationship to influence SG enabling, while KNets and KFlow seemed to work in an emergent relationship to influence enhanced SM. I interpreted this as KFlows more directly working within a micro-meso KWrk dynamic, while KNets *flow* (KFlow) TaK into an emergent IFlow force. KFlows in turn influenced SM while KNets and IFlow influenced SG. And, this only considers the TaK-KE dynamic in context to SM-SG dynamic.

With this baseline established, I compared just Participant 01 responses coded as ICAS Child Nodes with assigned classification attributes to the established baseline, represented by the left visualization (See Figure 37). Most significantly, P01 (SG)Enabler had a significant and direct influence on P01 KE and P01 IFlow, while P01 KFlow and P01 KNet had the most significant influence on P01 process controls (CMP). As Participant 01 perceived KT within his/her hierarchical military organization, process controls (CMP) containing inherently rigid communication protocols were considered a significant inhibitor to KFlow. When SG was perceived as a significant enabler within the KT dynamic, I interpreted Participant 01 perceptions of this influence most significantly in terms of KE.

SG was seen by Participant 01 as a natural desire to exchange ideas (KE) in a socio-physical dialog. Participant 01 expressed this in terms of new ideas and excitement to spontaneously share those ideas, i.e., new knowledge (TaK). From the perspective of P01, KE was a spontaneous result of creativity, specifically new ideas, and I interpreted this in context to enabling SG. However, Participant 01 expressed no interest in transferring that same creative thought outside of his/her micro-meso TbKM activity space. The creative thought would either flow somehow up through the chain of command, or it simply would not.

When I combined the perceptions of Participant 01 with the theoretical baseline from axial coding, I see the visual influence on the knowledge transfer dynamic captured in the right Node Cluster Analysis (See Figure 37). Not surprisingly TaK still significantly and directly was seen to influence KFlow, but interestingly that relationship appeared strengthened (p = 0.920889). In the axial coded baseline, TaK was seen to strongly influence KFlow (p = 0.912677). Perhaps of more interest, KE more significantly influenced the presence of clan controls (p = 0.921674). I interpreted this as the *enthusiasm* to share new ideas becomes, in essence, a form of clan control. Most interestingly, the relation to the research questions was the presence of a specific emergent force at the micro-meso TbKM level that could be directly correlated statistically to clan controls.

IFlow was still a significant (SG)Enabler (p = 0.881801), while TaK, KNets, KWrk, and KFlow were seen each in turn to significantly and directly enhance SM. Considering the initial visualizations of just four classification attributes, I interpreted this as consistent with the primarily micro-meso TbKM dynamic resulting from questions framing the *most frequent* nature of KT discussed by Participant 01 with Deville (2012). The predominant classification of Participant 01 perceptions was in the socio-physical and socio-cyber KNet domain.

Many additional insights and correlations emerged from this comparison activity, but these represent a meaningful representation of the potential to explore emergent ICAS dynamics in context to just KT. I would have enjoyed, with an additional several hundred hours of coding, mixing several other Participant perceptions into this dynamic with classification coding, especially the perceptions of Participant 08 who I interpreted as a senior officer within the organization, and Participant 10, who I interpreted based on responses as a senior staff NCO working underneath Participant 08. However, in context to current research goals, the power of the enhanced ICAS KM framework perhaps became most meaningfully conceptualized at the individual level.

Lastly, I explored composition emergence and compilation emergence. To summarize, what I found most significant was not the presence of composition emergence; and it was present (Kozlowski & Chao, 2012). I anticipated composition emergence based on the hierarchical nature of a military organization, most specifically the type of unit involved with a primary quality assurance purpose to monitor consistent operational efficiency based on published standards and regulations.

What I found more significant was the coherent framework represented by an ICAS instance formula that captured the specific characteristics of composition emergence within an enhanced ICAS instance, represented by shared perceptions of 11 participants. In this context, significant cognitive boundary alignment spanning organizational units resulted from (a) shared purpose (Ackerman & Halverson, 2002; Briggs & Reinig, 2010); (b) consistent SM (Kozlowski & Chao, 2012), and; (c) functionally equivalent activities and roles spanning organizational units (Kozlowski & Chao, 2012).

Kozlowski and Chao (2012) defined forms of composition emergence as “homogeneous, linear, and convergent, whereas compilation forms are heterogeneous, nonlinear, and divergent” (p. 338). In both cases, all forms of organizational emergence begin at the smallest micro-meso context and are constrained by overarching organizational structures. Based on complex networked relationships and specific ICAS dynamics, I might anticipate unique manifestations of a specific type or form of organizational emergence. The best that could be conjectured, however, was a normalized representation of type of convergence curve that would manifest under organizational conditions as influencing composition or compilation type emergence (Kozlowski & Chao, 2012).

Although significant conceptually, there remained no meaningful framework to apply emergent forces to these conceptualized compilation and composition forms of organizational emergence (Kozlowski & Chao, 2012). As such, “our ability to advance knowledge about the nature of emergence for psychological and social phenomena in organizations—what it is, how it varies, what shapes it—is hampered (Kozlowski, 2012a)” (Kozlowski & Chao, 2012, p. 341). What I was able to effectively capture was an explicit representation of a composition emergence within an ICAS Instance metaphor visualization.

ICAS forces representing homogeneous, linear, and convergent emergence characteristics were captured explicitly for Participant 01. Although we might predict composition emergence for a hierarchical military organization, we had no way to demonstrate what it manifests as, i.e. what it actually appears as in form, how it varies, and what shapes it within Deville's (2012) organization. Many facets of emergence remained hidden, including (a) how composition emergence manifests in terms of specific organizational structural constraints including power phenomena; (b) what social networking relationship factors influenced that emergence, and perhaps more importantly; (c) what that specific emergence influence is upon other ICAS emergent phenomena (Deville, 2012; Hatch & Cunliffe, 2012; Kozlowski & Chao, 2012).

With an ICAS Instance metaphor visualization, I can show *what* manifests, *how* it manifests and varies, and *what shaped* that particular manifestation. But perhaps more significantly, I now have a visualization framework to capture *how* that emergence influences other emergence within the ICAS organization. I would extrapolate this to be true for heterogeneous and divergent composition emergence.

Summary

I began analysis by creating a foundational ICAS Node representation within the NVivo® project. This foundational structure consisted of 57 NVivo® Parent/Child Nodes. Open coding included (a) importing 11 participants, both audio files and transcripts, from Deville's original NVivo® database (2012); (b) creating an additional

165 Participant Question NVivo® Case Nodes, and; (e) auto-coding 15 Question Aggregate Case Nodes, each aggregate Case Node capturing the response to the same question presented to the 11 Participants.

Additionally, open coding included importing approximately 400 journal references, culled to a subset of 127 journal articles, coded to NVivo® Nodes and classified with a Source Classification schema to validate percentages of references by year. Open coding linked theoretical foundations conceptually to specific ICAS Nodes. Open coding concluded with a preliminary ICAS Node structure grounded in theoretical foundations.

Axial coding activities included formalizing the NVivo® ICAS Node structure by linking specific phrases and concepts from theoretical foundations to specific ICAS Parent/Child Nodes. As theories were added to the ICAS Node structure, ICAS Nodes became enhanced metaphors representing ICAS emergent dynamics and forces. The ICAS Node structure was validated against the original six KT Themes developed by Deville (2012). The imported 11 Participant transcripts were coded to 323 response Child Case Nodes. Each of the 323 Participant Response Child Case Nodes were coded to Deville’s original six themes and triangulated back to Deville’s original interpretations.

Throughout theory coding, NVivo® Classification schemas evolved to include salient attributes of each new theory. As each new theory informed previous theory coding to specific ICAS Nodes, I created a series of evolving NVivo® Cluster Analysis Reports to continuously validate the integrity of the ICAS Node structure being created. Reflecting upon the results of each report, coupled with new insights resulting from infusing the ICAS Node structure with additional theoretical perspectives, I was able to meaningfully evolve six NVivo® Classification schemas collectively containing approximately 350 discrete attributes. Specific attributes represent very specific organizationally defined and emergent ICAS characteristics. Axial coding concluded with a meaningful interpretation of findings sufficient to identify the focus of Participant responses to be analyzed during selective coding.

The final coding phase, a grounded theory selective coding equivalent, began with applying classification attributes to a discrete subset of the 323 coded participant responses, specifically the 28 Child Case Nodes created for Participant 01 during axial coding. I then created visualizations and interpreted the significance of each visualization. Each visualization was shown to add new insights to existing research and in several instances, specifically addressed questions that remained unanswered at the conclusion of that prior research.

Selective coding concluded with a brief discussion regarding the benefit of the enhanced ICAS KM framework to interpret specific perspectives of emergent characteristics of the ICAS organization, specifically in context to composition emergence (Kozlowski & Chao, 2012). Applying unique classification attributes to specific individual perceptions created unique ICAS instance visualizations capturing many complex ICAS IFlow and KFlow dynamics. Such visualizations could provide management with additional insights necessary to govern more effective KT.

In Chapter 5, I discuss in greater depth how findings presented in this chapter enhance our understanding of emergent organizational ICAS characteristics and forces.

These enhanced understandings are then directly related to each research question. This discussion will focus on two primary concepts raised by the two primary research questions. Firstly, I will discuss how blending select inter-disciplinary theoretical foundations can enhance our understanding of the ICAS organization. Secondly, I will discuss how such enhanced understandings can potentially improve organizational management of knowledge in flux, a knowledge-economy firm’s most significant intellectual capital. Finally, I discuss how the proposed enhanced ICAS KM framework could be applied to the larger body of knowledge management literature.

Chapter 5: Discussion, Conclusions, and Recommendations

Each participant uniquely perceived organizational a KFlow phenomenon as an *object* of ICAS awareness (Heidegger, 2006). KT as a type of knowledge object is embedded within KFlow, thus was also perceived uniquely between participants within any given KFlow phenomenon (Deville, 2012; Heidegger, 2006). Consequently, ICAS knowledge objects conceptualizing organizational forces are embedded uniquely in the mind of each participant, albeit veiled at times to their conscious mind (Boxenbaum & Rouleau, 2011; Heidegger, 2006). This represents a significant ICAS potential force.

Two levels of awareness, one level in terms of what, and a second level in terms of how and why, shaped each participant's perception of ICAS knowledge and KT activity. These two levels of awareness concurrently shaped a veiled perception of ICAS emergent forces surrounding each participant's perception of knowledge related to their specific work activity.

Firstly, each participant's unique personal experience with an ICAS object, e.g., a KT phenomenon, frames that ICAS object's immediate nearness, creates a KT awareness (Heidegger, 2006). Secondly, interpreted through the organizational culture filter and ICAS environment, KT thingness frames an experiential reality for each participant (Heidegger, 2006). Organizational dynamics were perceived, albeit veiled, by participants as they came to understand the organizationally contextual essence of knowledge and KT (Deville, 2012). This essence of KT in terms of *what* KT takes place was the foundation of Deville's research questions, data collection, and interpretation.

Extending the original interpretations of participant observations, I likewise perceived organizational ICAS objects of awareness, i.e., emergent ICAS forces and dynamics, as being close or far away from each participant (Ahuja et al., 2012; Heidegger, 2006). However, only after I drew near the ICAS activity in context to organizational flow dynamics, i.e., during selective coding and interpretation, did I experience the thingness of participant knowledge activity (Heidegger, 2006).

The resultant additional experiential understanding as ICAS object visualizations was the underpinning philosophical reality to all phases of interpretation, i.e., the *how* and *why*. The pursuit of reality in this context was my journey towards discovery of emergent organizational ICAS dynamics and forces true essence (Heidegger, 2006). I sought to unveil participant perceptions of ICAS forces surrounding their unique perception of KT activity.

The combined experience of a) original researcher notes, b) participant perceptions expressed in audio files, and c) visual interpretations of written participant transcripts became the foundational blending of sound, image, and word (Heidegger, 2006). As this blending was subsequently combined with my previous experiences, I became aware of the essence of ICAS organizational KT activities and events. Yet, I was constantly aware that there was a spirit within the original organization that I could not experience, but simply captured glimpses of that spirit through reflexive engagement, i.e., the bricolage experience (Boxenbaum & Rouleau, 2011).

Sayer (1992) intuited that meaning becomes negotiated as a result of some social interaction or discourse. Meaningful bricolage to conceptualize an individual's perceived reality of knowledge and KT in terms of emergent ICAS behaviors, forces, and activities, became fundamental to analysis and interpretation when considering organizational emergence. I constructed relationship-building bridges between myself (researcher) and original participants, as well as original organizational context within the NVivo® project, from design to model representation (Boxenbaum & Rouleau, 2011; Deville, 2012; Hutchison et al., 2010).

I established researcher-participant trust relationships to create a place of sensible meaning for capturing nearness of individual perceptions in relation to observed emergent organizational phenomena (Heidegger, 2006; Laverty, 2003; Pringle et al., 2011). With historical research participants, this required significant reflexive activity constantly monitored for researcher bias, while adhering to the underpinning philosophical approach to knowledge and reality within evolving double-hermeneutic spirals (McKemmish et al., 2012; Wagner et al., 2010). There has to remain in this level of reflexive activity with historical subjects a sense of continuous nearness to individual perceptions as representing a living person, vs. simply analyzing data and interpreting an inanimate and historical text document.

Interpretation of Findings

Although each research foundation represented a limited perspective, a very focused and granular perspective of larger organizational ICAS emergent dynamics and behaviors, each provided a unique and meaningful micro-perspective I could infuse into an enhanced ICAS organizational framework (Boxenbaum & Rouleau, 2011; Brinks et al., 2013). As I searched for specific cues to enhance ICAS Node metaphor meaning within each research foundation, I found that concepts and terms could be linked to specific ICAS Nodes rendering very meaningful correlation coefficients represented by multiple NVivo® Node Cluster visualizations. I found Pearson correlation coefficients coupled with a visual 3D model that could be rotated around any axis and in all directions extremely meaningful for interpreting a multidimensional perspective of any given ICAS instance.

The power of the enhanced ICAS KM framework became a meaningfully complex, yet coherent and single metaphor when infused with approximately 350 ICAS classification attribute values spanning six primary classification schemas. Although I assigned several vectors in terms of NVivo® Relationship, I found these vectored relationships less meaningful than anticipated. What I discovered most meaningful, however, was the inherent power of the enhanced ICAS KM metaphor for Participant 01 to contain both KFlow and IFlow vectors by nature of ICAS classification attribute values.

My original premise was not to obfuscate vector dynamics within an ICAS instance, within a myriad complex of classification attribute values. Rather, my focus was to emulate a meaningful set of NVivo® Relationship vectors for enhanced analysis. Embedded with classification schemas, with each schema applied to multiple ICAS Nodes, I was able to more effectively create meaningful microvectored representations of any given ICAS instance.

I felt I had crossed a significant research paradigm boundary within the field of KM. Many historical and theoretical foundations find some culminating visualization or interpretation in the form of diagrammed objects connected with arrows. In some cases, these arrows would represent specific causal relationships (Briggs & Reinig, 2010; Nissen, 2006); while in other cases, they simply would represent correlated influence (Ahuja et al., 2012). I began my original enhanced ICAS KM framework with this later perspective as an anticipated conceptual outcome, a large vectored ICAS Node dynamic.

Regardless of perspective, the paradigm that predominates existing KMS theoretical research is that of vectored relationship. For example, vectored relationship paradigms remain visible in the final presentation of a two-dimensioned enterprise knowledge ecosystem (EKE) (Huo, 2015). Each EKE mechanism was comprised of events and experiences, or some blend of substantial and emergent organizational objects. Yet, the outcome was a single vectored process relationship between the two foundational knowledge mechanisms (Huo, 2015; Langley et al., 2013).

However, the challenge is more complex than simply understanding vectored relationships. As Langley et al. (2013) observed, distinctly autonomous and local interactions gradually connect, resulting is some emergent and integrated institutional form. Kozlowski and Chao (2012) stated a similar though in relation to composition and compilation emergence. Only within complexly interwoven IFlows can some sense of ICAS force flow manifest, and then not in a consistent vectored relationship, but in a shaping or influencing sense within that ICAS instance.

It is within this stream of thought where KMS research should shift in paradigmatic thought away from knowledge process vectors to a more fluid, organic, and emergent ICAS organizational dynamic visualization. Within such multidimensional visualizations, where IFlow and KFlow are present, any given ICAS Instance shape is most meaningfully visualized as a framing context.

However, each historical theoretical foundation, inherently rich with meaningful process microvectored relationships, was absolutely fundamental in framing my final organizational ICAS metaphor visualizations. The KT-KE Dynamics Metaphor Visualization is presented here as representative of many that emerged.

Such visualizations premised upon rich microvectored relationships allowed more meaningful capturing of emergent flow dynamics within a specific KFlowT. It is, in the final analysis, the combination of time and flow that creates the preponderance of existing paradoxes, yet to be fully understood in KMS research, and in a larger context management research (Langley et al., 2013). In any given ICAS visualization, emergent ICAS forces, such as IFlow and KFlow, although having kinetic force and influence potential, may have aspects of each force that rest dormant or may be in the act of creation within any given ICAS Instance.

As seen in my final comparative analysis and interpretation of an ICAS Instance in Chapter 4, comparing Participant 01 against an ICAS Node theoretical foundation, vectored flows such as KFlow and IFlow could only be most meaningfully interpreted in context to all other ICAS characteristics captured in that unique ICAS instance microperspective. And, just as SM and SG individual dynamics could not be interpreted independent of each other, the more complex SM–SG dynamic could not be meaningfully interpreted independent of time and flow dynamics manifest within the ICAS Instance, as perceived by Participant 01.

As illustrated, an ICAS Instance is not simply a visualization of forces snapshot at an instant in time, but should also be visualized within the larger meso-macro flow dynamics across time. Blending theoretical framework captured in ICAS Nodes, I had a sense of an organizational ICAS metaphor shape. Adding just one Participant perspective provided unique opportunities to capture insights into perceptions of KT over time and at specific instances. A next generation ICAS modeling capability could capture thousands of microvectored instances, and similar to weather forecast, begin to forecast how these will shape the organizational knowledge ecosystem climate.

Interpreting participant responses, or observed organizational emergent phenomenon, thus had a coherent and meaningful ICAS metaphor as a visualization aid. Each phase of analysis simply provided a unique perspective to an emerging ICAS metaphor visualization as an interpretation aid.

ICAS Metaphor Visualizations

Phase one visualization included a) validated NVivo® representation of an enhanced ICAS organization, b) statistically showed tensions and relationship directions that could be interpreted as ICAS flow tensions, and c) provided a meaningful visual framework for phase two analysis and interpretation. During axial coding, I then linked participant observations to the resultant ICAS Nodes and/or used those observations to further enhance Node Classification schemas. Axial coding thus had a focus, i.e., to validate an enhanced ICAS KT-KE dynamic that would emerge during selective coding as an ICAS *metaphor* (See Figure 38).

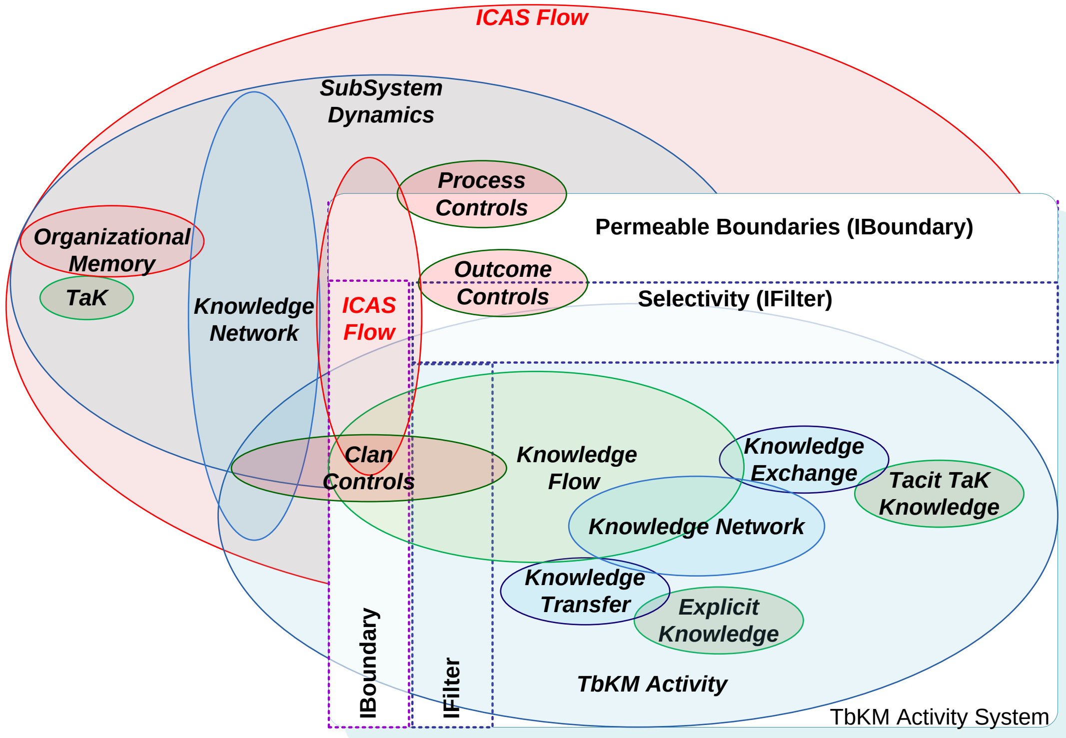


Figure 38. Enhanced ICAS KT–KE dynamics.

A significant outcome from phase one open coding correlation coefficients and second phase axial 3D visualizations included enhanced understandings of ICAS permeable boundaries and selectivity, ICAS Nodes IBoundary and IFilter, respectively (Bennet & Bennet, 2004). ICAS permeable boundaries were originally conceived as a barrier in flux, filtering out while concurrently allowing certain ICAS forces and objects to flow through, analogous to an organic sponge (Bennet & Bennet, 2004).

ICAS selectivity was a subsequent and *vectored* ICAS activity involving cognitive boundary alignments (Ackerman & Halverson, 2000; Bennet & Bennet, 2004; Briggs & Reinig, 2010). I have reinterpreted both as contained within an evolutionary organizational dynamic that continuously generates new organizational knowledge as a type of complex I-Space dynamic (Boisot & Sanchez, 2010).

The emergent and complex I-Space in essence creates an ICAS flow shape throughout any given I-Space instance (Boisot & Sanchez, 2010; Kozlowski & Chao, 2012). What I found most significant was that the shape of IFlow as an I-Space dynamic occurred concurrently at multiple levels of the organization. At one level, the micro-meso social TbKM level, various team clan controls, localized cultural and social norms, as well as KNet dynamics surrounding KT–KE activities within TbKM KWrk shaped the micro-meso TbKM problem and solution space. In this context, the I-Space is simply an emergent and continuously morphing force field (Boisot & Sanchez, 2010).

Based on multiple NVivo® Node Cluster analyses spanning many hundreds of correlation coefficients, macro-meso and organizational subsystem dynamics were seen to shape IFlow dynamics surrounding the micro-meso TbKM activity system. What became apparent through axial and selective coding interpretation was that IFlow also significantly influenced macro-meso TbKM activity system dynamics, unique to that TbKM activity system (Ahuja et al., 2012; Bennet & Bennet, 2004; Kozlowski & Chao, 2012; Linger et al., 2007). However, macro-meso to micro-meso TbKM activity systems were seen as not necessarily distinct subsystems, implied by the Australian KM ecosystem (Linger et al., 2007).

The specific IFlow shape during an ICAS instance is influenced by social and cultural subsystem dynamics surrounding all TbKM activity subsystems, as micro-meso TbKM activity outputs pass through the IBoundary-IFilter force field via KNets carrying

KFlows. As a knowledge flow–knowledge network dynamic (KFlow–KNets), these micro-meso TbKM outputs shape organizational memory (OM) while shaping organizational knowledge network dynamics. As rhetorically congruent messages were seen to provide SG consistency while passing through organizational KNets (Ahuja et al., 2012; Sillince, 2005), I interpreted micro-meso TbKM activities influencing macro-meso TbKM activity dynamics within Deville's organization as a composition emergence (Kozlowski & Chao, 2012).

The direction or tension of ICAS force IFlow, i.e., which Node(s) influenced and which were most significantly being influenced at any moment in time, can most meaningfully be interpreted as a confluence of multiple ICAS dynamics outside, passing through, and within a TbKM activity subsystem dynamic. These ICAS dynamics include, among others, a) physical-socio-cyber networking dynamics (KNets), b) knowledge flow dynamics (KFlow) surrounding KT–KE dynamics, and c) various types of organizational controls as a collective control *framing* mechanism that contain embedded SG–SM information (Ahuja et al., 2010; Boisot & Sanchez, 2010; Kozlowski & Chao, 2012; Nissen 2006; Turner & Makhija, 2006).

Within this context of framing mechanism, ICAS Nodes representing the SG–SM dynamic, although specifically coded with classification attributions within an ICAS Node structure, become homogenized within KFlow and IFlow. Degree of blending and degree of influence then become a function of many other ICAS emergent characteristics, perhaps most specifically visualized as a type of I-Space force field.

ICAS force fields can repulse or attract, be impenetrable, or become some degree of permeable. In essence, this correlates significantly to conceptualized force phenomena that infuse all organizational subsystem phenomenon (Hatch & Cunliffe, 2012). IBoundary and IFilter, when infused with procedural–outcome–clan control dynamics, create a Boisot I-Space type force field linking micro-meso and macro-meso TbKM within an ICAS instance. This is a very powerful resultant ICAS force in flux, unbound from time and space, yet during any given ICAS instance, manifests within and around socially complex KNets.

KNets thus exist both within and without the TbKM domain of activity, i.e., the TbKM activity system, and were seen as linked through ICAS permeable boundaries and cognitive filtering, individually and organizationally by KFlow dynamics. In the enhanced ICAS KT–KE Dynamic conceptualization (See Figure 29), the IBoundary and IFilter are actually tightly coupled together, visualized as two ICAS Nodes but acting as a single sponge (Bennet & Bennet, 2004), or type of Boisot I-Space force field (Boisot & Sanchez, 2010). Collectively, this force field allows knowledge to move outside the TbKM activity system boundary, thus becoming an ICAS *knowing* force, or constrains TbKM activity knowledge within that boundary, thus becoming an SM–SG inhibitor (Ahuja et al., 2012; Boisot & Sanchez, 2010; Linger et al., 2007).

Thus, subsystem dynamics rest within IFlow dynamics, both shaping and shaped by, move through the IBoundary–IFilter dynamic, and influence the shape of the IBoundary-IFilter force field at any point of time. The degree to which social and cultural subsystem dynamics pass through and influence TbKM activities are most significantly linked to clan controls when creativity is a primary TbKM outcome. Process and outcome controls are more meaningfully influenced by functional and political subsystem dynamics when consistent organizational precision requires centrally coordinated organizational activity.

Collectively, all ICAS forces shape a specific IFlow. IFlow then becomes integral to shaping the IBoundary-IFilter dynamic, i.e., an ICAS I-Space force field (Boisot & Sanchez, 2010). Thus, the I-Space force field touches and is touched by all control dynamics, as well as KFlow emergent dynamics and KNets, structured and emergent, both within the micro-meso TbKM activity system as well as at the macro-meso organizational level activity systems. The simple 57 ICAS Node relationship with a minimally sufficient volume of discrete classification attribute values have begun to visually represent these dynamics with new insights. These new insights have in turn provided enhanced understanding of complexly emergent and paradoxical organizational ICAS behaviors.

Perhaps a most significant management practical application would be to likewise consider enhancing KT potential within the ICAS organization not as a process implementation or improvement exercise, but as holistic shaping activity. Understanding various organizational visualizations of ICAS instances representing current organizational ICAS dynamics has been shown to provide clearer understanding of force types and force loci within that dynamic. Each clearer understanding represents a microshaping opportunity, not a process improvement opportunity; although, processes are inherently involved in any information system, and therefore inherent to any given ICAS instance.

Likewise, KM within the ICAS organization is not simply a socio-technical organizational transformation exercise, although some form of continuous socio-technical organizational transformation is inherent to the learning organization. And, only a continuously learning organization can sustain intellectual capital over time in the form of a knowledge garden (Ackerman, 1998). Consequently, KM within the ICAS organization should become a collective learning experience requiring shifts in mental models, both within management and within the ICAS organization's knowledge seed, the individual.

The most meaningful way to present the need for shifts in mental models is perhaps by visualizing a current ICAS Instance as a series of ICAS Metaphor visualizations. With such rich visualizations, both managers and individuals perhaps would be able to perceive more clearly their respective influence on the formation of that ICAS Instance.

Implications for Social Change

We live in a knowledge economy. However, the context of knowledge economy within an ICAS organization is shifting. ICAS organizations are being pulled into a vortex of rapidly increasing change. Historically simple cyber-social networks are morphing into increasingly complex physical-socio-cyber networks, and are becoming additionally more complex as AI-infused cyber-symbol-socio-mental-physical spaces (Zhuge, 2014). Management, within the ICAS organization, should collectively embrace a paradigm shift of thought to better understand knowledge within their organization. Knowledge should be viewed not simply as a management challenge, but understood intuitively as an organic garden requiring cultivation as a collective organizational stewardship responsibility (Ackerman, 1999, Vo, 2012).

Knowledge as a garden to be cultivated represents a paradigm shift of thought, as a new management mental model, and is not bound to organizations and governments, any more than complex socio-cyber networks today are bound to organizations and governments. Complex socio-cyber networks today collapse both into unique quasi-virtual spaces (Zhuge, 2014). I would argue that our society is becoming embedded within complex socio-cyber networks, a present immersion reality. Governance and control within and shaping traditional embedded systems are shifting outside the direct influence and control of individuals, organizations, governments, and to a degree society at large.

In the same context that ICAS organization leadership cannot directly manage organizational knowledge, neither can individuals manage directly their immersed presence in cyber space. If I am a member of an ICAS organization, then, I am present in cyber space and I have no direct control over the degree of that presence. I am immersed in a cyber-social and complexly emergent network of relationships. If I cannot begin to understand my responsibility as a steward of my presence in those relationships versus manager of my presence in complex cyber spaces, then I simply will be swept into or immersed in a vortex of change beyond my control. But, if I can embrace my role as steward of my presence, then, I can begin to embrace a globally social imperative to be responsible for my presence in all complexly emerging cyber spaces.

Creating meaningful ICAS Metaphor visualizations for individuals, whether in high school academic settings or within organizational training settings, could begin to provide opportunities for individuals at varying ages of comprehension to more meaningful understand their shared responsibility as an individual steward of their presence within an emerging complexity of AI-infused cyber-symbol-socio-mental-physical spaces (Zhuge, 2014). The earlier an individual's awareness of his/her individual responsibility as a knowledge steward, the greater potential for ICAS organizations of the future to become collectively better stewards of a critical global asset, i.e., intellectual capital created within a global knowledge garden.

Recommendations for Action

Using ICAS Metaphor visualizations may yet provide management the opportunity to explore collective stewardship responsibilities of any firm's most precious resource, i.e., intellectual capital as a by-product of continuous organizational learning over time. Complex emergent forces and characteristics of the ICAS organization should be shaped vs. managed in a traditional sense. Subsequently, IC should be shaped collectively, not managed directly. ICAS Metaphor visualizations are not a panacea, nor are they intended to represent every facet of the ICAS organization. With advances in AI and quantum computing, such holistically enhanced visualizations may yet become reality. I anticipate at that singularity moment, our need to interpret such visualizations may very well become obsolete.

In the interim, ICAS Metaphor visualizations can be leveraged by organizations to better understand emergent characteristics of their organization that shape their firm's IC. Enhanced understandings could in turn become the foundation for new mental models embraced by individuals, not the organization in relation to some massive transformation program. Thus, process improvement and organizational transformation fundamental to KM in a historical sense, should be complemented with shifts to organic knowledge garden stewardship at an individual moment in time. And, ICAS Metaphor visualizations provide unique opportunities for each individual to perceive their respective stewardship role. And each individual regardless of hierarchical position needs only one role, i.e., knowledge gardener.

Recommendations for Future Research

A possible future research effort would be a more exhaustive QIMS of the KM body of knowledge. A possible outcome would be a taxonomy relating models and theory linking various perspectives of ICAS IFlow, KFlow, and knowledge from multiple disciplines against organizational theory, based on multiple Sysperanto slice perspectives. A key value-add result from this level of enhancement is increased understanding, not only of key organizational attribute relationships impacting knowledge emergence, but the emergent and systemic organizational forces surrounding any given ICAS organizational attribute.

Additional future research including an additional meta-synthesis exercise could create a set of specific attribute terms associated with a unique Classification schema for each ICAS Node, expressly for the purpose of capturing dissimilar terms for like concepts within literature, and vice versa. However, the value of ICAS Nodes and Classification schemas for current interpretations required very specific attribute assignments to capture ICAS dynamics, force tensions, and emergent characteristics.

As only one classification schema can be applied to one Node, my interpretation focus remained on ICAS emergent dynamics and not on meta-synthesis per se. However, a significant meta-synthesis activity was inherent in axial coding. My existing NVivo® project could readily accommodate this activity.

In essence, multiple ICAS instances could be created in a single NVivo® project, one for meta-synthesis, and others to continue to explore other historical datasets with additional participant responses. This would represent then an additional research project. Ultimately, additional ICAS Nodes could be defined to capture external stakeholder tensions and relationships, in essence extending IFlow with KFlow outside organizational boundaries. A set of interorganizational linkage Nodes, or bridging Nodes, as child Nodes to IFlow and KFlow might provide significant additional insights into ICAS emergent forces that set organizations in unique symbiotic relationship.

These additional child bridging Nodes could thus correlate one organizational set of subsystem dynamics to linked external organizational subsystem dynamics. As bridging Nodes would have unique Classification schema attributes, IFlow and KFlow shapes could be interpreted in context to knowledge spillover, for example. Additionally, unique organizational control dynamics that span and shape organizational boundaries could be interpreted as an enhanced IBoundary-IFilter, or organizational I-Space force field. As such, an interorganizational I-Space force field could then capture the shapes of various interorganizational ICAS dynamics.

Several participants mentioned specific motivations for engaging or triggering knowledge transfer independent of organizational controls. Other participants mentioned specific preferences for technology avoidance. Based on audio files, aversions for specific technology adoption could be generational. A significant additional contribution to an enhanced ICAS Node configuration for modeling purposes would be inclusion of a Participant Node. A unique person Node specifically with an additional classification schema for capturing meaningful demographics, to include psychological profile data as well as specific competencies and skills could provide unique insights into specific ICAS forces generated from individual motivations, especially when linked to BIT Nodes.

One of the challenges with understanding ICAS IFlow dynamics regarding \\IFlow\ICAS Flow\Force Type and \Nature included differentiating sender and receiver in a KFlow dynamic and within a SG-SM dynamic. The differentiation of perceptions between sender and receiver were explicitly stated in several cases, and implied in others, especially within responses regarding KT confirmation signals.

With every ICAS IFlow and KFlow dynamic surrounding a KWrk activity, there are two nodes in the ICAS network involved, a sender node and a receiver node. It would be extremely beneficial to code an additional Participant Node classification attribute for capturing participant role in relation to sender or receiver, or both with a primary and secondary relationship, specifically for capturing unique KT-KE dynamics surrounding TaK and ExK as well as knowledge in flux.

Yet another possible research project would include creating a knowledge ecosystem forecasting capability. When ICAS potential forces create excessive ICAS instance pressures, understanding IFlows as currents vs. vectors is an improved perspective. IFlows move from point A to point C through point B when seen as vectors. However, vectors can’t adapt to ICAS object B, as object B temporarily impedes IFlow to point C. Conceptualizing IFlows as currents, the ICAS current flows from point A to C, and if impeded, potentially creates significant pressure to simply flow around or through B to C.

IFlows represented as currents vs. vectors provides a unique opportunity to measure IFlow in flux, i.e., between points A and C, as point B in essence remains within the original IFlow. Multiple IFlow currents create an emergence confluence, sometimes creating very unique ICAS currents, such as ICAS rip currents. In such cases, interpreting ICAS emergent forces requires an entirely different level of vectored relationships. The organizational knowledge ecosystem is very similar in this respect to oceanic and atmospheric currents, and both global currents are dynamically interwoven.

However, advanced NVivo® auto-coding and modeling capabilities would have to be designed, programmed, and tested. The challenge would be to optimize auto-coding by embedding classification queues into audio transcript files, allowing specific words, synonyms, and phrases to create a meaningful set of participant ICAS Child Nodes under each ICAS Child Node. Although I did this manually for one person, one set of questions, the classification attribute coding level of effort was significant. However, if the entire 11 participant set of 233 coded references could have been attribute coded to the appropriate subset of 57 ICAS Nodes for each unique reference, many thousands of microvectored flows would become visible.

Lastly, an additional future research design imperative in many cases would be to very specifically and intentionally *not* minimize historical research the value-add. Limiting seminal historical, yet currently essential KM research for creating contemporary extensions to existing KM theory, using arbitrary percentages of historical vs. current content, potentially hobbles critical thinking.

Had I focused my research based on percentage of historical vs. contemporary content, I would have lost the effulgent insights provided by historical inter-disciplinary theory that brought unique light to enhanced metaphor visualizations of the ICAS organization (Boxenbaum & Rouleau, 2011; Peterson, 2015). More appropriate would be a rich culling of *additional* historical research to further inform emergent organizational ICAS dynamic visualizations, such as those illustrated in Figure 38, developed from theoretical foundations dating back to the late 1990s and blended with evolving research (Langley et al, 2013; Peterson, 2015).

Summary

Organizational knowledge is a paradox, in some continuous form of flux, and only consistently emergent when premised upon specific ICAS organizational behaviors. The challenge is not to enhance our understanding of knowledge in flux, but to visualize more meaningfully how the ICAS organization interacts with such knowledge. The paradoxical nature of knowledge, at least within the natural mind, will remain a paradox.

However, understanding emergent ICAS characteristics, typically perceived as blurred, hidden, and likewise paradoxical, no longer has to remain paradoxical, blurred, and hidden. Organizational emergence historically has been viewed paradoxical premised upon some knowledge paradox, i.e., knowledge in flux. Emergent organizational characteristics are evidenced by the knowing mind. The knowing mind makes sense to the degree possible surrounding organizational forces, consciously or otherwise. As such, emergent organizational dynamics have remained obscured or hidden behind the knowledge paradox. With ICAS instance visualizations, I began to define more clearly knowledge in various flux states, as well as surrounding IFlow and KFlow flux dynamics.

I focused on the fundamental problem created by perishable and lost intellectual capital resulting from ineffective organizational knowledge flows. By creating ICAS Metaphor visualizations to more clearly perceive historically hidden and blurred emergent ICAS characteristics and forces, individuals at all levels of an organization may understand their respective roles as organizational knowledge stewards with greater clarity and insight. The result could be enhanced knowledge transfer over time, and thus improve and sustain an organization's intellectual capital over that same period of time.

I employed a phenomenological hermeneutical research approach infused with significant and equivalent elements of grounded theory methodology. Further blending a meta-synthesis of significant historical and contemporary research, I enhanced understanding of 11 historical research participant perceptions regarding knowledge transfer activities within their organization. Using Nissen's (2006) and Maitlis and Lawrence's (2006) method of analyzing and interpreting phenomenological data using an equivalent three phase analysis approach employed in grounded theory study, a series of visualizations evolved depicting significant emergent organizational ICAS characteristics and forces.

The original research interpreting participant perceptions of knowledge transfer within social networks framed a set of six knowledge transfer themes (Deville, 2012). I used these original themes to validate the structural integrity of an enhanced organizational ICAS KM model containing 57 Nodes and six primary classification schemas collectively representing approximately 350 ICAS classification attributes. ICAS Nodes with specific schemas and attributes became an ICAS instance that represented specific emergent and defined organizational ICAS characteristics. Through a series of double hermeneutic spirals within and spanning each of three phases of equivalent grounded theory coding, analysis, and interpretation, this preliminary ICAS Node representation evolved into a series of ICAS Metaphor visualizations.

My understanding of participant perceptions was enhanced as participant responses were coded against the ICAS Node structure. As each Node represents a specific emergent ICAS metaphor, participant perceptions of certain knowledge work activities captured significantly more detail than Deville (2012). Deville's original research was designed to capture the interplay of social networking dynamics within a knowledge transfer context.

Beyond original interpretations, I was able to differentiate specific participant perceptions to very specific SM, SG, control dynamics, knowledge flow, knowledge networks, ICAS flow, six cognition boundaries, and seven foundational emergent ICAS forces, collectively linked to a specific characteristic of knowledge work. As a result, I was able to more clearly and precisely visualize how participants perceived knowledge transfer in terms of not simply generalized themes, but in terms of emergent ICAS forces and characteristics.

Although designed to frame clearer insights into organizational ICAS emergent forces for managers, all members of an organization could benefit from enhanced insights provided by ICAS Metaphor visualizations. ICAS Metaphor visualizations were shown to more precisely visualize a member’s individual contribution to an emergent ICAS instance, while concurrently visualizing how the member’s contributions and perceptions further influenced the collective emergence of organizational ICAS behaviors, in the form of composition emergence.

In a very practical sense, perception becomes an emergent ICAS organizational behavior. During final stages of selective coding interpretation, I began to capture participant perceptions in this context as an emergent ICAS force within a distinct Node outside the ICAS Node structure, i.e., the Mental Model Node. However, based on constraints and project scope, I did not complete that Node mapping to the remaining 10 participants. However, it remains a viable additional ICAS Metaphor enhancement activity.

The very small sample size, originally a concern for Deville (2012), was actually significantly beneficial to the current study. Based on the structural integrity developed within an initial ICAS Node representation of 57 emergent and defined organizational ICAS metaphors, I would anticipate this model would readily scale to larger organizational contexts and readily bridge to any industry where knowledge work is a significant organizational activity. Further study to mature the initial Node representation of an enhanced ICAS KM framework could further significantly improve management's perception of key emergent forces within the ICAS organization that significantly shape knowledge flows.

Historically, KM practitioners and theorists have been unable to capture organizational emergence with sufficient specificity to interpret exactly how and why specific emergent forces have influenced an organization's knowledge transfer capabilities, or why specific forces emerged at all, or failed to emerge. The best anticipated capture included what emerged after the fact with sufficient specificity to interpret more meaningfully certain vectored relationships that led to that particular emergence. Thus organizational interventions and costly KM improvement programs have resulted in minimal ROI for many organizations seeking to enhance knowledge transfer capabilities.

Perhaps for the first time, we have a metaphor visualization that provides sufficient interpretive capability to actually begin to more meaningfully understand how and why specific emergent forces manifest and interact, as well as what manifests, in terms of both composition and compilation emergence. Practitioners and theorists now have an opportunity to visualize very specific shaping, initiating, enabling, and inhibiting organizationally defined and emergent ICAS forces that most significantly influence the shape of organizational knowledge. And, not just from the organizational perspective, although that in and of itself would be significant, but concurrently from the perspective of our most significant knowledge asset, the individual knowledge worker. Any individual within the organization has the potential to see exactly how their perceptions, actions, and attitude influence organizational knowledge work, uniquely to their respective sphere of influence and activity.

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Appendix A: Participant 01 Field Journal Notes

Participant 01

15 December 2011 @ 1000

Themes: Knowledge = Information, Formality Affects KT, Difficulty with "least", Questions Indicate KT, Values F-to-F.

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

I think knowledge transfer, as the name implies, is the transfer of information or, as it were, knowledge from individual to individual whether it's as a group disbursement such as a mass e-mailing or a crowd briefing or just interpersonal, you know person-to-person talking. It is just the movement of ideas, information or even just nonsensical stuff like rumors from person to person.

Q01 Synopsis/Preliminary Analysis:

Person to person movement of information/knowledge ...includes various categories. Appeared to equate information and knowledge. Referred to the knowledge transfer process as "movement" from person to person, implied objectification. Information = Knowledge

DFL: Coded group disbursement and mass emailing, crowd briefing to KT, ExK, FSS. Coded P2P talking and movement of ideas (TaK), rumors, to KE. Ideas are *exchanged*, information is *transferred*. **KNet** dynamics are unique for each, as are ISS characteristics, the former being formal, and the later being informal. KNet dynamic is differentiated ExK/KT is Tie Driven, focusing on transitivity, repetition, referral links, whereas TaK/KE is more Nodal Assortative, focusing on proximity, shared purpose, and common goals. Code TaK to KE in this context, as the concept of "movement of ideas" in plural implies an idea exchange. Tie Pattern Driven links to Organizational Memory. *Formal* communication more directly associated with *functional subsystem* and *informal* communication more directly associated with *social subsystem*. Group level activity, communication, works at **ICAS Share Purpose** level, while P2P TaK works at individual **BIT Goal Congruence,** if sufficient context demonstrates purpose of TaK is explicitly or implicitly for purpose of creating shared understandings. Cannot assume all TaK is for purpose of creating shared understandings. In this response, there is no clear differentiating purpose of TaK KE or KT. Group KT reduces Emergent **Uncertainty** while improving **Knowledge Centricity** "facilitating availability of expertise, driving process improvement, enhancing mission performance, and enhancing job performance." (ICAS p.50)

Q02. In your workday, who do you transfer knowledge with most and why?

Predominately, I would say coworkers simply because that's who I have the greatest amount of interaction with. The peer group I live and work with basically on a day to day basis.

Q02 Synopsis/Preliminary Analysis:
Coworkers comprise largest contact group due to frequent interaction.
DFL: Participants do not distinguish between KE and KT, as most literature does not meaningfully differentiate. However, KE in form of dialog involves exchange of ideas, or question and answering, sharing, whereas KT in form of dialog implies mostly unidirectional knowledge flow. Differentiating KT and KE in KNet Dynamics, IFlow Dynamics, and Activity (Communication = more directly associated with KT, Ideation = with KE, although not an axiomatic given; requires interpretation of reinforcing participant queues if available). Coded to KNet Networking Dynamic Classification most frequent Network nodes for Q1 Reference 002 (TaK/KE micro-meso social dynamic Activity=Ideation). Sets KFLow Frequency value = Very Frequently. Can apply to formal or informal network, TaK or ExK, KE or KT and should be correspond to KFlow coded separately for R001 and R002. No direct Node Coding here, only informs attributes for Q01 coding. Activity for R001 set to Formal, type is dependent upon type of mass email, thus could be control, coordination, or others (set to Multi-Purposed) unless otherwise specified.

Q03. Who do you transfer knowledge least throughout your workday and why?
As far as information that I have I would say upwards to leadership and management within the organization. Generally, if I'm going to give them information it's at their request.
No spontaneous conversation with them?
Very rarely.
Why do you think that is?
Part of it is, you know, instrumental to the organization we work in. In a military hierarchy I think that we have a lot more information that comes down as part and parcel of that hierarchy itself and then generally, leadership, because we are leadership-hierarchy structured in a pyramid fashion, they simply don't have time to be receiving information from a hundred different sources, at random.
Q03 Synopsis/Preliminary Analysis:
Upwards information knowledge flow. Hierarchical organization structure, hierarchical transfer, leadership availability/time constrains information/knowledge upwards flow. Information = Knowledge
DFL: Coded Ref 003 ExK / KT formal vertical up. Qualifiers in last part of response, rationale for more formal communications over informal. Coded Ref 004 informal vertical up TaK / KT. Qualifiers last part of response, rationale for lack of informal communications.

Q04. Most frequent exchange contacts: your relationship with these people?
Certainly. I think it is overlapping spheres of influence. I have the most contact with those personnel who I have the most in common with at work. That is, fellow civil engineers [peers, micro-meso social group]. And then, there is another sphere outside that concentric to, but with a lessening amount of interpersonal communication; that would be personnel within the mission support group community [organizational, micro-meso TbKM group]. Because again there is a commonality, but lesser amount of such

commonality than with my civil engineering peers. So, those would be personnel within finance or security forces or communications where there is still a bond of fraternity if it were within the mission support community; but, not that same similar background as within civil engineering. And then, beyond that in yet another concentric ring would be personnel who are outside the support group community [organizational, macro-meso TbKM group]. That's your operations, maintenance, and what not here on the IG. We just don't have those common bonds. And I would also venture that amount of contact and the amount of knowledge transfer from one concentric ring to the next would probably be about exponential.

Q04 Synopsis/Preliminary Analysis:

Interesting description using "spheres of influence"...contains holistic thinking and elements of complex adaptive systems theory.

DFL: Coded Ref 008 KNet ICASNet Distribution, Connectivity, Density, Clustering, Flow Types, and Flow Multiplexity all capture this systemic dynamic of increasingly larger and more complex Node structures with increasingly complex Tie relationships, both homophilic and heterophilic (Ahuja et al., 2012).

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?

It's generally work or at least somewhat work related. Obviously we will have the occasional frivolous conversation about sports or news or things like that. But, it's generally even in those circumstances it's often with a work focus. We'll talk about current world events but it will be with the focus of how can we incorporate those into our next scenario or next inspection. A lot of time is spent reviewing pubs and forms and news from within our respective career fields and information sharing about how that's going to impact CE or how we need to be flexible on certain things.

Q05 Synopsis/Preliminary Analysis:

Frequent discussion is work-centric; with some "frivolous conversation", appears to indicate an emphasis on work related discussion over personal/informal discussion. Implied a combined informal and formal social network by intertwining work and non-work related discussions.

DFL: Ref 009 / Informal, very frequent micro-meso social TbKM dynamic. KFlow should be more influential than ICAS KNet dynamics based on Q02 Response. Ref 010 / TaK/KE, KFlow, KFlowT, SM Process, SM Enhancer. BIT Understanding, Goal Congruence. *Process Controls*. KWrk, ISS, SSS, SGEnabler. KStock links to OM. Ref 011 / Relationship between TaK=>ExK = Information /KT => KFlow, *Outcome Controls*, EChange, ISS, FSS, KFlowT, KNets. KStocks, SG Trigger. Specific links between micro-meso TbKM, KFlow, and larger network ICAS Network activity (IFlow). ISS and SSS shifting between informal to formal, TaK to ExK, KE to KT. Last sentence reviewing pubs and sharing information is ExK/KT where ExK=Information. Outcome Controls vs. Clan Controls where Clan Controls seems to override Outcome Controls. Clan Controls specifically provide for recombination of knowledge (Turner & Makhija, 2006, p.210). Fosters EOrgSharedPurpose => Multidimensionality => (OI)Creativity.

Links to High Order BIT Ability, high intelligence, i.e., pattern recognition (ICAS, p. 56).

Q06. With these folks that you most frequently contact what do you least frequently discuss?

Wow… You've kind of got me at a loss there.

OK, no problem.

There's a lot of things that we rarely touch on that I would consider…

Anything come to mind?

Not that I can think of…not at this moment, no. I guess it's hard for me to decide because I have no basis of comparison. Are you looking for something that I would normally discuss with my peer group if the peer group other than with the IG?

It would be something you would discuss but not as much as work-related things like what you are talking about in the previous question.

Got ya… If this were, if I were in a normal posting, not the IG, we would talk a lot more about base policies, base politics, current events as it pertains to the local area. And here on the IG that seems somewhat superfluous and I hesitate to say that beneath us, but it really doesn't apply.

So you would talk more about these things in a normal base? More than what?

More than here at the IG.

OK, I see what you're saying…in comparison with the IG.

It would be a much larger part of day-to-day conversation. Because operationally we're much more involved at a normal installation.

Q06 Synopsis/Preliminary Analysis:

Difficulty formulating a response to a "least" question. Comparison to "normal posting" seems to indicate a bounding of information/knowledge flow around different organizational structures within an AF squadron [distributed macro-meso organizational TbKM (Process=>Clan Controls) within more flexible structure (FSS-ISS-SSS)] *versus a staff function such as the IG* [central macro-meso organizational TbKM (Outcome=>Process Controls within more rigid structure (FSS-ISS-PSS)] . *Frequency of topics discussed depends on function or work place context.*

DFL: Ref 012 / Links distributed organizational structure to central control organizational structure. Shifts are within macro-meso organizational TbKM level of activity, but as controls shift to distributed organizational structure, connotes Process=>Clan Control dynamic more prevalent, where as central macro-meso organizational TbKM activity emphasizes Outcome=>Process Control dynamic. Both code to IFlow and ICAS Networking Dynamic. Least frequent discussions in social networking dynamic with EgoNet Bridged relationships seems to be a function of control dynamic in place, in this context.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

Often, with formal communication it's easy because it's, you know, in an email or an announcement made that pertains to the group and it's kind of prefaced as being information. With informal communication, you know, person-to-person, conversations or even in informal e-mail conversations you really have to be able to ascertain what's new or what knowledge is being transferred. Some of that is open to personal interpretation. And sometimes that's information that you missed the first time through. It's something you won't realize that information was transferred until later on.

So, as it spreads throughout this organization…that's really the intent of the question… How do you know if something in the formal structure which is easy to tell since you can see the emails and that type of thing. But, informally, what alerts you to the fact that other people know the same thing I know, for example?

If it's something truly novel or new there's a sense of, almost a sense of excitement about sharing that information. I think people truly want to put forth new ideas. As a general sense of excitement about it, whether it's because they themselves feel a **sense of power as being the messenger**. Or whether that it's a far more giving sense [SG Trigger => KFflow Trigger (appear to be directly correlated)] of I want to share this information. I think it's up to each person's personal motivations; however, I think there is a sense of excitement and a sense of novelty to spreading new information or new ideas.

Q07 Synopsis/Preliminary Analysis:

Highlighted the importance of new knowledge and the identification of what knowledge is being transferred. Also, P1 inferred the important role of interpretation and subsequent realization of knowledge transfer. However, participant 1 appeared to equate knowledge and information. Again, highlighted new information/knowledge; stressed that ***excitement*** *facilitates knowledge transfer. Included an* ***emotional component*** *as* ***motivator*** [SM Enhancer = SG Trigger] *to share new knowledge/information.*
Information = Knowledge

DFL: Formal Communication KT Confirmation. Links to Discourse Feedback Loop (Linger et al., 2007). Informal Communication KT Confirmation links to Perspective or Social Learning Feedback Loop. Both relate to SG process within ICAS Flow Dynamic. SG Triggers considered an outcome of a SM Gap. However, in this context a SM Enhancer acts as a SG Trigger, which fosters KE and additional KNet activity. Links to BIT Solution Space, Understanding, and Goal Congruence. Direct correlation between SMEnhancer as an SGTrigger and (OI)Creativity and (OI)Problem Solving. Enhanced SM activity with motivational force seems to create greater degrees of IFlow. IFlow gets coded here as well as KNet, KFlow. Additionally, supports correlation between Cognition Dynamic integral to *Creativity* and Problem *Solving*.

Q08. What factors do you feel contribute to knowledge transfer in this organization?

It's the new and novel concept. I think the new information within a peer group will spread *naturally* based on the *interpersonal relationships* involved except for where there are *barriers* to that communication.

Q08 Synopsis/Preliminary Analysis:

*Return to the importance of new information...****natural tendency of information/knowledge to flow up to organizational boundaries*** [EgoNet viral networking activity, effect of strong Tie Bridges in homophilic network] [in homophilic network] [ICAS Permeable Boundaries (IBoundary)]. *Information = Knowledge*

DFL: Peer Group = micro-meso social TbKM dynamic with strong EgoNet Ties with homophilic Alters. Relationships directly relates to KFlow, stronger the Ties and Alters and quicker and farther reaching KFlow activity, KT specifically emphasized in this dynamic. Solution Space increased creativity, enhanced Understanding, more meaningful SM Process and SM Enabler, SG Enabler.

Q09. What do you feel might hinder knowledge transfer in this organization?
Of course we are a hierarchal organization, so there's rank, there's precedent, all the bureaucratic items that go with our organization. Which, you know, imposes a sense of formality on certain communications and that I think inhibits information transfer.
DFL: (SG)Inhibitor. SM Process linked to information transfer versus knowledge explicitly.

How does it inhibit?
I may have a piece of information that I consider to be new, novel, or interesting and I will freely share that with my peers because I think they will also find information to be interesting. However, I am not going to go take that information up the chain of command purposefully. If the information makes it to one person in the chain above me, just like a cake is built in layers, the information can pass itself in layers. I feel no particular drive to take that information from the bottom of the cake, as it were, all the way to the top. The information will just have to work its way up on its own.

Q09 Synopsis/Preliminary Analysis:
Rank/bureaucracy/formality inhibits transfer. Highlighted the information process in a hierarchical organization as a systematic transfer mechanism that does not require one in the lower echelons to actively transfer: " The information will just have to work its way up on its own." Information = Knowledge

[Deville Q09 Synopsis: Intuitive understanding of ICAS Permeable Boundaries that links => ICAS Flow Inhibitor causing => KFlow Inhibitor => SG Inhibitor resulting in => SM Inhibitor. Appears rigid or inflexible ICAS Boundary (IBoundary) may create a reverse ripple affect back into micro-meso TbKM cognitive activities]. R018: Type of information itself determines transfer mechanism and KNet dynamic, peer vs. heirarchical (Perspective Feedback Loop, Social Learning vs. Hierarchical Discourse Feedback Loop) => Network Dynamic\MicroF Inertia\Nodal Assortative. \MicroF Opportunity\Nodal Assortative. Nodal activity should create new networking structure (MicroF Agency\Create Structure). Should Bridge both old and new Ties. Also links to \MicroD Brokerage\Domain Specific Value. \MicroD Diversity\Highly Homophilic. R019: Heirarchical => determination to move knowledge vertically to leadership requires \NetPrim Structure\Micro-Meso TbKM Coordination activity => \MicroF Inertia\Tie Pattern requiring Clan Controls. Team Leader responsibility to engage vertical networking dynamic.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

I think that's kind of inherent to the process. I mean, I know what I know. (laughs) To paraphrase the Supreme Court, there's no definition for pornography; but, I know it when I see it. So, information is just that: if I know an amount of information, if there's something new, it's new or novel to me. I guess it would be the lack of recognition [of existing pattern].

Q10 Synopsis/Preliminary Analysis:

Indicated a seemingly intuitive process occurs upon realization of knowing. This relationship echoes the notion of knowledge as inextricable to the knower (look up Tsoukas' article on this; also, reference Polanyi's tacit knowing). Appeared somewhat perplexed by the question and the need to self-reflect for the response. Information = Knowledge

R020: Knowledge Acquisition not necessarily equivalent to self-realization, i.e., cognitive perception and understanding. Assumption here is there is equivalency. This is a paradox (Chae et al., 2005). Also links to Snowden (2002) knowledge in flux. ExK-TaK conversion (receiving knowledge) inherently an (SM)Process => BIT Ability Boundary (Intelligence as individual capacity to learn and reason... reasoning ability is essence of SM confirmation of new knowledge acquisition. Also links to pattern recognition, again specifically Ability Boundary, i.e., intelligence.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

I think it's vast and varied, honestly.

Can you provide some examples?

Yeah, absolutely. Because we are an organization that's structured around certain amounts of formality, we're very by the regulations, we're very by the book here, I've learned a tremendous amount of information about structure, status, and requirements as far as it pertains to the inspector general's team. You know, how my peers and coworkers approach their tasks and some of the parameters, formalities, and inhibitors they have on how they do things and how they look at things. Also, because all of us have vastly different backgrounds, I think their perspectives are very different than mine, even if it's the common topic. And I think that's very valuable, particularly in this setting. There are a lot of very smart people in this building. And I think that having that collection of knowledge and experience it is very easy to share information.

You mentioned perspectives being different. Can you explain a little more about that?

Well, we all have different backgrounds. I think that's true of any circumstance where you take a group of individuals and put them together. No matter how much commonality there may be, there's still be different set of perspectives because people who have similar experiences are still going to have that personal experience that is different. The outside stressors may be the same, but the way they react to it is going to be different.

And I think that has a lot to do with, you know, the sense of nurture, the sense of experience throughout our careers. And so we see things as individuals exactly in that term. We see things as individuals. So even with the vast amount of commonality that occurs in an organization like this, we're all Air Force, we all wear the uniform, are all volunteers, we all serve our country. You know, there is a huge list of common items, but we're still individuals within that functional area. And even if we had a background that's almost identical the way that those experiences impacted us it's still going to be unique. And each individual brings that unique perspective. So, we may be very similar on how we view things, but even the smallest difference can change our approach. And so with information sharing our perspective likewise changes our delivery and, in some cases, the, perhaps not the central tenet of the message, but it can change some of the flavor of the message.

Q11 Synopsis/Preliminary Analysis:

Participant 1 highlighted the value of various viewpoints and perspectives relative to any given topic as a facilitator to sharing information which leads to knowledge transfer. Also referred to organizational hierarchy's influence, in this case not as inhibitory but as facilitative to learning. Emphasized the importance of what each individual perspective brings to the whole. This conceptualization evokes tenants of gestalt theory and some similarity to the butterfly effect seen in complex adaptive systems. Knowledge ultimately is unique to each member of a network; but, each unique perspective contributes to the whole, the collective organizational knowledge. Information = Knowledge

R023: Unique perspectives = unique experiences same training, similar backgrounds => creates unique messages. (SM)Process enhanced by uniqueness (SM)Enhancer. Seems like this relationship would inherently be a (SG)Enabler or Trigger. But difficult to interpret last sentence in context to SG. Can only directly infer SM activity. Because this is a receiver condition, sender perspective determines SG attribute. Enhanced nuances to message during transfer *implies* (SG)Enabler. Expanding Deville construct regarding organizational hierarchical influence. Not an indication of structural hierarchy, rather more an indication of cultural value system creating cohesiveness and trust framework. I would link this more to cultural subsystem dynamic vs. functional (hierarchical) organization structure. However, Deville does bring up an intuitive observation, i.e., organizational functional structure, i.e., hierarchy, can facilitate perspective, i.e., cultural perspective exchange within a social learning feedback loop (Linger et al., 2007). There does appear to be a correlation in participant's perception between discourse and perspective, formal command structure and coordination flows vertically and social learning dynamic within peer group, both as interconnected feedback loops. Linger et al. (2007) appears to keep them autonomous or sees them as two sides to the discourse of knowledge work (See Figure 3). They appear to be reinforcing looping structures linked within SG-SM dynamic. Balancing Dynamic embedded within IFlow will determine whether these are reinforcing or countervailing loops.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

Generally speaking, it's functional [domain specific]. It's what I do

References 72-73 - 0.08% Coverage

and what I've always done

References 74-75 - 0.12% Coverage

, which is [domain specific knowledge]

References 76-87 - 23.12% Coverage

perspectives. So, it's my background, it's my experience [domain specific knowledge] . So, it's not so much new or novel information, but it's my perspective on the subject, again tempered with my experience and my knowledge.

Q12 Synopsis/Preliminary Analysis:

Slightly different concept raised...participant indicated his knowledge contribution is functional, or work-related; however, he also acknowledge the importance of his individual perspective as a tempering influence.

R024: Concur with Deville. Functional more specifically is domain-related. ICAS Flow is a function of coordination, communication, control activities in conjunction with Balancing Dynamic. This is more expertise driven, in this context participant is sender, initiator of communiction, initiator of SG and influencer within SM micro-meso KT activity. As this is more personal interpretation, more directly linked to individual cognitive BIT\Ability, the emphasis appears to be on framing those cognitive interpretations in terms of improved SM, i.e., knowing (ICAS Flwo\ForceType\Knowing). I would consider this more horizontal (\Direction\Horizontal) as this links to Q11 in terms of KT. Implies SME. Knowledge interpretation *tempering*, a cognitive pattern recognition and interpretation activity, within individual (SM)Process indicates mature or seasoned *experience*.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

From my experience, when somebody starts to learn something from me, from something I've said or written, it is generally followed up by questions. When they start questioning, they're looking for clarification or they're looking for more information. Occasionally, people will say 'oh, I didn't know that', but that in and of itself can be somewhat dismissive. I think when people are truly figuring out something new, they will question it. Not as in questioning the authenticity of it, but wanting more information because I believe people truly do have a thirst for knowledge, as it were. When they come across something new or novel they're going to want more details about it.

Q13 Synopsis/Preliminary Analysis:

Participant indicated questioning as the primary feedback mechanism that alerts him to the fact that his knowledge recipient has obtained knowledge (change in knowledge *state). Further, he stipulated that this questioning does not originate in the doubt of authenticity, but, rather, in a quest for elaboration.*

R025: Deville intuitively places SG-SM confirmation signals within (SM)Process as embedded within larger dynamic, i.e., a feedback loop. Within KNet Networking Dynamic, based on current dialog, working within an expanded knowledge network, outside highly homophilic connections to more diverse connections, i.e., other organizational units, where organizational value is linked to domain specific knowledge (\MicroD Brokerage\Domain Specific Value => Organizational Value) as network connections move outward to more heterophilic (\MicroD Diversity\Diverse Connections) for purpose of bridging new ties for purpose of KT (\MicroF Inertia\Nodal Assortative => Tie Pattern). Shift to organizational value shifts force focus to organizational control and coordination, ensuring consistent operational effectiveness. This links to ICAS Flow purpose or inertia shift from micro-meso activity to larger organizational emergent \EShared Purpose. Also links to BIT Goal Congruence and Understanding Boundaries. This activity specifically, thirst for knowledge, is part of (SG)Trigger and (SM)Enhancer within individual (SM)Process. This is about receiver individual knowledge acquisition and participant's responsibility as sender to engage in that individual's SM Process. Power base is not based on legitimacy as much as referential, a function of trust based on perceived expertise.

Q14. And what method would you say you use to transfer knowledge most with and why?

Verbal.

Why is that?

I just dislike email. That's a big part of it. Although, for obvious reasons, people outside of our organization, non-peer group within the IG, most of the information flow is written communication because email is one of the few very reliable ways we have to communicate with personnel at other units. That's not necessarily a personal preference, it's just the necessity of the way we do business here. But, I think with voice, face-to-face communication because it allows so many of the non-verbal cues to play out. It allows a much fuller method of communication. You're able to show, via inflection in your voice, via body language you can deliver a much richer message than you can through written communication. And, likewise, it allows you to do things like use sarcasm which is very, very hard to convey in written communication.

Q14 Synopsis/Preliminary Analysis:

Stressed verbal (face-to-face) communication as preferred method; however, participant acknowledged the necessity of email in performing duties. Elaborated on the value of non-verbals; indicated face-to-face communication provides a richer experience where nuances in transmission/reception are more appreciated relative to written communication.

R026: Optimum KT => Homophilic Network => Nodal Assortative => Verbal communication. Interestingly, participant recognizes inherent link to Q13 and assumes still discussing knowledge acquisition or receipt confirmation. Body language becomes

integral to (SG)Trigger on part of participant, as sender, how participant can shape receiver's (SM)Process. This is more directly governed by Clan Controls.
R027: More directly associated larger more heterophilic networks in more complex structures. As KT becomes part of IFlow and flows to other parts of the organization, becomes linked to EShared Purpose and more directly aligns with and governed by Process and Outcome Controls.

Q15. And what method would you say you least transfer knowledge with?

Smoke signals? (laughs). I would say non-verbal but still interpersonal communications. So, like body language or things like that is the least effective way of transferring information. I think it helps you to convey the information. It helps you to deliver intent or some of the subtleties of the message. But, you can't really deliver any kind of message. Beyond that, probably, again, I use voice [f2f=voice preferred most] more than written communication [least used].

Q15 Synopsis/Preliminary Analysis:

Participant again indicated the preference for voice over written communication. He also indicated that nov-verbals (i.e., body language) serves to convey or facilitate information; but, non-verbals are not an effective delivery method.
R028: This is (SG)Enhancer. Currently coding enabling and enhancing within (SG)Enabler. Current classification schema considers one side of KT activity, i.e., receiver side. (SG)Enhancer might provide for differentiating sender\receiver differences during KT-KE dynamic. Alternatively, consider SG Process embedded within flow dynamics in context to sender\receiver perceptions, in terms of Networking Dynamic\EgoNet Constraint\KFlow Focus Alignment with \ICASNet Flow Type\SG Flow. \NetPrim Structure\Communication. Participant is still reflecting within Q14.

Appendix B: Participant 02 Field Journal Notes

Participant 02

15 Dec 2011 @ 1330
Themes: Knowledge as Action/Process/Procedure, Combined Formal/Informal, Formality Affects KT, Verification/Confirmation, Values F-to-F

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Basically I think that means what means are used to transfer knowledge from person to person, from groups, set up so I would think knowledge transfers just as it applies, whatever media and means we use to transfer knowledge to different individuals.

Q01 Synopsis/Preliminary Analysis:
Participant 2 indicated knowledge transfer is person to person as well as to/from groups; included media in his definition. Included process in describing knowledge transfer.
R029: Participant uses KT to define KT in context to media choice. KT is limited to small micro-meso TbKM dynamic within network of relationships, qualified in R030 in context to specific role required during inspection. Changing organizational role shifts KT responsibility and activity. Required qualifying questions to drill down to scope and sphere of network connections in this context. Qualified in Q02. TbKM Activity a function of specific role. Code as KT only and ExK. Different individuals implies heterophilic network, but only as \MicroD Diversity\Diverse Connections. \MicroD Brokerage\Domain Specific Value. \ICASNet Flow\KFlow. Work Activity\\Activity (TbKM)\Rigid as primary purpose qualified Q02 as operational control and coordination, requiring explicit chain of command. \Extremely Governed. \Formal. \Formally Defined. \Degree of Complexity\Difficult premised upon complex network environment involved. DoD WAN\LAN environments are simply not simple and \Difficult at best, can be \Complex. \Social Context\Primarily Work. Purpose\Planning. KFlow\\KFlow\Duration\Months. \Reach\Group. \LifeCycle\Apply.

Q02. In your workday, who do you transfer knowledge with most and why?

I actually transfer knowledge to a wide range of folks and it's normally in preparation for operational readiness inspections, SIPRNet (secret Internet protocol routed network) accounts, stuff like that. So, obviously having additional duties, it depends on what role I have to have when I'm transferring knowledge.

Who are these folks that you are communicating with?

Logistics readiness, operations, maintenance.

So, folks that work here?

Yes.

Anyone else?

Well, of course I coordinate with the organizations themselves too. So, as we get ready to do 180 day meetings for operational readiness inspections and stuff, we coordinate with the units, prepare on getting them ready, and coordinate on transferring knowledge throughout the inspection all the way up the end of the inspection.

Q02 Synopsis/Preliminary Analysis:

Indicated knowledge transfer is work-centric, dependent on "what role I have to have when I'm transferring knowledge." Knowledge transfer occurs with work related functional specialties. Also indicated that external agencies, 'customers' (units due to be inspected), are also frequent knowledge transfer contacts.

R030: Heterophilic network, complex, and multiplexed. Primary activity remains planning. Control Mechanism would be primarily Process Control for KT for Planning TbKM activities. R031: Daily Meetings and Coordination activity. Primary purpose is planning, long term and daily, i.e., "throughout the inspection."

Q03. Who do you transfer knowledge least throughout your workday and why?

Probably the civil engineers, comm, the functions such as that. We have an informal, as far as communications-wise, not much [KT].

Why do you think that is?

Just the roles and responsibilities of what everybody has to do. Normally I am mainly involved with phase 1 operations. CE normally doesn't get involved in the phase one portion. Comm is writing themselves out of the phase one portion.

Q03 Synopsis/Preliminary Analysis:

Formal network based around those with similar work functions; however, participant 2 indicated that he maintains an informal relationship with those in less similar functions (i.e., those who he has less formal contact with on a daily basis). Fairly separate informal and formal social networks.

R032: Agree with Deville's interpretation. Requires Audio connection to transcript to make this connection. Not intuitively obvious from Transcript alone. As KT becomes less formal and structured, social networking dynamic becomes more social. Also, limited sphere of TbKM Activity. Implies minimal SG Triggering or Enabling. Simply following procedures. Not necessarily a high creativity. Code \Ability Boundary\Intelligence\Average Intelligence. Primary Understanding Boundary\Understanding\TaK/KT Available. Cognition Dynamic\Attention\Spreading Activation Beneficial. \Domain Expert. Limited scope of influence and activity.

Q04. Most frequent exchange contacts: your relationship with these people?

It's a very good working relationship. I think anytime we ask for anything that they're very responsive to get it back, very informative. I think we've got a very good rapport with each other.

Q04 Synopsis/Preliminary Analysis:

Indicated strong reciprocal relationship with contacts in his formal network.

R033: Formal Network = Strong Tie (Positive Bridging) to Create Structure (MicroF Agency). Primarily Tie Pattern (MicroF Opportunity & Inertia). Appears correlation between stronger Tie Pattern for force focus in networking dynamic links to Process Control and Maintaining Structure. Process Controls work within existing ICAS Flow structures around existing formal networks within Networking Dynamic.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?

Generalities, you know: how you doing? How's the family? If there is a new program, such as IGEMS, we'll discuss some of them or an upcoming trip, a smaller trip that we may be going on together. With civil engineers it's mainly just informalities.

Can you go into a little more detail, when you say the informalities?

Just like I said, just the general greetings of how are you doing, what you been up to, how was your last trip, you know, stuff like that. Not the formal business.

Q05 Synopsis/Preliminary Analysis:

Participant indicated informal knowledge transfer centers around personal topics in discussion. However, he also indicated that some work related issues may be discussed (in this case, a new problematic application for documenting inspection results). While P2 alluded to separation between formal and informal networks, this appears to more of a degree of separation based on work related functions.

R034: Agree with Deville. Seems limited knowledge-work activity creates demarcation or continuum between degree of influence provided by networking relationships versus activity relationship. In this case, activity relationship for less intense knowledge-work activity becomes emphasis for primary informal network communication. Social network becomes primarily interwoven with work activity versus relationship building. Again, emphasis on Tie Pattern in Networking Dynamic. \Cognition Dynamic\Average Intelligence.

Q06. With these folks that you most frequently contact what do you least frequently discuss?

My guess is the generalities, casual how ya doing, but you really don't get into how's your family, how's everything else because you are more business oriented and you're driving at the point of, trying to get at…

So, if I hear that right the details… You don't too far into details

On the generalities details, correct, you don't go too far into the general details. You just do your casual good morning, how's it going then you press on to a I need something done or are you need something done or what can we do for each other.

Q06 Synopsis/Preliminary Analysis:

Participant indicated least frequently discussed in knowledge transfer are details behind superficial greetings due to a focus on work related issues.

R035: Very superficial networking dynamic. Not interesting in bridging new ties and creating new alter connections. Not interested in shaping relationships. MicroF Tie Type\Bridging Old Tie and \Agency\Maintain Alter. Not looking for change, enhancing networked relationships, just doing the job.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

Emails, commander calls, word of mouth, yeah, mainly those.

What is it about these particular things that alert you to the fact that knowledge is getting from one place to another?

Just that the message being relayed by commander's calls and the important things the general wants to get across. Or, e-mails, depending on who, the team chiefs, the front office. So, the general nature of the message itself that knowledge is getting across. You know, usually these emails are addressed to all personnel, all ACC civilians, stuff like that.

Q07 Synopsis/Preliminary Analysis:

Participant 2 focused on word of mouth via senior leader to the organization at large (commander's calls) and email addressed to groups (or the entire group) alert him to knowledge transferring across the organization. While he didn't explicitly mention the hierarchy, the inference is apparent that knowledge, at least formal knowledge, flow down the organizational chain.

R036: Agree with vertical KFlow focus. Equates KT Activity Confirmation with Media and simple inclusion in distribution list. If you are in a distribution list for any type of communication, that is acknowledgement or confirmation that KT has taken place. Assumption is recipient receives message simply by being in distribution list. Does not account for deleted unread messages or missed Commander Calls. Focus is on network infrastructure, i.e., the Media to create the KT activity. If the media is present, KT is present. If the Media is absent, KT is absent. Links to Process Controls.

Q08. What factors do you feel contribute to knowledge transfer in this organization?

Yeah, I think just the close knitness of the team and everything helps you get along. Along with rumors being spread the news gets out there as people are being told. We're good about spreading the, for the most part, we're good about spreading the word out to a lot of people. Sometimes, word don't get out there; but, you know, there's things that leadership does that doesn't get down to us till later and it's already a policy guidance by COMMACC (Commander, Air Combat Command). But overall I think we're good about spreading the word and getting the information out there to each other.

Q08 Synopsis/Preliminary Analysis:

Participant 2 indicated, despite some problematic vertical knowledge flow, the organization communicates well due to a close-knit relationship which suggests a tightly woven social network, perhaps formally and informally. The leadership issue fits in the theme of leadership/formality effects on knowledge transfer.

R037: Social network, strong Alter connections, KFlow link to IFlow to move information outward to more heterophilic network. IFlow can be bound by hierarchical inhibitor blocking downward vertical flow of new information. Clan Control, KNet, KFlow creates most meaningful immediate, local, KT activity. R037 & R038 offers tow different perspectives to KNet Dynamics and KFlow supporting KT, in R037 laterally out between peers, and in R038 vertically down from leadership.

R038: Vertical flow hierarchical structure inhibits certain information, i.e., Outcome Control information in form of policy that creates new Process Control. Appears to be resentment towards lack of information that allows them to anticipate change and begin creating new operating procedures. Having been in the military, I would interpret this as a frustration with not being able to prepare for change and then having insufficient time to effectively alter existing protocols and procedures to adapt to new regulations. Code to

EChange & EUncertainty, ICAS IFlow\Degree of Influence\Negative, \Direction\Vertical Down, \Nature\Align Resources, \Force Type\Intention (focus resources, i.e., "policy *guidance*"), KFlow, and Outcome Controls. Link to (SG)Inhibitor and (SM)Process. In this instance of information flow, inhibits (OI)Actions in form of \Activity\Initiate (Trigger). I interpret Policy as a *Trigger* function within the organization, initiating significant ICAS activity.

Q09. What do you feel might hinder knowledge transfer in this organization?

Emails, stuff like that, because you want to hear it personally, you want to hear the facts, what's going on, that anybody can see written words and misinterpret it or read what they want to read, how they want to interpret it.

So, the misinterpretation…

Misinterpretation of emails, and stuff like that…

Q09 Synopsis/Preliminary Analysis:

Participant 2 indicated that email misinterpretation hinders knowledge transfer possibly to the lack of indicators present in face to face contact that lend validity to the message.

R039: Formal written communication inhibits interpretation. Lack of understanding surrounding individual SM. (SG)Inhibitor & (SM)Process. Informs coding for Q08 for P02. I interpret this as not the written communication media, but rather lack of supporting rationale behind written communication. The fundamental questions asked typically involve a series of *why*. KE provides dialog to acquire answers to why. Code this to Understanding Boundary\TaK Unavailable and \Attention\Spreading Activation Beneficial. However, TaK Unavailable is the (SG)Inhibitor that prevents optimum Spreading Activation within Cognitive Activity. The result is "misinterpretation," i.e., EUncertainty & additional EComplexity.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

Basically, I understand what you're saying and am trying to think of the right way… Because obviously you hear something then you confirm it and… So, basically by hearing it and trying to confirm that yes, that's indeed the true way.

Can you explain that process of confirming the information. How would you do that?

Talk to my supervisor. Talk to another coworker. Talk to a senior leader. That hey, I've heard that this has happened, is that true, yes that's true or no it's not. Trying to always get a second party confirmation also. Hey have you heard this? They'll say yes or no.

Q10 Synopsis/Preliminary Analysis:

Confirmation leads to understanding that knowledge is gained (i.e., perceived change in one's knowledge state). Confirmation through knowledge transfer (communication) with others to obtain additional sources to confirm/deny what one has learned. Verification/Confirmation

R040: ExK Received via TaK Confirmation. TaK required to validate knowledge accuracy. (SM)Process requires ExK & TaK working together with TaK. This is an

insightful response in context to KT legitimacy and accuracy, versus "rumors" (Q08). Information communication, i.e., KT laterally apparently considered "rumor" until validated with TaK KE, i.e., multi-direction dialog (R041).
R041: Confirmation of knowledge accuracy appears to be a function of Alter ties within homophilic social network, based on high degree of trust. Again, Tie Relationship to create transparency. Trust involved in homophilic social network in form of Tie Patterns as part of (SM)Process. Trust is a (SG)Enabler and (SM)Enhancer.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

Most frequent is emails. Is that what you're asking?

What would be the content of those emails?

Policy changes, upcoming inspections, just the information we need to prepare for upcoming inspections everything like that.

Q11 Synopsis/Preliminary Analysis:

Work related, formal knowledge

R042: \Cognition Dynamic\Intelligence\Average Intelligence. Issue is pattern recognition within questions being asked, interpretation and SM of question. Again, Media = Knowledge. Media inherently carries knowledge, a KT vehicle. Yet, Media is not the confirmation vehicle for TaK. This relationship should be explored with other Participants. Deville (p.90) captured this as an emergent relationship "perceived between knowledge, information, and the systems that support both KT and information transfer." KNet & KFlow\LifeCycle\Share, \Reach\Organizational, \Duration\Days. ***Interesting to note that ExK by definition includes some degree of understanding and SM enabling meta-information to flow with ExK. However, a key frustration is lack of meta-information flow. This represents a key organizational opportunity to improve ExK-KT dynamic, i.e., inclusion of meta-information to address why, how, and when questions, providing application rationale to enhance SM(Process). This could come in form of better process definition, i.e., minimum CMMI ML3 capability.***

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

What the tasking's gonna be, where are we going to send them, things like that. Things that they need to ensure that when they go out to do their readiness inspection, that they know, what they're looking for are what they're doing.

So, more work related…

Yes.

Q12 Synopsis/Preliminary Analysis:

Participants' knowledge transfer focuses on work-related, in this case to those to be inspected, issues.

R043: ExK Type. Link to Process Control as part of KT-ExK TbKM Activity. Code R044 Outcome Control. Tasking implies Outcome, "what they're looking for." The inspection itself is the Outcome. R043 Process Control, i.e., "what the tasking's gonna be, where we are going to send them." Logistics for TbKM Activity, Process R043; what and how expected to be done, Outcome R044. R044 Links to Solution Space, Shared Understanding, and Optimum Complexity. This is the Outcome\Process Control framework for Perfect\Perfect ExK\ExK and Complete\Complete (See Figure 8). ExK Complete.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

A reply in an email, a verbal, yeah I've got it, I understand, I'm working on it…so, email replies, verbals.

So, when they convey to you that they understand.

Right, yeah. And obviously you look for non-verbals at the same time as you're talking to them if it's an actual conversation.

Q13 Synopsis/Preliminary Analysis:

Participant indicated he validates his perception of others' change in knowledge state from his communication via explicit cues (e.g., a verbal or written response, von-verbal signs during conversation). Verification/Confirmation

R045: Intuitive conceptualization of state change of knowledge. Links ExK-TaK conversion in context to a state change, representing two specific states with KE as transition confirmation of state change from ExK to TaK. This should be noted in Findings discussion (Chapter 5) and look for "state change" indicators and dynamic relationships in larger ICAS Flow dynamics.

Q14. And what method would you say you use to transfer knowledge most with and why?

Overall, verbal.

Is that on the phone? Face-to-face?

A lot of it is on the phone. With organizations it has to be on the phone, but when I'm here within this organization itself, it's face-to-face. I always get out and walk about and talk. I'm not one to just sit at my desk all day.

And why is that? Why do you choose those methods to communicate most frequently?

Just my upbringing back when I came in to the military in the late seventies, early eighties it was management by objective, getting up and walking around and observing. So, just my training style…that's always been, you know, being a personable type of person and getting out and seeing people face-to-face rather than trying to just do it by the phone or do it by email.

Q14 Synopsis/Preliminary Analysis:

Participant 2 indicated his preference for face to face knowledge transfer based on his prior management experience; however, acknowledge the necessity of other methods due to job requirements. Face to face value

R046: Verbal communication as KE optimum choice. Although question asks KT, participant is responding with KE. This validates a primary argument regarding very little

separation in literature between KT and KE. Code \TaK and \KE and KNet and KFlow in social context with Clan Control.
R047: Links to Clan Controls as a means to identify process and outcome control needs in terms of TaK being primary knowledge. Identifying primary SM Gaps, creates SG(Trigger) opportunities. This links to leadership style embraced by knowledge-worker. The distinction between Q14 and Q15 responses appears contradictory until responses are separated out by *context* of communication. In Q14, TaK (f2f) dialog is involved with KE. This represents a classic TaK-KE dynamic for most meaningful confirmation of KE. Even though both questions ask KT, response is primarily KE for this participant in Q14 and KT for participant in Q15. KT of ExK requires written confirmation. TaK-KE dynamic appears more trust based and less formal in nature. I would interpret this as "spreading the word."

Q15. And what method would you say you least transfer knowledge with?
I would probably say phone. I mean recently although we said that it may be the most, I prefer phone less, email is documentation. With a phone call people can say I talked to you on so-and-so. Well, where the email that this is what I said.
So, the phone, calling someone would probably be the least that you would use…
Yes.
Why is that?
Just because we’ve got to have records of what we’re doing. So, a verbal, a lot of times you can say yea I remember talking to you, you know face-to-face, I remember that conversation. And you can tell if someone’s lying about it, I don’t remember that conversation…well, I can tell that you’re lying about it. A phone call, anybody can say…an email, hey I sent you an email on such and such a date. I’ve got a read document that says you read it.

Q15 Synopsis/Preliminary Analysis:
Participant 2 indicated lack of verbal cues in phone conversations can be challenging in determining veracity of message. Email, at least, provides a written record of the exchange. This response also appears to indicate that this least chosen method may be more closely aligned with his formal network. Verification/Confirmation
R048: ExK-KT dynamic with confirmation validation of KT. Email confirmation as validation of KT is part of an informal social dynamic, a function of social subsystem. Code this as a Process Control where ExK should be validated as Complete and non-diverse while TaK could be articulated as Incomplete, even if provided in a complete context. Process controls therefore can be used not only to overcome Incomplete TaK but also to ensure confirmation that TaK is *not* incomplete. This is an additional construct for Process Control as a metaphor. (**Use in Chapter 05**).

Appendix C: Participant 03 Field Journal Notes

Participant 03

15 Dec 2011 @1500

Themes: Knowledge as Action/Process/Procedure, Formality Affects KT, Combo Formal/Informal, Questions Indicate KT, Value F-to-F

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

In my little small segment… What I do in my job, what I know in my job about my job I forward that on to my boss, to the colonels when they ask questions. An example, the Air National Guard… Colonel <name removed> came down to talk to me today about our orientation program… What we do, how we do it, how it's set up, who does what.

Q01 Synopsis/Preliminary Analysis:

Participant 3's definition centered around work-related aspects of knowledge transfer...primarily vertical knowledge flow, focusing on chain of command hierarchy. Participant inferred the importance of process in knowledge transfer.

R049: A good example of simple procedural information transferred as part of leadership SM Process. Codified knowledge in procedure and program transferred via dialog where ExK\Information is "shared." I interpret KE within a recipricol exchange; this is not the case. I have interpreted KT to be most closely aligned with ExK in some form; this is an example. ExK typically interpreted as codified extracts of TaK. However, "how we do it, how it's set up..." could imply TaK KT. This could be an example of TaK\ExK where conversion of experience becomes verbally communicated. Code as \KFLow\KType\TaK/ExK. Flow direction multi-directional.

Q02. In your workday, who do you transfer knowledge with most and why?

I would say deployers first. I work with branch chiefs quite a bit. Course, anything and everything that I do I keep my boss informed.

Why is it that these particular folks are the ones you transfer the most knowledge with?

Well, it's by nature of my job. With deployers, constant questions, what about this, what about this, or things that I need to forward to them. They are required to know. Branch chiefs, as an example, I'm having an issue with mandays right now and I go back and forth with them on those concerns. Same thing with special interest items… If I have questions I go to the branch chiefs. I think that would be the biggest.

Q02 Synopsis/Preliminary Analysis:

Participant 3 emphasized customers (IG team members scheduled to deploy) as the predominate knowledge transfer population, followed by mid to senior level leadership, including her boss. Participant also emphasized the importance of upward knowledge transfer to her immediate supervisor (boss). Participant indicated most frequent knowledge transfer revolves around providing information to both customers and those in leadership positions.

R050: Deployers is operational, tactical knowledge flow. Specifically to enhance right actions. This involves participant KNet engagement with KFlow for enhanced individual SM, creating Goal Congruence and Understanding with organizational Shared Purpose. This is KT\ExK in homophilic network.
R051: \(SG)Enabler and (SM)Enhancer within macro-meso SM Process. This is more linked to Functional SS and Information SS. This is a Process Control dynamic, ensuring consistent outcome when TaK is incomplete, while ExK is complete. The challenge with Turner & Makhija (2006) is simply all ExK is assumed by definition ExK inherently complete. In some cases, organizational guidance policy may be very explicit, but not all operational contingencies are included, therefore incomplete. There is no place for ExK\Incomplete (See Figure 8). If as in this case ExK is incomplete and non-diverse, then we can assume TaK surrounding ExK, i.e., SM Process would be inhibited ((SG)Inhibitor. In this case Clan Controls would be most effective if modified original definition of Clan Control to include more than Cultural Knowledge (Choo, 1998). Key application of Clan Control knowledge is *adaptability* ((OI)Creativity, (OI)Problem Solving, Goal Congruence Boundary, Solution Space Boundary, Understanding Boundary, EComplexity, EOptimum Complexity, EShared Purpose, EMultidimensionality. Clan Controls allow for *"common interpretation of both process and outcome knowledge"* (Turner & Makhija, p.205). In this context Clan Controls effectively and positively work against the negative feedback loop created by incomplete knowledge in form of organizational policy.

Q03. Who do you transfer knowledge least throughout your workday and why?
Senior leadership.

How would you describe senior leadership?

The general, you know the staff up front and I would say the O6s (Colonels, team chiefs). I mean I do deal with them but not on a regular basis, no.

Why do you think that is?

Because the O6s generally would go to my boss first and ask him. I mean on occasion, yes they do come to me but they are the least likely to come down my level in the pecking order.

Q03 Synopsis/Preliminary Analysis:

Indicated organization complies with a fairly strict hierarchical structure. This constrains participants' knowledge transfer to immediate peer group and first level supervision. Formality (leadership/bureaucracy hinders knowledge transfer).

R052: \Activity\Frequency\Very Infrequent, \Duration\Days. Network is less dense, broader sphere of Tie Relationships, not Alter bridges, and heterophilic at this outer level, more complex in this context. \EgoNet Structure\Centralized, \ICASNet Assortativity\5 Highly Positive. Colonels talk to senior staff, typically.

Q04. Most frequent exchange contacts: your relationship with these people?
That’s a hard question. My relationship… Coworker. Even though they’re not in my direct vicinity, no, they’re still a coworker. That’s a hard question. I’ve never thought

about my relationship with them. It's more than just business-like. Because I don't approach people within a business-like intent. I don't think…

If it's more than just a business relationship, how would you categorize that?

I like people. So when I'm talking to them and even about something business-like I always tried to have a personal connection with them. I mean it doesn't have to be really personal but I still try to have a warmer connection with them other than I need you to do this (bangs hand lightly on table). Then I stop the conversation, I don't do that. Does that make sense?

Q04 Synopsis/Preliminary Analysis:

Expressed some difficulty in formulating a response. However, participant 3 indicated relationship with frequent contact involves both formal and informal networking. Combined formal and informal social network.

Participant verified a proclivity to develop a dual focused relationship: both formal and informal with the same contact.

R053: Informs Q02 coding. Shifts focus to dual Alter bridging in Nodal Relationships mixed with Tie Relationship. \ICASNet Assortativity\4 Positive, \ICASNet Clustering\4 Clustered, \ICASNet Connectivity\Distributed Path (... "even though they are not in my direct vicinity"), \ICASNet Density\Highly Dense Ties (business plus "warmer connection"). Correlate this to Male vs. Female and to organizational level, role in organization. MPF personnel by definition are "people focused" and in general more personable. This would be a good example of \ICASNet Flow Multiplexity\5 Highly Multiplexed as there is typically multiple messages flowing in KT or KE, one for formal work activity outcome and TaK creation and one for social networking Tie formation, Alter Bridge building and maintenance, depending upon strength of social networking.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?

If we're talking people in my office that I work with, for instance… Personal issues… What you did over the weekend, who bought a new TV set, where did you get it, what did you pay, that kind of thing. We discuss news stories that we've read or that we've heard, what your family's doing, those kinds of things.

Q05 Synopsis/Preliminary Analysis:

Participant indicated informal network discussion focused on personal, yet rather superficial, subjects. Readily identified informal topics of discussion.

Q06. With these folks that you most frequently contact what do you least frequently discuss?

Extremely personal home life. We would talk home life on a, as I would call it, a surface level. But, since most of my coworkers are male, men tend not to talk on a personal level like females do. So, if we were having a conversation in the office, I'd keep it at that level.

At the surface level?

Yes.

Q06 Synopsis/Preliminary Analysis:
Participant indicated other than superficial discussions are off limits due to the fact that her coworkers are male. She asserted that males tend to shy away from discussing deeply personal issues. The inference appears that the participant indicated this is the case for conversation in the work place.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

Generally, via E mail traffic from senior leadership down to include, of course, my supervisor down to me. Unless it's within my own office, it tends not to be face-to-face as much as it used to be. It tends to be more via the computer.

Why do you think that it is? That outside of your office knowledge transfer is not face-to-face?

One, people can keep a record copy of things that they said. They can back up yes I've provided this to whomever. I also think in this day and time people are more to themselves and or less likely to have human interface. It's easier to sit on the computer and send it without having to get up and walk down the hall.

Q07 Synopsis/Preliminary Analysis:
Participant 3 stated email (written) communication alerts her to knowledge transfer across the organization. She also indicated that contemporary work place communication is greatly reliant on email over face to face communication due to ability to codify conversations and the convenience email affords: " It's easier to sit on the computer and send it without having to get up and walk down the hall."

R056: Formal network, Tie Patterns, more macro-meso, complex network, involves requirement for written confirmation of knowledge receipt. Links more closely to ISS and FSS. Code to ExK & KT. \Activity\Degree of Complexity\Universal, \Degree of Definition\Formally Defined, \Degree of Formality\Formal, \Degree of Freedom\Extremely Governed, \Degree of Structure\Rigid. Designed organizational structures tend to be rigid and less flexible, more appropriate for formal communications to ensure consistent SM message (Theory of Rhetorical Congruence), \Purpose\Control. Process Control mechanism. (SG)Trigger, (SM)Process, (SG)Enabler.

R057: Inner office, close network, lateral, social exchange. Links more closely to CSS and SSS. Code to ExK\TaK KT. KFlow micro-meso, simple, Nodal Ties. Less formal and unstructured, \Degree of Structure\Loosely Controlled. Clan Control mechanism, providing for additional TaK-KE enhanced SM activity. (SG)Trigger, (SM)Process, (SG)Enhancer. Note Enhancer implies inherited Enabler. \EgoNet Structure\Communication.

Q08. What factors do you feel contribute to knowledge transfer in this organization?

What factors…

In other words, what is it about this team that you've noticed that allows knowledge transfer to occur.

That's funny, I've never thought of it in those terms. I kind of think of it more as knowledge transfer is directed because it's a military organization. And, it comes from uphill and travels down.

So, using that, if it's directed from on high on down, what do you feel facilitates transfer of that knowledge?

A need to know. Guidance. Direction.

Q08 Synopsis/Preliminary Analysis:

Participant 3 indicated knowledge transfer is directed which implies a strong element of control due to the nature of the military's hierarchical organizational structure. This perception appears to place the mechanism of transfer in the control of leadership. Emphasis on the influence of hierarchy.

R058: Process Control. Organizational vertical down communication, Shared Purpose, \Leader Need\Control vs. Autonomy (Guidance), \Organizational Need\Information vs. Knowledge to ensure organizational SM with consistent guidance message. \Knowledge Worker Need\Acquiring vs. Contributing Knowledge. Informs R056 Coding. ICAS Flow Positive Influence.

Q09. What do you feel might hinder knowledge transfer in this organization?

I find the IG team very disjointed. Ops, maintenance, and support all stay within their own realm, if you will. I think sections within those branches kind of stay within themselves. I think that tends to inhibit knowledge transfer to a bit. But, I think it's also because of rank structure and the way we're set up. Because I know information will come down from above and it will sometimes stop at a branch chief level. If they feel no one else has a need to know or aren't interested, they don't forward it on. Or, they don't have time to forward it on.

Q09 Synopsis/Preliminary Analysis:

Participant 3 indicated that organizational boundaries between branches (the major divisions) hinder knowledge transfer; moreover, she elaborated that subsections within the branches contain knowledge constricting boundaries...silos within silos. Additionally, vertical knowledge flow down the rank structure can inhibit knowledge transfer if held at one (or more) levels. Formality (leadership/bureaucracy) hinders transfer.

R059: (SG)Inhibitor. \\KNet\Networking Dynamic\Increasing Centrality, Highly Embedded, Centralized, 1 High Negative, Highly Diversified, Highly Complex Path, Minimally Dense Ties, Forced Tie, \ICASNet Flow Multiplexity\2 Separated, Flow Types\SG Flow, \Brokerage\Organizational Value, \Diversity\Highly Heterophilic, \Prominence Attraction\Neutral, \Tie Type\Maintain Tie, \Agency\Unknown, \Opportunity\Tie Pattern, \Random\Network Internal (links to ISS, PSS, and FSS). \NetPrim Node\Organizational, \Ties\Hierarchical.

R060: (SG)Inhibitor. \Cognition Dynamic\Active Cognitive Inertia, Experience Level\Universal, \Intelligence\Universal, Understanding\ExK Unavailable. ExK Unavailable Inhibits KFlow, Inhibits IFlow. Reduces SG-SM effectiveness at micro-meso level. \ICAS Flow\Degree of Influence\Extremely Negative.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

Well, outside of the usual way email, phone calls, just in general conversation you learn things that you've never heard. I've got a little continuity binder for deployments as an example. And I keep a little running list. And every time someone tells me something I had called over [received] and they give me a piece of information on the phone that I'm not familiar with or haven't heard, write that down so I can constantly keep my notebook updated.

That sounds to me like, say with the deployers you keep that notebook. Do you do something similar with your informal contacts? With those that you talk about other things…

Not really.

Q10 Synopsis/Preliminary Analysis:

Novelty appears to alert participant to change in her own knowledge state. Knowledge state changes in her role as deployment manager, for example, she records in a binder to capture and codify these new revelations.

Indicated that formal network contacts warrant knowledge codification, whereas informal contacts do not.

R061: Could actually be TaK or ExK, but in this context, more accurately interpreted as TaK, i.e., "someone calls over and tells me something," but key is KT takes place more meaningfully at social level as part of a KE dialog, and then gets codified as ExK, i.e., "continuity binder." Code as ExK\TaK during KT. Explicit communication, formal network, Tie Relationship focused in context to operational knowledge. \Knowledge Worker Need\Acquiring vs Distributing.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

Outside of the term business?

In any sense…

It all generally business related. Usually something directional in nature I would say.

Someone telling you to do something…

Or, and I mean it in another way also as in deployers, special interest items, mandays, you can't do this because member has to do (taps hand on table three times) or they're not allowed to do (taps hand on table three times). Or, they're required to fill this form in order to do this. Or, they can not fire this weapon without having fired this weapon…that kind of thing.

So, in other words if I can summarize, the knowledge that you obtain from your contacts is kind of procedural knowledge, how you do certain things.

Yes, yes.

Q11 Synopsis/Preliminary Analysis:
Again, the participant 3 refers to the vertical structure of the organization as a powerful influence on knowledge transfer. Also, procedural knowledge appears to play a large role, categorically.
R062: \Activity\Purpose\Control (inform procedural control to create specific sequenced outcomes with dependencies), \Social Context\Mixed (see Q04 Response). \Balancing Dynamic\Knowledge Worker Need\Acquiring vs. Contributing Knowledge. \Leader Need\Not Applicable in this context. \Micro-Meso TbKM Need\Group SM Need (implied). \Organizational Need\Information vs. Knowledge as primarily information exchanged for purposes of defining or clarifying defined procedures, i.e., enhance SM process (SG)Enabler, (SM)Enhancer. \KFlow\3 Mostly Complete, \Degree of Complexity\3 Diverse (links to ExK-KT dynamic where procedural knowledge incomplete), \KType\ExK/TaK (allows enhanced SM activity by providing additional TaK, links to BIT\Attention\Spreading Activation Beneficial coded at either ExK or TaK, in this case ExK as ExK primary knowledge type in cycle.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?
I would say as deployers how to, how they would go about, or proceeding on paperwork for deployments. How they, you know, go to the hospital and what they're supposed to do, what uniform requirements are. It's the same thing for special interest items. I had someone call me and ask me how do they start the process for an ACC SII (Air Combat Command Special Interest Item). And so I send them information on this is how you set one up, this is what you're required to do, and these are the steps that you have to follow.
OK. What types of knowledge do you provide or, at least intend to provide, to your informal network?
I don't think I've ever thought of it as a type of knowledge. I think I thought of it as just informal conversation.
And what would those things be? The things you mentioned earlier, talking about family and things like that?
Yes.

Q12 Synopsis/Preliminary Analysis:
Participant 3 indicated procedural knowledge is also what she provides to others.

So, formal network knowledge transfer tends to be procedural, likely codified; informal knowledge transfer from participant to others tends to be more personal, likely not codified.

P063: As with Q11, informed by Q04 Response. Similar coding to Q11 only direction would be based on caller SM gap, code as (SG)Trigger, (SM)Enhancer, (SM)Process, same \Activity\Purpose\Control. But \Balancing Dynamic\Contributing Knowledge vs. Acquiring and \Micro-Meso TbKM Need\Group SM Need and \Organizational Need\Knowlege vs. Information (a KFlow requirement exists). Links to \KFlow\KType\ExK/Information, i.e., "what they're supposed to do."

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

When they come down and ask me questions about something that I have sent them. Same thing, if I'm working with someone on the staff. Or, I just sent out mandays…I had someone call me today and say I received your mandays could you explain to me now how I do this, this, and this? Or, my boss reads my emails then comes in and asks me questions…could you clarify this, clarified that.

Q13 Synopsis/Preliminary Analysis:

Participant indicated that a request for more information relative to her message alerts her to the change in others' knowledge state. Again, questioning serves to alert that change in knowledge state occurred in others.

R064: Knowledge Acquisition Confirmation, code as \KFlow\KType\Acknowledgment Signal

Q14. And what method would you say you use to transfer knowledge most with and why?

Email.

Why is that?

So I can keep a record of everything that I've said and done.

Is that for formal or informal communication?

Formal.

What would you use for informal communication?

Verbal.

Verbal being?

One on one…

Face to face or phone?

Face-to-face first, on the phone second. Because within the IG, if I want to discuss something with you more informally I would get up from my desk and come see you.

Q14 Synopsis/Preliminary Analysis:

Formal knowledge transfer methods tends to be email. Informal transfer tends to be face to face (preferred) or telephone. This appears to indicate that formal knowledge transfer requires codification to ensure a record of the transaction is available. It also appears *that this requirement is not necessary or warranted for informal knowledge transfer. Participant indicated she values face to face knowledge transfer over other methods.*

R065: Formal written (Email). \Activity\Purpose\Communication, \Cognition Dynamic\Understanding\ExK Send Only (acknowledgment not required or anticipated). \ICAS Flow\Force Type\Knowledge. Links to SM(Process). Links more to knowledge distribution and transfer.

R066: Verbal directly related to KE vs. KT, i.e., "if I want to discuss something..." which would imply a TaK KE or KT. In this case purpose is to transfer or distribute knowledge outbound. \Attention\Spreading Activation Beneficial, \Understanding\TaK/KT Available, \ICAS Flow\Lateral (Q02 Response qualifies), ICAS Flow\Force Type\Intent. Links to SG(Trigger). Relates more to knowledge acquisition and exchange.

Q15. And what method would you say you least transfer knowledge with?

Formal knowledge? I would least likely call you. Because I think sometimes things get lost in the translation and, at least, if it's in email I know what I've said, you know what you've said. If I'm talking to you face to face, we can tell by facial expressions that there's been a disconnect.

And, informal communications, what would you least likely use?

Email.

Why is that?

Because I tend to be an informal person, I would rather talk to you face to face. And there's no sense weighing down your email box. (laughs)

Q15 Synopsis/Preliminary Analysis:

Participant indicated that her least likely methods of knowledge transfer is by telephone for formal network contact due to the lack of codification or non-verbal indicators that would be available in face to face communication. Participant reiterated her preference for face to face communication with informal network contacts.

R067: Both formal and informal least used KT media would be email. Social connection with f2f confirmation. Informs Q14 and informed by Q02 Responses.

Appendix D: Participant 04 Field Journal Notes

Participant 04

16 Dec 2011 @ 1300

Themes: Knowledge as Action, Combo Formal/Informal, Values F-to-F

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Knowledge transfer… To me it would be like, say if you have someone new to the organization, and you want to get them up to speed or whatever, you want to take what you already know, what you already know, pass that on to them. That way they can get up and perform their duties or their job as soon as possible, and as best as they can at that particular time before they start building on themselves or gaining knowledge themselves. That knowledge transfer is giving you a baseline.

Q01 Synopsis/Preliminary Analysis:

Participant 4 indicated that knowledge transfer occurs person to person in a work related setting to position, as an example, the receiver of knowledge with a baseline to perform duties. This a particularly functional definition of knowledge transfer, related to knowledge in process/action.

R068: KT more TaK. (SG)Trigger (new assignment, new role, new tasking), (SM)Enhancer, (SM)Process. \TaK, \KT, \KWrk\Activity\Degree of Formality\Formal, \Degree of Freedom\Loosely Controlled, \Degree of Structure\Dynamic links to (SG)Trigger to create foundational knowledge base. \Social Context\Primarily Work. \Balancing Dynamic\Knowledge Worker Need\Contributing Knowledge vs. Acquiring, \Leader Need\Unknown, Micro-Meso TbKM Need\Group SM Need, \Organizational Need\Knowledge vs. Information. \Cognition Dynamic\Spreading Activation Beneficial, \Experience Level\Domain Expert, \Intelligence\High Intelligence, recognizes need to establish foundational knowledge for solid knowledge growth, \Understanding\TaK Send Only. \ICAS Flow\Degree of Influence\Extremely Positive, \Direction\Lateral, \Force Type\Knowing, i.e., the act of enhancing SM through SG, \Nature\Align Resources using knowledge, i.e., TbKM Activity alignment, \KFlow\4 Complete, \Degree of Complexity\Not Applicable, \Duration\Hours, \1 Very Infrequent, \KType\TaK/ExK flux knowledge in flow, \Life Cycle\Create, \Reach\Individual.

Q02. In your workday, who do you transfer knowledge with most and why?

My coworkers.

Why is that?

We all basically do the same job. And if there's something new that I know I've learned from doing my job I need to pass that on them. Because it just keeps recurring. And, if we can do that we can nip it in the bud before it gets out of hand. Or, on one particular trip they may skip it, nobody may bring it up and it can hamper the inspection team.

Q02 Synopsis/Preliminary Analysis:
Participant indicated coworkers are those with whom he transfers knowledge most in a problem solving/resolution context.
R069: Homophilc network connections, strong Tie Relations and Nodal Relations. Primary KT within small micro-meso domain. \Micro-Meso TbKM Needs\SG Needs. Informs Q01 Response.
R070: Directly links KFlow to ICAS Flow in relation to (OI)Decisions and (OI)Actions. This is an (SG)Inhibitor, i.e., lack of KT, and negatively influences (SM)Process, i.e., \Cognition Dynamic\Attention\Spreading Activation Beneficial but \Understanding\ExK Unavailable, and \ICAS Flow\Degree of Influence\2 Negative, \Force Type\Knowing. In this context a negative, countervailing force working against OI Decisions and OI Right Actions.

Q03. Who do you transfer knowledge least throughout your workday and why?
That's a tough one… Team members outside of my immediate work group.
And why is that?
Because they don't participate in that part of planning the trip that we do. You know, those guys, the inspectors, they take care of what they do once they hit the ground. Our job is to get them there, get them settled, and get them ready to get there and start doing their inspections.
Basically, the function of your job is not the same as theirs.
Right.
Synopsis/Preliminary Analysis: Attributed the least amount of knowledge transfer to exchanges with those with an apparent proportionate distance from his immediate coworker's core duties.
R071: Increasingly larger sphere of network Pattern Ties with diminished Nodal Ties reduced KT in any given period. TbKM Activity is primarily a planning and initiation activity, staging activity. KT is related to planning activity, i.e., \Activity\Degree of Complexity\Difficult, \Degree of Defition\Formally Defined, \Degree of Formality\Formal, \Degree of Freedom\Externally Governed, \Degree of Structure\Flexible ("planning the trip that we do" implies resource assignment and flexibility in scheduling based on specific time period), \Purpose\Planning, \Social Context\Primarily Work, \Balancing Dynamic\Knowledge Worker Need\Action vs. Cognitive Rest, \Leader Need\Optimizing Resources, \Micro-Meso TbKM Need\Group Continuity vs. Group Change, \Organizational Need\Resource Allocation, \Cognition Dynamic\Spreading Activation Beneficial, \Experience Level\Domain Expert, \Understanding\TaK/KT Avalable, \ICAS Flow\Degree of Influence\Positive, \Direction\Multi-Directional, \Force Type\Direction, \Nature\Align Resources, \KFlow Dynamic\Duration\Weeks, \Frequency\1 Very Infrequent, \KType\Procedural, \Life Cycle\Share, \Reach\Organization.

Q04. Most frequent exchange contacts: your relationship with these people?
We have a long standing relationship because we were all military on the IG team. Now we've gone from being military on the IG team to being civilians working on that same function on the IG team. It's like a family. We have a family type of relationship.

Would you categorize your relationship with these folks as formal? Or, informal? Or, maybe a mix of both?
Yes, it's a mix [formal and informal, work and social].
Synopsis/Preliminary Analysis: Participant 4 indicated a combined formal and informal network with coworkers due to long standing relationship spanning back to when they were active duty performing similar or the same duties.
R072: Informs Q02 KNet Coding. Emphasis on homophilic connections of similar Nodal type, dense structure, Alter Bridges.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?
Sports. What we did that weekend. Family, seeing how family is. What you're doing for lunch. (laughs)

Q06. With these folks that you most frequently contact what do you least frequently discuss?
Politics. Religion.
Why is that?
I don't think it has a place in the work area.
Synopsis/Preliminary Analysis: Participant 4 appeared to have a fairly regimented idea of what informal network discussion topics should be in the workplace...may be an extension of the regimented control of formal work related discussions (among the same people). Emotionally charged subjects are least discussed.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?
Among the team at large? Because things operate smoothly. There's not a lot of hiccups between point A and point B.
So, in the processes that we have here in the IG team…I'm just trying to recapture your words to make sure that I understand. These processes perform more smoothly as knowledge disseminates throughout the organization.
Right. They understand, people outside of our office understand what we're doing and why.
Synopsis/Preliminary Analysis: Smoothly running processes are indicative of (effective) knowledge flow across the IG organization. This leads to understanding by external teams' of participant 4 and his coworkers' roles/responsibilities. Again, this implies knowledge within process/action.
R075: KT confirmation via organizational performance indicators, i.e. "things operate smoothly." Code to \KT and \Process Control\Group Continuity vs. Group Change, \Organizational Need\Localized Operation vs. Corporate, \Outcome Control\Group SM Need, \Organizational Need\Maintaining Optimum Complexity. And \(SG)Enabler linked to Process Control concurrently \SM(Enhancer) links to Outcome Control. Turner & Makhija (2006) postulated KT impact was low and negligible for ensuring operational precision as knowledge acquisition was considered negligible. However, KT should continue to bring new TaK codified into ExK to process improvement. Organizations are

constantly in flux, i.e., a state of IFLow dynamics continuously impacts organizational SM at any given point in time. Therefore, KT is never negligible nor insignificant in an ICAS learning organization. Interesting perspective of KT confirmation value in context to OI Actions (Balancing) and OI Problem Solving (Cognition) dynamics.

Q08. What factors do you feel contribute to knowledge transfer in this organization?
Open lines of communication.

Can you explain a little bit more about that?
Initial training. Letting people know that you are willing to help are willing to assist if they need it. I guess they let us know what problems they have. We, in turn, let them know what difficulties or what we're running into and getting the problem solved on the other hand. Just that open communication back and forth.

Synopsis/Preliminary Analysis: Participant 4 indicated that effective communication between his team and those outside of his team contribute to knowledge transfer. Understanding processes between his office and those external to his office facilitate knowledge transfer.

R076: This is KE-TaK dynamic, in a homophilic networking dynamic, close Tie Patterns while developing Nodal Tie relationships. This would be building or bridging extension activity within the Networking Dynamic positively linking KFlow to ICAS Flow for improved SM(Enhancer) while being a SG(Trigger), fostering OI Creativity and OI Problem Solving. Code to all referenced Nodes appropriately.
R077: Links KWrk\Activity\Training to KT positively. A foundational positive level set, informs Q02 response, as well as R076 coding.

Q09. What do you feel might hinder knowledge transfer in this organization?
Egos.

Can you explain a little about that?
Being on the IG team or being part of the IG team some feel that it puts them at a different level from other folks. A know-all, can't tell me anything type of mentality. And that's not good.

So, you feel that hinders knowledge transfer?
Yes. If you're trying to explain or you're trying to do something with someone who thinks that's below them. Or, they really don't want to get involved with it because they do feel that it's below them. It's not their job…

Synopsis/Preliminary Analysis: Participant 4 indicated that status, or one's perceived elevated status, hinders willingness to effectively transfer knowledge. This is somewhat related to hierarchical bureaucracy hindering knowledge flow.

R078: SG(Inhibitor) within SM(Process), impeded by blocked KFlow or reduced KFlow. I am not coding for morale and motivation issues, a work ethic dynamic. A possible additional coding classification schema would be the Participant Node, where demographic data can be coupled with motivation level and other characteristics such as perceived self-efficacy and self-esteem. These underlying individual psychological attributes are not considered, and should be within an enhanced ICAS dynamic.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

I can do it, I can perform it without having to keep asking what do I do now, what do I do with this. I can take it from one point all the way through to completion.

Synopsis/Preliminary Analysis: Participant 4 tied knowledge obtained to ability to perform. This indicates he makes the connection that knowledge applied manifests through process/action.

What about in terms of your informal communication, how do you realize you've learned something?

Informally? Same thing. When I can relate to what they're telling me or they're saying to me. Or, you see their point of view. They can see yours.

Synopsis/Preliminary Analysis: Even though participant 4 indicated the same phenomenon occurs in realizing knowledge obtained from informal contacts as with formal contacts, he articulated that the manifestation occurs in understanding, or the realization itself, rather than in overt action.

R080: Informal Nodal Ties, strong Alter Bridges, homophilic and dense networked relationship for this level of social discourse. This represents an individual additional level of SM. This would be a meaningful SM(Enhancer) that would improve intelligence, by creating new awareness to additional patterns, i.e., "you see their point of view."

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

What type of information do I obtain from my frequent contacts? Things [knowledge and/or information] on procedures.

Like procedures on the team?

Yes, procedures on the team. Actually, I learn a lot about what they do when they do go out…different career fields, talking to people I can understand what they do when they go out. Before, I just knew they were in a branch, but what they did in that branch I had no idea.

Right. So, even in your contacts that are a little bit less frequent you obtain procedural knowledge, job details, that kind of thing…

(Indicated agreement)

Synopsis/Preliminary Analysis: Participant 4 indicated a broadening of categorical knowledge, specifically with procedural knowledge, occurs (for him) through others' knowledge transfer to him. Knowledge manifestation through process/action.

R081: Code to \CMP\Balancing Dynamic\Acquiring vs. Contributing Knowledge, \Micro-Meso TbKM Need\Group SM Need, \Organizational Need\Information vs. Knowledge. The challenge with coding this positive force is that it represents both KT and KE, both TaK and ExK within an individual knowledge cycle where larger spheres of organizational activity, procedures, \Networking Dynamic\EgoNet Centrality\Decreasing Centrality (i.e., "I can understand what they do when they do their job"), \EgoNet Constaint\Not Applicable, \EgoNet Structure\Communication, \ICASNet

Assortativity\1 Highly Negative (actually a very positive learning organization activity, increases spreading activation capabilities, intelligence in form of additional pattern recognitions), \Cognition Dynamic\Attention\Spreading Activation Beneficial, \Understanding\TaK/KE Available, \ICAS IFlow\Degree of Influence\5 Extremely Positive, \Direction\Universal, \Force Type\Intent, \Nature\Network. \Nature\Network implies a positive force towards fostering creativity within a continuously learning organization.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

I think it would be the same thing…how to accomplish certain tasks, knowing where to go for assistance if it's needed.

Thinking of your coworkers, where you have a formal and informal relationship that sounds like a formal sort of knowledge transfer for you that you provide to them. Kind of the same thing as what's provided to you?

Right.

What about informally? What kind of knowledge do you typically provide to your close contacts, your coworkers?

What's going on in my life. Family. Hobbies. Things I like to do. Same thing…what's going on with me.

Synopsis/Preliminary Analysis: In response to a prodding question, participant distinguished between types of knowledge provided. As before, participant 4 clearly delineated between the two. Even though the informal and formal networks contained mostly the same people, the types of knowledge transferred appeared to remain consistently within the communication context (i.e, without blending). Combined informal and formal social network nodes; but, knowledge varied categorically according to type of discussion.

(DFL) Not coding to complex unique reference here, very limited ICAS Node coding. I am going to use Q12 response to inform prior codings. Code primarily equivalent to Q11 response but in outflow direction, \Distribute Knowledge vs. Acquire. Same positive influence in SG-SM dynamic as well as IFlow positive force.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

Verbals, non-verbals. Gestures. Or, you know, just a I understand or I can relate to what your going through.

What type of gestures would kind of clue you in to knowing that someone gets what your telling them?

Could be a head nod. A smile.

Synopsis/Preliminary Analysis: Participant 4 indicated he relies explicitly on both verbal and nonverbal cues to alert him that others have obtained knowledge from him.

R083: Not coding to complex unique reference here. Code to \KFlow\KType\Acknowledgment Signals.

Q14. And what method would you say you use to transfer knowledge most with and why?
Verbal.
Verbal on the phone or verbal face-to-face?
A lot of both because we do a lot of business on the phone. But, I prefer talking to people over sending email. If I had a choice, I'd rather talk to a person versus electronic communication.
Why is that?
I don't know…I guess I'm just old school like that (smiles).
R084: \KT\Formal but verbal vs. written. Verbal implies social Nodal Tie connection to ensure positive acknowledgments. Mostly a preference over technology. Verbal communications over written communications, both as formal KT media, but verbal with informal feedback messages has greater perceived value..

Q15. And what method would you say you least transfer knowledge with?
Texting, telephone, those smart phones…
Why is that?
First, I'm not very good at it and I'm not real big on technology.
Synopsis/Preliminary Analysis: Participant 4 clearly indicated that he values direct face to face verbal communication over other, especially technology driven, methods.
R085: Least used KT media, smart phone technologies, formal electronic media. Generational characteristic. This would be another significant demographic for an ICAS Node representing the Participant to capture demographics, including generation demographic data.

Appendix E: Participant 05 Field Journal Notes

Participant 05

19 Dec 2011 @ 1230
Themes: Formality Affects KT, Combo Formal/Informal, Value F-to-F
Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?
Passing information from one person to another.
Can you elaborate a little bit on that?
Well, in my line of work anyways when I think of knowledge transfer it's everything I know down to the people that work with me so that they have a clear understanding of what I'm trying to tell them and what I'm trying to pass to them and vice versa. On the inspection team sometimes we get into specific information that I may not know or somebody above me may not know. So then, transferring their knowledge to me, part of our buying and selling, me going into talk about certain things. So, being able to pass that up as if I'm the intelligent one talking about it to other people.
Synopsis/Preliminary Analysis: Participant 5 indicated an understanding of knowledge transfer occurring predominately in a vertical fashion. He indicated that transfer flows both upwards and downwards from himself to others and vice versa. He also indicated that part of the process involves an interpretation of knowledge obtained from his subject matter expert subordinates to his direct supervisor/leader as if he's "the intelligent one." Participant focused on the hierarchical aspect of the organizational knowledge transfer.
R086: Code TaK-KE and KFlow vertical down. This is specific exchange reference, i.e., "and vice versa." Once knowledge acquired, agree with Deville, emphasis shits to vertical KT as ExK up, having gone through a lateral exchange dialog to enhance understanding, creating a (SG) Enabler and SM(Enhancer) within vertical down KE life cycle for subsequent knowledge cycle activity, i.e., vertical knowledge transfer (R087).
R087: Code KT-ExK and KFlow vertical up. Here knowledge moves vertically as part of another knowledge transformation cycle, where TaK-KE dynamic is embedded within secondary vertical KT-ExK KFlow. This would be a primary example of Slice *inheritance* (Alter, 2005).
Q02. In your workday, who do you transfer knowledge with most and why?
Typically, mostly it would be (name excluded) and (name excluded).
Your coworkers?
My coworkers, even though I'm the lead for the section those are my two right hand and left hand guys.
And, why is it? Is it because they are your closest…
Yes, it's really so that if any of the three of us aren't available we're all up to the same level of understanding. From different trips, as you know, we've got anywhere from five are six things going on despite the inspection we're getting ready to go. You know, with

everybody else that's coming up and all the questions that are being asked. Same with emails, we're all three on all the emails that are sent out and everything else.
Synopsis/Preliminary Analysis: Most frequent knowledge transfer involves coworkers in an effort to keep closest subordinates and himself "all up to the same level of understanding." This understanding involves knowledge obtained verbally and email traffic.
R088: Very specific Clan Control, SG(Trigger) as leader. Ensures knowledge moves up and down vertically, primarily vertical up as KT and vertical down as TaK-KE. Code R088 in context to Clan Controls, SG, and SM dynamics. Informs network dynamics and emergent force directions for both R086 and R087. Code to Shared Understanding, Understanding Boundary, and EKnowledge Centricity. This is one of the more meaningful representations of **Clan Control** influencing the shape of KFlow dynamic by aligning multiple levels of KFlow as well as KType, both formal and informal. KNet homophilic, dense Nodal Ties, ensuring vertical down to create composition emergence. "Knowledge shared is power squared" (Bennet & Bennet, 2004, p. 47).
R089: Similar Clan Control dynamics and KFlow dynamics but network increases to larger macro-meso level including more complex network, less homophilic, less dense, ensuring optimum compilation emergence. Combination of R088 and R089 validate power of Clan Control to create optimum IFlow dynamic to create Shared Purpose, Optimum Complexity, and Knowledge Centricity for consistent OI Actions and OI Decisions.

Q03. Who do you transfer knowledge least throughout your workday and why?
In a normal workday, I don't know that I have one specific person, per se. But I would venture a guess to be… If I had to name somebody, it would be (name excluded).
Who is (name excluded)?
She works in my logistics section. She's a log planner by trade. And the reason I say that is because she doesn't have anything personally going on that requires my attention. And she kind of stays quiet herself, so she's not looking to talk to me a lot either. Not that I don't seek her out to say hello and stuff like that and see how's she's doing. Then, there is (name excluded) in between her and I as well. So, that's probably what cuts down on the…
Synopsis/Preliminary Analysis: Participant 5 indicated a switch in focus. He described his most frequent contacts in a work related context. However, with least frequent contacts he described a more personal context. The one contact he focused on also involves an intermediate (on the rank/organizational hierarchy) which may contribute to the relative lack of knowledge transfer.
R090: Again, hierarchical structure a KT and SG inhibitor, as KT would move through layers and knowledge would not be TaK expert, but intermediary source, and that knowledge repository would be only as valuable as KE-KT dynamic with SG-SM capabilities within that particular work group. \Formally Defined and \Formal activity.
R091: \Activity\Degree of Definition\Ad-hoc, \Formality\Informal, \Completely Autonomous, \Degree of Structure\Dynamic, \Purpose\Monitoring. Interpret in leadership role as an informal monitoring mechanism. KNet\Nodal Tie.

Q04. Most frequent exchange contacts: your relationship with these people?
I think a pretty good one. More so than just a boss-subordinate relationship. I tend to ask a lot of, not necessarily personal questions, but to see how they're doing, see how their day's going, how their families are doing. And then allowing that door to open for them to invite more information in towards me, but I don't ever try to get too personal with it.
It sounds like you have both a formal relationship and an informal relationship. Would that be a correct way to put it?
That would be…yep.
Synopsis/Preliminary Analysis: Participant 5 indicated a blend of formal and informal social networking with the same people. Participant acknowledged his effort to inquire about subordinate's welfare without prying. Combination formal and informal social networks.
R092: Power of Clan Control to create enhanced Nodal Tie relationships benefiting Pattern Tie relationships. In this context, Clan Controls directly links to enhanced (SG) by creating trust. Links to CSS and EShared Purpose, as such a (SG)Enabler and (SM)Enhancer. Enhanced SM "allows that door to open for them to [provide additional information]" creates or enables subsequent SG. Clan Controls thus create SG potential energy with Pattern Tie network by creating kinetic energy with enhanced Nodal Tie relationships.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?
Usually it's work related issues. Something specific to what they're individually working on. And now, you know, this time of the year it's about what they're going to do over the holidays, stuff like that too.
Kind of a mix...
Yeah…I try to keep it as close as I can, but it's probably more 65-35, 65% job and then 35% personal.
Synopsis/Preliminary Analysis: Reiterated in more general terms, the blend of both formal (work related) and informal (personal) discussions.
R093: Daily KT involves social as well as work activity information. Informs R092 and R088 at more homophilic network level, blending Nodal Tie and Pattern Tie strengths. ICAS Flow and KFlow, SSS and CSS.

Q06. With these folks that you most frequently contact what do you least frequently discuss?
Money. I never talk to them about their personal finances or anything else. But, we do talk about just about anything else that they want to talk about.
Synopsis/Preliminary Analysis: Participant indicated that finances comprise a subject too deeply personal or emotionally charged for their discussions.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?
I can see it…
How so?

From a trip brief…because not everybody goes to the trip brief…So, myself (team member, name deleted) or (team member, name deleted) will go to the trip brief and then we'll have an LRS brief after the trip brief. And, you can see that knowledge transfer. If you were sitting there, in the trip brief, all that information that was passed getting directly passed to everybody that wasn't there.

Any other ways?

Team chief meetings where everybody's there.

When you're on the road?

Kind of a one-stop shop for everybody to get all that stuff. Through emails, mass emails to individual emails. Sometimes it'll be IG all. Other times it'll be through the O6 to the branch chiefs to the lead…then I'll know.

Synopsis/Preliminary Analysis: Participant highlighted visual cues alert him to when knowledge transfer occurs throughout the organization. However, he also indicated other means as well, such as written and, likely, verbal mechanisms.

R096: Unique KNet dynamic, mobile vs. stationary individual or micro-meso group context. As with prior participant, confirmation within formal email communication is considered inherent by nature of media. No direct acknowledgment received, just assumed. More distributed via distance and mobility, confirmation becomes assumed vs. explicitly observed. \Networking Dynamic\NetPrim Node\Cyber Space, i.e., void of direct human interaction. NOTE: Future enhancement to Networking Dynamic would be more specific NetPrim Node attribute to capture telecommuting vs. remote work activity. At present, both are captured within Cyber Space attribute. Within enhanced ICAS representation, there should be a way to meaningfully capture Activity Type to link more closely with \KFlow\KType and NetPrim Node attributes (Zhuge, 2015).

Q08. What factors do you feel contribute to knowledge transfer in this organization?

It has to be the people passing the information. So, people have to take stock in what they've either A sat in the meeting and heard or B read through the email and heard and then going to verbally pass that along. A lot of times you'll see emails, as we talked about, with the chain that'll say just FYI and then send it out. That's relying on them to go through and read through it. Other times you'll see a quick synopsis of what, hey this is what this is about. So then you can start dictating how much time you actually need to spend reading through, you know, that whether it pertains to you or not.

Synopsis/Preliminary Analysis: Participant indicated people, as the mechanism of transfer, are key to knowledge transfer. The media may be through verbal (meetings) or written (email); however, people serve as the judicial intermediaries that serve as facilitators of knowledge transfer.

R097: SM Enhancer as a SG Trigger within SM Process. Typically, SG is seen to drive SM based on perceived SM Gap (Maitlis & Lawrence, 2007, Weick, 2012). However, here SM can become an SG Trigger. The SG-SM dynamic is not SG=>SM directional only, but can be an SM=>SG dynamic, as is the case here with meaningful information synthesis during any given knowledge cycle. The KWrk activity is time compressed and simplified, i.e., \Understanding Boundary, \Solution Space Boundary, \KFlow\KType\ExK/TaK, \KT, as part of enhanced SM Process. In this context, knowledge in flux is reduced in complexity, ultimately reducing \Uncertainty. \IFlow\Force Type\Knowing, \Degree of Influence\5 Extremely Positive.

Q09. What do you feel might hinder knowledge transfer in this organization?

The same thing…it's people. To me, that is the most dynamic and one thing I can point out that can either help or hinder. If you've got somebody that holds on to information or doesn't pass out everything they should about a certain subject, then that's only going to hinder your organization and hinder everybody to effectively do what they want to do. You know, it goes back to effectively communicating.

Synopsis/Preliminary Analysis: People serve as simultaneously facilitators and barriers of knowledge transfer. This relates, in a more general sense, to the hierarchical bureaucracy hindrance.

R098: \SM Process, SG Inhibitor, \IFlow\Force Type\Knowing, \Degree of Influence\1 Extremely Negative, increases \Uncertainty. Impacts OI Decision Making and OI Problem Solving, prevents OI Actions and diminishes EMultidimensionality.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

My ability to regurgitate what I just heard. More than once. Anybody can hear one thing and repeat it, but it's to actually digest it and be able to explain it little bit more.

Synopsis/Preliminary Analysis: Participant 5 indicated that realization of knowing when you know occurs after cognitive processing (analysis and synthesis) over rote repetition serves to signify the change in knowledge state.

R099: ExK=>TaK conversion. A potential to create subsequent SG(Enabler). Code at \Ability Boundary, \Solution Space Boundary, \Understanding Boundary to focus on Cognitive Dynamics at individual level to enhanced organizational KFlow dynamics. Requires higher order intelligence to create meaningful patterns for current and/or future problem solving.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

It's valuable knowledge. I don't know how you quantify that. Because as we go through certain things, we deal with simulations and all that stuff, so sometimes we inadvertently get left off of emails. And then to be able to talk face-to-face about here's where it's at. I know you weren't on that email, but this is what the branch chief said or the team chief said. Or, we got a phone call…there was no email. The unit was calling and asking these types of questions and this is how we responded back to them over the phone. But, still ask, you know. In our line of work we like to have all that stuff written down in email; not necessarily to protect ourselves but to make sure that everybody's on the same page, the unit and the inspectors. In fact, this morning, that was one of the biggest things or when people stop by into the cubicle and not everybody's around and they want to talk about a subject and stuff like that. We had that this morning.

So, it sounds like the type of knowledge that you transfer with your closest contacts is basically work related, formal types of information.

Yeah…the only other time that it would be outside of work would be if like we have an individual who's sick. You know, passing on the status of that individual. If one person's been checking in on them. Then, we kind of keep that consistent instead of bombarding that individual. You know, and I've kept them for myself, like with (name excluded) who's been out with back surgery…kind of kept them up to breast on how he's doing. And then, we've got another individual that we're monitoring daily. And, so it's just catching up on that type of stuff.

Synopsis/Preliminary Analysis: Participant 5 indicated primary type of knowledge transferred is work related; however, he did acknowledge that extenuating circumstances, such as illness or surgery, also comprise a primary category of knowledge transfer.

R100: Knowledge Acquisition. High degree of situational awareness. Represents high degree of intelligence with high levels of environmental and surrounding KNet dynamics, awareness. *I am not explicitly capturing situational awareness in a specific unique attribute, but indirectly in \IFlow\Force Type\Intent as implying high degree of situational awareness and initiating action as necessary.* \OM\Cognition Dynamic\TaK/KE Available. EKnowledge Centricity, \Understanding Boundary, \EShared Purpose, i.e., "make sure that everyone's on the same page." \IFlow\Force Type\Intent.

R101: Transition of TaK to ExK for further distribution and to become part of OM. Code to \OM\Cognition Dynamic\TaK/KT Available. Both R100 and R101 collectively positively influence ICAS Flow as well as KFlow. In both cases, \ICAS Flow\Force Type\Knowing. \Life Cycle\

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

Everything that I know that is going on. I try to make it so that, it's irrelevant if I'm present or not; I try to leave them with everything that…my thoughts on all the subjects that are currently out there, my intent on everything that's out there, and where we need to go on everything that's out there. So that I don't necessarily have to be sitting there in the conversation. Because, like I told you, the dynamics of how everything works, I mean a phone call could be happening right now as we're sitting here. And they should be answering in line with how everything's set up to answer.

Synopsis/Preliminary Analysis: Participant indicated that his intention in providing knowledge to others is to ensure everyone holds the same knowledge state. Thus, he serves as a knowledge broker.

I know as a team lead it's a kind of downward directed to make sure everybody's in the know. Does that make sense?

Yeah…more of a push.

R102: Knowledge Distribution vs. Knowledge Acquisition. Ensure SM continuity, an SM(Enhancer) and (SG)Enabler. Very explicitly TaK-KE, understanding, interpretation, application guidance provided with knowledge, true KE, i.e., TaK/ExK with meta-information to enhance SG-SM dynamic. This is a Clan Control outcome. \KFlow\Life Cycle\Apply. This is both a Share and Apply dynamic. The emphasis on Apply comes from KType\TaK/ExK, the emphasis on TaK being distributed via KE. This requires strong Nodal Ties as well Pattern Ties. Informs EShared Purpose and Understanding Boundary, as well as Ability Boundary, increasing personal pattern recognition capability with TaK. This informs subsequent Outcome Control linked to Clan Control where enhanced Outcome Control becomes KNet potential ICAS energy.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

When something is passed down and I pass it on I see that they're following everything that I ask them to do in reference to whatever's happening. So, it's the product I see in the end. And if I don't see what I've got, then I always go back and ask them what part of the conversation I had with you earlier did you not understand? You know, really it's not to knock them but it's to make sure that I'm communicating well enough to them so that they understand it.

Synopsis/Preliminary Analysis: Participant indicated that his cue to others' obtaining knowledge from him is evident in what he perceives as their comprehension and in the returned product based on the transferred knowledge. He also indicated a proclivity to affirm understanding with others to ensure he was communicating effectively.

R103: Process Control. Positive acknowledgment through observed adherence to process. So process should be monitored for when Clan Control is primary KWrk\Activity\Purpose\Control. \KWrk\Activity\Purpose\Monitoring when Clan Control is ensuring Goal Congruence and Understanding. This is a feedback activity, but in context to monitoring outcome of process flow. Code Clan Control and Outcome Control, R104. Activity Purpose is unique for Clan Control and Outcome Control. \ICAS Flow\Force Type\Intent. Informs R012. \KWrk\Activity\Purpose\Control. In this case product is process adherence.

R104: Outcome Control. \KWrk\Activity\Purpose\Monitoring. In this case, product is observed outcome of process.

Q14. And what method would you say you use to transfer knowledge most with and why?

Verbal.

Verbal being phone? Verbal being face-to-face?

I prefer face-to-face first. Phone, second. Then, email and texting, third, I guess. And the reason for that is I usually ask after I'm done talking to them what did I just ask you to do? To make sure we're on the same page. So, you don't get that [TaK-KE confirmation signals and acknowledgment] with the texting and the emails as much.

Synopsis/Preliminary Analysis: Participant 5 indicated preference for in-person communications due to ability to receive immediate feedback that is not available via written forms of knowledge transfer. Values face to face knowledge transfer.

R105: Positive SG Enabler and SM Enhancer.

R106: Negative SG Enabler and SM Enhancer.

Q15. And what method would you say you least transfer knowledge with?
I try to cover it all. They're just so impersonal and can get read out of context. You don't know what the emphasis is on sometimes. When you're talking to a person you can hear the fluctuation in their voice, you know with everything else. Most of the time they'll repeat it and you get the instant feedback from whoever you're trying to pass the information on to. So, that's why I prefer face-to-face first and I get to see the immediate reaction, the facial reaction to what just happened. The phone, sometimes you get that, plus it gives them the opportunity too. If you're not spelling it out in a way that they understand it, it gives them the opportunity to come back and say did you mean this or did you mean that? This is how I perceived it. It's that give and take.
Synopsis/Preliminary Analysis: Participant indicated that written media of knowledge transfer do not contain avenues for feedback available in face-to-face; he values the immediate feedback apparent in face-to-face communication. He also indicated he values the opportunity face-to-face communication provides to knowledge recipients to clarify the received message.
R107: TaK-KE for KWrk\Activity\Communication with \Clan Control a monitoring activity.
Is there anything you'd like to add?
I do think people are key, though…it doesn't matter…you that old test that they pass a paragraph around verbally around the room, by the time it gets back it changes. So, it depends on how intent the individual was listening in receiving that information that they can be able to explain it to others.
Synopsis/Preliminary Analysis: Participant reiterated that people, as the knowledge transfer media, are key to the process.

Appendix F: Participant 06 Field Journal Notes

Participant 06

19 December 2011 @1300

Themes: Formality Affects KT, Combo Formal/Informal Networks, Difficulty with Least Question, Verification/Confirmation

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Knowledge transfer I believe would be knowledge that a group or an individual has that they are able to provide to somebody else whether that be family or friends, personnel, clients, employees, subordinates. And that is usually flowing downhill, can be lateral, it can be upwards in rank or supervision. And also downwards or like I said, lateral.

Synopsis/Preliminary Analysis: Participant 6 indicated that knowledge transfer occurs primarily between people in a downward fashion within a vertical hierarchical structure. However, he acknowledged that knowledge transfer may also occur laterally or upwards. Focused on flow among a hierarchical construct.

Q02. In your workday, who do you transfer knowledge with most and why?

Throughout the workday, that would be my immediate supervisor.

OK… Why is that?

Our working relationship deals within a certain career field, and being new to the team for me, we keep each other in the loop to make sure we're on the same page. So it is not necessarily transferring knowledge… Maybe I'm thinking more of sharing knowledge and also keeping abreast and making sure we're on the same page.

Synopsis/Preliminary Analysis: Indicated most frequent knowledge transfer occurs with immediate supervisor primarily to ensure knowledge equity and learn about new position with the IG team. Participant also appeared to distinguish between knowledge transfer and knowledge sharing, but did not elaborate.

R109: \Activity\Purpose\Training (OJT). TaK-KE to ensure goal congruence and shared understanding. Supervisor provides feedback via TaK-KE. \Balancing Dynamic\Knowledge Worker Need\Individual Learning vs. Group, \Leader Need\Control vs. Autonomy, \Micro-Meso TbKM Need\Group SM Need, \Organizational Need\Knowledge vs. Information. \ICAS Flow\5 Extremely Positive, \Direction\Vertical, \Force Type\Knowing, \Nature\Network, i.e., linking KOs and LOs with KFlow with Activity Systems. \KFlow\Degree of Complexity\2 Non-Diverse, \Duration\Hours, \Frequency\5 Very Frequent, \KType\TaK/ExK, \Life Cycle\Share, \Reach\Individual. \Activity\Difficult, \Degree of Definition\Ad-hoc (as necessary) requiring R110 Clan Controls to ensure desired outcomes. \Purpose\Execution (Ops). \Process Control for Knowledge Interpretation (\Life Cycle\Share) to create common interpretation. \ICAS Flow\ForceType\Knowing

R110: Supervisor component: \Activity\Degree of Definition\Formally Defined, \Degree of Formality\Formal, \Degree of Freedom\Loosely Controlled, \Degree of

Structure\Dynamic, \Purpose\Review. \Clan Control for Knowledge Interpretation (\Life Cycle\Share). Reinforces SM and creates opportunity to discover SM gaps to create SG(Trigger), a potential force, gap analysis. \Force Type\Intent.

Q03. Who do you transfer knowledge least throughout your workday and why?
On the entire IG team?
Of all the folks you have contact with in your workday.
So of the 20 that I said I have contact with…maybe some of the field units out there.
And why would that be?
Because that knowledge transfer takes place as needed or as required. And also they usually come to us for knowledge and we only provide to them when they ask. We don't usually volunteer knowledge or offer knowledge unless they come to us first.
Synopsis/Preliminary Analysis: Participant 6 stated least amount of knowledge transfer occurs with units to be inspected. He elaborated that this knowledge flow is predominately from his section on the IG team to the to-be-inspected unit. Rarely is knowledge provided without a precipitating request or without intention.
R111: Least KT remote units, homophilc network, i.e., same occupation field, Pattern Tie, distributed network. (SG)Trigger. Request for knowledge becomes (SG)Trigger, but should be solicited. \ICAS Flow\Force Type\Initiative Activities, \Force Type\Knowledge, \Degree of Influence\2 Negative Influence, i.e., on KT activity. This is a cultural and social norm established within KNet dynamic, not governed by a specifically defined process or outcome. As such may not be monitored for completion or effectiveness, as there is not indication of \Clan Control assessment at this extended network level, outside immediate 20 closer Nodal Tie connections. Pattern Ties are less formally defined and governed, monitored or controlled. I would interpret this as a (SG)Inhibitor and negative influence on (SM)Process. \Networking Dynamic\EgoNet Constraint\KFlow Inhibitor.

Q04. Most frequent exchange contacts: your relationship with these people?
Yes… Other than being in the military it's fairly casual and friendly in nature. It's still professional because we're military, of course. I guess that's a pretty short example of what our relationship is.
OK… So it kind of sounds like you have a formal connection with these folks, but you also said you're casual and friendly as well so is there some kind of informal connection there?
Yes, we don't necessarily talk about work we also talk about family what did you do this past weekend, what will you be doing this coming weekend, movies, this couple likes to do this, this couple less to do that. Things like that. Joking.
Synopsis/Preliminary Analysis: Participant 6 indicated that the informal component of his relationship with his most frequent contacts is quite strong, likely as strong as the formal component. He indicated combination formal and informal social network nodes.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?
I'd say…informal?

Yes.
Working out or types of exercises. Usually stories of restaurants because, oddly enough, we talk a lot about food.
OK.
Just funny experiences from throughout our lives whether it relates to taking care of the yard or things we'd seen at other units that we've been stationed at throughout our careers.
Synopsis/Preliminary Analysis: Participant 6 indicated that informal conversation centers around personal, off-duty activities through a technique seemingly like storytelling. Appears to be a clear distinction between informal and formal knowledge transfer even though both occur with mostly the same network nodes.
R113: Relates to creating OM, creating Nodal Tie relationships linking to specific TaK (experiences) at various KNet nodes, within homophilic network dynamic. \ICAS Flow\Force Type\Knowing, \Nature\Network. \Cognition Dynamic\TaK/KE Available (i.e., dialog). Links to \Shared Purpose, CSS, SSS. Cognitive Dynamic needs to be expanded to capture OM characteristics more meaningfully to link ICAS Flow dynamics to ideation process at individual and group level.

Q06. With these folks that you most frequently contact what do you least frequently discuss?

Of the things that we do discuss what is the least?
Yes.
Hmm… It's kind of hard. Can I refer back to that one later?
Difficulty with a "least" question.
Sure… Absolutely.
So, there was one question that we skipped over where I asked what do you least frequently discuss with your informal contacts?
Of the things we do discuss, obviously there's an encyclopedia of all types of discussions out there that we don't talk about…but, of the other things that we do discuss that we discuss the least…it would probably be another person's character in a negative sense. It happens, people gossip but I think that's one thing that we try to stay away from.
Synopsis/Preliminary Analysis: Participant indicated that least discussed topic involves malicious conversation about others (e.g., gossip).

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

Usually, you either hear it secondhand or an email goes out. Also, my immediate supervisor, he'll come back from a staff meeting and either tell us OK this was what was discussed that you need to know and he usually, and that's only because our cubicles sit right there by each other, and for the rest of the people under his supervision an email will follow which I'll be included in so I'll hear it twice. And it might even be a follow-up to the email. Then we'll talk about a third time.
Synopsis/Preliminary Analysis: Participant indicated that knowledge transfer manifests in dissemination from an individual (in this case, his supervisor) to a broader audience.

Participant also indicated that due to his position in his immediate organization, along with proximity to coworkers, he often encounters redundant information.
R114: Secondary communication and extended confirmation loops out to micro-meso level with more extended network connections, Pattern Ties.
R115: Primary KT in social context based on physical proximity.

Q08. What factors do you feel contribute to knowledge transfer in this organization?
How it should be? Or, how it realistically does?
What are the factors that actually make it happen?
Outlook mail makes it happen. SharePoint makes it happen. And usually email that isn't directly from me, you see in the bottom somebody usually states pass on as required or pass on to all of your people.
And you're referring to e-mail?
Yes, I'm referring to email that maybe twice removed, it wasn't sent to me, it was sent to branch chiefs.
Got it through the chain of emails…
Yes.
Synopsis/Preliminary Analysis: Participant indicated that technology, predominately email, and facilitates knowledge transfer. The written component in this medium allows a persistence of information that leads to knowledge transfer even if he wasn't the initial intended recipient.
R116: Formal email KT enabler. SM Process and SG Trigger, i.e., "pass it on."
R117: ISS supports KT. SM Process and SG Enabler.

Q09. What do you feel might hinder knowledge transfer in this organization?
Hearing things secondhand. So, we gain knowledge transfer that way, but also that hinders it because like the old game telephone line, or whisper down the lane, when you're hearing something although the intention might be accurate, or they might mean well, you're not getting the full story and the intent of the original message or source of knowledge.
Synopsis/Preliminary Analysis: Participant indicated knowledge receipt via hearing contains an inherent risk of misinterpretation.
Yes, what do you think hinders knowledge transfer?
An example is our new superintendent (name deleted) I heard through (name deleted) [a more senior person], I heard that [the superintendent] is a big fan of wearing ribbons. If you're in your blues, you need to wear ribbons. Well, that's being more stringent towards AFI because the AFI doesn't tell us we have to wear ribbons. But, I started wearing ribbons with my blues even though we're not required to. So, four months later, five months later I still have not heard (name deleted) say he likes the people to be [doing specific activity] wearing ribbons with their blues.
So that sounds like a question of expectation that you really aren't sure about.
Right, it's still knowledge… It's not doctrine it's not bible, it's just something that someone would like to see. And what that person thinks we should; but however, I started

doing something even though it did not hear from the source and even though I'm under no obligation to do it. So I don't know that helps with anything.

No, I can see that. Because that question addresses things that hinder knowledge transfer and it sounds like the vagueness of your understanding at the leadership level it wasn't clearly spelled out what his expectation was in terms of wearing ribbons.

Right.

So, it sounds like you didn't really get the full story of what he really expects to see.

Yeah, it might be what he [more senior person] wants but maybe it wasn't important enough for (name deleted) to say that to people.

Synopsis/Preliminary Analysis: Participant 6 indicated that behavior change may occur due to faulty knowledge transfer brought about from others' misinterpretation. Other participants (find them) mentioned misinterpretation of information, specifically email.

R118: KT hindered by second had information, misinterpretations and filtering. SG Inhibitor and SM Process. IFlow\Degree of Influence\2 Negative, \Direction\Universal, \Force Type\Knowing, \Nature\Network. More under influence of \Clan Control.

R119: Intention. Intention for KT influencing behavior, code to \Goal Congruence Boundary and \Understanding Boundary. Different type of ICAS Force, \Force Type\Intent, \Degree of Influence\1 Strongly Negative, \Nature\Align Resources. \Outcome Control, i.e., "leadership level it wasn't clearly spelled out what his expectation was."

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

How do I seek it out?

How do you know when you know something?

Usually depending on the nature of the knowledge if somebody mentions something and I say oh yes sure you are right the IG or team chief did say that in an email, I see it right here. Or, you're right, there it is on the front page of the portal. I see it right there. So maybe something in black and white or, no kidding, hearing it verbally from the originating source whether its doctrine, policy, or I want you to wear PT gear on the third Thursday of the month or something like that.

So, you said that depends on the type of knowledge… This sounds like more formal things that get passed on…are there any other types of knowledge that you could talk about?

Whether it's casual?

Yes.

Yea, it might be somebody talking about hey, I hear so and so's trying to get this on their PT test again and that that all comes back to official military stuff, but OK that's great but maybe I heard it wrong or maybe I remembered it wrong or maybe they misspoke but then I might talk to the source, that person, and they say oh, no actually I'm trying to do my run in 12 minutes. So that's something… I'm not sure of that answers your question.

Synopsis/Preliminary Analysis: Participant indicated that he confirms he knows when he's obtained knowledge when he can confirm this knowledge via electronic media. He also acknowledged that hearing from the originator of the knowledge also confirms his realization of obtaining knowledge. Participant indicated this verbal confirmation with the knowledge source may occur with formal and informal network interactions. Verification/confirmation alert to change in participant's knowledge state.

R120: Primarily first hand communications. Not a KT dynamic, just an information transfer activity. Supports SM Process. I interpret this as a SM gap requiring SG, code as SG Trigger. Knowledge acquisition confirmation messages. ExK/Information vs. ExK or TaK. KWrk is formal and work related. Code in context to Clan Controls and Nodal Ties.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

It is usually practice, standards, or expectations I should say whether it's on a UCI or in an ORI. So, to sum it up, it would be expectations…it's kind of an oversimplification, but I think that sums it up best.

You mentioned UCIs and ORIs… Is there a distinction between the two in terms of the knowledge obtained?

Yes, UCIs Compliance Inspections are more about interpreting regulations and how you apply them to home practices. ORI [Contingency] knowledge is more about procedures and wartime. Things that people don't do all the time. So, UCIs are looking at how you follow the regs day-to-day [process activity, daily operations, compliance]… and then, how you implement [outcomes] that into a war scenario is what we do with an ORI. So it might sound the same two people outside the IG, but for us there is a big difference.

Synopsis/Preliminary Analysis: Categorically, participant 6 indicated that the type of knowledge transferred with his most frequent contacts is work related.

R121: Practice in terms of process compliance, Process Controls. KWrk Ops. In both cases, ExK-KT, i.e., "how you apply them." I interpret this is validating KT has taken place through ExK confirmations.

R122: Standards and expectations also related to contingency operations, future outcomes. KWrk Quality Check. I interpret this as validating TaK-KE has taken place through ExK confirmations.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

Usually answers to what they expect or my interpretation of what governing directives say.

So, it's typically work related?

Yes. But, again, if I'm just supplying them with knowledge, it's usually just casual crosstalk.

Could you explain a little about that when you say crosstalk?

Conversation that's not necessarily sequential…just going back and forth…people taking turns talking about holiday shopping, hanging out with in-laws, who's the annoying relative (laughs), things like that.

Synopsis/Preliminary Analysis: Participant indicated that knowledge he provides can be both formal and informal.

R123: TaK-KE dynamic in more social context. Appears to be a function more directly governed by social connections, i.e., Nodal Ties, in highly homophilic network connection, immediate or direct co-worker sphere of influence, i.e., micro-meso level only, group level.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

If I still have a puzzled look on their face, I try to read body language. Or, if they repeat what I'm saying in a different way but it still makes sense to me then I know they've received and interpreted what I'm saying.

Synopsis/Preliminary Analysis: Nonverbal cues or articulated reflection by recipient serves as an indicator to participant that others have obtained knowledge from him.

R124: Verbal indicators, body language. Social context SG Trigger and SM Enhancer within SM Process. Requires ExK/TaK KT. Multiple levels of feedback representing knowledge in flux, i.e., uncertainty in this context.

Q14. And what method would you say you use to transfer knowledge most with and why?

Direct communication in email.

Direct communication?

Meaning if it's instead of hey can you tell so-and-so this usually I try to make sure I tell that person directly.

Face-to-face? Phone?

Yes, whether it's face-to-face or on the phone. If it's going to be verbal, it's going to be on the phone; but, if not…I don't know if it's a good thing, but a lot of times we rely on email as the official thing…but I try to…if I can be cliché, an email sent is not an email received. So, you usually have to follow through with them. After you click send doesn't mean it's done.

Synopsis/Preliminary Analysis: Participant indicated that his preferred method is both email and verbal (phone and/or face to face) in conjunction; however, he also emphasized that this communication should be direct (i.e., not routed through an intermediary).

R125: 1st phase or KWrk Activity surrounding KT confirmation, formal or written via email communication. \Formal communication does ensure KT, therefore code in terms of knowledge receive confirmation in ICAS Flow dynamic as a \2 Negative influence. From a knowledge degree of completeness, confirmation acknowledgments are \1 Incomplete. Code to Understanding Boundary and Goal Congruence Boundary. Here negatively impacts SM Process by inhibiting SG. If knowledge gap is not perceived, i.e., no acknowledgment confirmation, then there is no trigger opportunity to provide additional SM.

R126: Actual confirmation takes place via informal verbal follow up. This is \Informal, and ICAS Flow dynamic is \4 Positive influence. Confirmation acknowledgments are \4 Complete with this type of follow up. Code these two responses uniquely to capture this subtle difference in terms of Knowledge Flow degree of influence on ICAS Flow dynamics. Code to Understanding and Goal Congruence Boundary. In this case, creates a SG Trigger opportunity by confirming SM, thus a SM Enhancer.

Q15. And what method would you say you least transfer knowledge with?
I guess third hand, you know, telling. I do not like to rely on telling someone to tell someone, putting an individual between me and the intended receiver.

Why is that?

Because the person might forget to tell that other person…they might misinterpret what I said. They might not tell them in a timely manner, for whatever reason.

Synopsis/Preliminary Analysis: Consistent with the previous question, participant 6 reiterated that his least preferred method is verbal through an intermediary.

R127: Several different inhibitors to SM process, i.e., SG Inhibitors. One is process termination prior to completion or outcome. Second is misinterpretation, poorly received knowledge, represented as Incomplete Knowledge. A third inhibitor would be process delay. These are three key indicators of a faulty or misaligned SG-SM dynamic.

Appendix G: Participant 07 Field Journal Notes

Participant 07

20 Dec 2011 @ 1100

Themes: Combo Formal/Informal Networks, Questioning Indicates KT, Value F-to-F

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Knowledge transfer…it's pretty simplistic, right? Transfer of knowledge.

Can you expand a little bit more on that?

(laughs) I guess it's the transfer of knowledge from one individual to another. In your line of work I guess, since you're studying how it transfers, it would be at the level of transfer. In other words, is it truly understood or just superficially understood, what nuances are conveyed. And, I guess it goes back to the definition of what is knowledge. Are facts knowledge or is more the application of facts knowledge? So, there are extreme nuances of that,we're going to get into obviously. Knowledge management is how corporations or governments or whatever control that knowledge, that management. And, not only is facts and figures, but also how it all goes together. And, those parts that can't be written down, how those are conveyed and managed. It's very in depth.

Synopsis/Preliminary Analysis: Participant 7 expressed his understanding of knowledge transfer as a complex, nuanced exchange. The study of knowledge transfer involves studying this exchange at the level of the transfer within organizations along with its method of conveyance. P7 probably expressed the most insightful pondering of the subject while, at the same time, attempting to answer the question.

R128: KT and ExK. Includes information as knowledge ExK/Information. I would interpret nuances as subtle meanings conveyed in the form of meta-information or SM information to facilitate shared understanding of knowledge, implied. But key is knowledge is a flux between TaK and ExK between "know how" and "know what" (Chae et al., 2005). Relates to knowledge in terms of transactive memory (Chae et al., 2005, p. 67). Transactive memory may provide real-time links to knowledge sources to enhance SM and provide additional SG, if ICAS Flow creates those dynamic connection opportunities.

R129: More subtle Transactive Memory (OM), networked through complex heterogeneous connections and a function of level of diverse expertise. \ICASNet Clustering\Highly Diversified, \ICASNet Connectivity\Highly Distributed Path, requiring \ICASNet Density\Dense or Highly Dense Ties, i.e., optimally complex network Node relationships, accessible and understood, easily navigable across sub-nets.

Q02. In your workday, who do you transfer knowledge with most and why?

Here on the IG or in my previous job?

Here on the IG team.

OK…on inspection or not on inspection?

Either one…let's going with a combination of both.
Two extremes. On inspection I interact with a lot of people. There's a lot of knowledge transfer.
So, on an inspection who would you say you transfer knowledge with the most?
Those who I'm inspecting. In that instance we're looking through a lot of files together. Throughout my inspection I have to stop and sit down and explain what I find and what I didn't find and go through, you know, the pros and cons of what they did. So that not only am I telling them how they're getting their grade, but also where they can improve upon. So, that's an intense sort of teaching, knowledge management at that point in time. During the week when I'm here it's kind of boring. I might work on a staff issue. But, that's a very limited pool.
Synopsis/Preliminary Analysis: Participant 7 indicated knowledge transfer varies by job environment. When out on an inspection he indicated an "intense" level of knowledge transfer with those who he is inspecting. When back home, less knowledge transfer occurs. Interesting how he focused on a knowledge management "point in time" as an intense education opportunity.
So, here who would you say you transfer knowledge with most?
Again, let's define the word knowledge. Are you talking a conversation about sports or…
As you understand the meaning of the word knowledge.
Subtle nuances…is the question how many people?
No, who do you transfer knowledge with the most while you're here?
Oh, I got ya…I guess that would be my coworkers, my functional, staff personnel, that sort of thing.
Synopsis/Preliminary Analysis: Participant 7 stated his coworkers and closest functional contacts are his most frequent knowledge transfer targets.
R130: Intense TaK-KT in a teaching context. Implied one direction, based on observation, Participant shares his TaK regarding observed behaviors and performance in context to organizational controls, i.e., process and outcomes defined in the form of directives and regulations. Again, emphasis is in a one-on-one context. A highly explicit and homophilic social dynamic with strong Tie Pattern. EgoNet dynamic less significant in this formal KT activity. This would actually be Less Frequent KFlow.
R131: Relates more to Daily Operations activities, routines, governed more by Clan Controls and localized process and stronger Nodal Ties, implied. This would be more Frequent KFlow activity.

Q03. Who do you transfer knowledge least throughout your workday and why?
The least…well, I'd probably say those functionals that you're not related to. I'm in contracting so other functions where I don't interact on a functional basis I don't really interact with them, so I don't really share knowledge with them. I might in a social setting outside of work.
What would you talk about in a social setting?
(laughs) What don't you talk about?
What would be a typical thing that you would have a conversation about?

You name it, you know…politics, sports, religion, current events, history, things to do…so, a wide variety of stuff.
Synopsis/Preliminary Analysis: Participant 7 reported that he transfers knowledge least with those in disparate functional roles; however, he inferred that he might share knowledge with these contacts in a social setting. In this context, participant 7 indicated that a wide range of topics may be discussed. Indicated formal and informal social networks with common nodes.
R132: Least KT. Heterophilic network connections, weak Tie Nodal relationship. KFlow very infrequent contacts.

Q04. Most frequent exchange contacts: your relationship with these people?

Professional. In the work setting, I guess, professional. I'm not particularly close with anyone on the IG team. I've only been here for six months so don't really have a…not at the friendship level but at the professional level.
Synopsis/Preliminary Analysis: Participant indicated that he has not established close personal ties with his frequent contacts. However, he characterized his relationship with these as "professional." P7 inferred that the professional relationship is the default level of interaction.
R133: Informs KNet coding for Q03 R132 and Q02 R131.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?

(laughs) It all depends on the person and what the topic du jour of the day is. I really can't answer that question.

Q06. With these folks that you most frequently contact what do you least frequently discuss?

It all depends…if I'm talking to the person and they're more inclined to talk about a certain subject. If one person is really tight on sports, then I'll talk about sports. If one person is really more inclined on politics, then I'll talk to them about politics. So, it really sort of depends on the person and the news of the day, advice, normal stuff. The IG is for me is a unique animal because prior, you know, you were in a squadron [formal hierarchical structured unit] organization, everybody working the same task. So, it was a lot more, I would say a lot greater informal networks. I think here [autonomous work unit] you find the informal networks are actually smaller in scope, much smaller in scope.
Synopsis/Preliminary Analysis: Participant 7 indicated that topics of discussion are dependent upon the other person. He indicated that he will follow the inclination of the other person regarding discussion topics.
Why would you say that?
Because we're stove-piped here. Because other organizations you would have everyone working on the same team, working on a goal. Say 20 people working in a squadron, working on a goal. Here, your function is your…so I think the informal networks here are functionally as far as knowledge jobwise are very small. I think maybe you have a larger social network. But, as far as…I would posit my network here is smaller than a commander last year overseas I was constantly talking to multiple functionals, multiple

personnel all the time about a wide swath of information. But, here I find it a little limiting.

Synopsis/Preliminary Analysis: Participant indicated that his current position on the IG team limits social (informal) network formation, as opposed to his position in his previous squadron. He stated that this occurs due to the stove-piped organizational structure in the IG team.

R134: Larger organizational context with greater SM-SG linked to larger hetrerophilic network and more complex social network relationships, more Nodal Assortative EgoNet relationships. \ICASNet Density\Dense Ties.

R135: Smaller homophilic network connections within Pattern Ties. \ICASNet Density\Minimally Dense Ties. Here SM-SG dynamic bound to limited micro-meso Goal Congruence Boundary over larger organizational Shared Purpose boundary, ultimately I would perceive this as a SG Inhibitor.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

How do you know when knowledge transfer occurs? When the majority of the people will get it.

What's the evidence that you see that tells you that people get it?

OK, for instance, as you know, we've been transferring to IGEMS and every trip there's a new procedure on what they do or do not want them to do in IGEMS. If it's explained properly, people are like hey, yeah I got it, I can teach you that, I can do whatever; if you don't get it, blank stare, and it's like hey, let me get the expert who can explain it to me...again. And, so I think they get it when there's more people than not...there's always someone who doesn't get it...but, in an organization, if the majority of people got it and they follow through with it, great. When the majority of people are like hey can you explain it to me again, they flat out didn't get it. It's also at some point in time when it's formalized in written format...got your writing guide? Hey, here it is...hey, thanks for showing that to me, I got it. Like a continuity book, that kind of stuff. It's a tough question.

Synopsis/Preliminary Analysis: Participant indicated that evidence of knowledge transfer across the organization manifests in some sign that the majority understands some phenomenon. He indicated that this occurs, for example, in response to a problem affecting the organization. He also reported that formal written evidence, such as a continuity binder, alerts him to successful knowledge transfer across the organization.

R136: Positive KT Acquisition confirmation. Positive KT acquisition includes transition of TaK to ExK in form of desk top procedure or continuity folder. Key knowledge is maintained and codified.

R137: Negative KT Acquisition confirmation. No effort to transfer knowledge to ExK format. As a result, TaK originally transferred is perishable and lost over time.

Q08. What factors do you feel contribute to knowledge transfer in this organization?

The factors that contribute to knowledge transfer are two parties obviously being willing to receive and accept. To contribute to it, you know, a good setting, we're not particularly

stressed here. When we're at home that contributes to it because you have the time to sit down and talk about an item and reflect upon it...those are all positive factors. I think some of the limiting factors are different backgrounds. As you get one functional talking to a different functional who has a completely different background, you have to kind of accept the context...you have to explain the context of where you're coming from. But as far as, you asked me the question of what is contributing factors, I would say time, we have ample time when we're at home station. We're not in a stressful environment. And, certainly we have all the tools at our disposal whether email, phone, or in person...
Synopsis/Preliminary Analysis: (Participant 7)The primary contributing factor to knowledge transfer in the IG team is the lack of stress and available time while at home station.
R138: Positive factors include: TaK-KE dynamic. Motivation and willingness to engage are key. Optimum KT takes place in reduced stress environment, time for reflection.
R139: Links to Q09 directly, KT Inhibitors, coded with Q09..

Q09. What do you feel might hinder knowledge transfer in this organization?
The functional stove pipes. I would say just one doesn't understand the context of the other one.
Synopsis/Preliminary Analysis: Participant indicated that the primary hindering factor is the disparity between functional backgrounds/expertise which incurs an acknowledgement of context to facilitate knowledge transfer
R139: Heterogeneous social networks, complex and disconnected networks, reduced Tie Pattern relationships. Ultimately, there are not cross-pollination opportunities between diverse, disconnected, dense homophilic sub-nets into larger heterogeneous Nodal Assortative dynamics to enhance extended SG-SM dynamic.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?
For me, it's when I grasp the concept. Let me explain about that. Sometimes the boss will give you his intent and once you've grasped the intent, great. Other bosses will give you 15 steps in order to get there. I'd rather have the boss give me, hey I want you to do this. This is the end product I want. And I'll figure out the steps...other bosses will give you all the steps in between and you say look at and say well, hell, this is where you're trying to get to, right? All right, great, I want to do it. So, I guess when I understand the...for me it's when I understand the big picture, when I understand the base intent of what the hell...why are we doing it this way? When I understand the why we're doing it that way, then I got it. We're doing it this way because...or we're doing this thing outside of [standard procedure] IGEMS because we can't figure it out and, so using a Word document I can edit it and I can do that stuff with it...OK, great, now you got it! So, I guess for me it's the aha moment when I figure what the bigger concept is and I go aha.
Synopsis/Preliminary Analysis: Understanding the intent of a request relative to a larger picture is the participant's indicator that he knows when he has obtained knowledge.
So you can put it together...

Yeah, I can put all the pieces together.
R140: \Ability Boundary\Highly Intelligent with strong pattern recognition. KFlow enhanced with SM to improve \Understanding Boundary and \Solution Space Boundary. With higher intelligence, \Process Controls with ExK step by step guides are less meaningful, inhibits \OI Creativity. Here, \Outcome Controls are more meaningful with \Clan Controls to allow for innovative opportunities. I would interpret this as directly related to OI Creativity in terms of continuous process improvement (CPI). Higher order intelligence and SM requiring more flexible KFlow fostering OI Creativity. \ICAS Flow\Force Type\Intent. \Degree of Influence\Positive.
R141: Same BIT Boundary coding but here \Process Controls creates a negative ICAS Flow force dynamic, by inhibiting OI Creativity and additional SM derived from individual \Ability Boundary being under utilized. \Force Type\Intent, \Degree of Influence\Negative.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

Good question...there's a lot of knowledge I learn that don't come from contacts. Watching the news or reading the newsletter, you know, or reading other outlets...I would say a lot of knowledge comes from that. So, for me, it's not just from contacts. I guess from contacts you get the unofficial stuff or, hey here's what the news media said but a contact will sometimes say hey did you also hear this? So, they fill in the gaps, I should say. From contacts...they fill in the gaps, did you hear about that? They told us to this in IGEMS...crap, I missed that somewhere. So, they help you plod along, I guess.
Synopsis/Preliminary Analysis: Indicated knowledge obtained from contacts fills in the gaps from knowledge obtained from other sources (e.g., news or issues in work center).
You keep mentioning IGEMS, it's the most common brought up topic throughout my interviews...
It's [Information System / Formal Knowledge Repository] a terrible knowledge management situation. It's a classic case of an organization not knowing how to do it, sort of fumbling through the procedures along the way. But, yet not having the formal process to lock it down and educate everybody on how it...what the end goal is. I think we're getting there but I would say that is sort of a lacking thing...
*** Note that IGEMS is a common example of a poor knowledge management tool.*
R142: Strong Nodal Assortative provides enhanced SM, provides opportunity for SG Triggers. "Fill in the gaps" is a strongly positive SG-SM ICAS Force. Positive SSS dynamic and informal ISS. \ICAS Flow\Degree of Influence\Extremely Positive. \Force Type\Knowing.
R143: SM Process and SG Inhibitor with strongly negative ICAS Flow and KFlow implications. Poorly designed and delivered formal ISS dynamic. \ICAS Flow\Degree of Influence\Extremely Negative. \Force Type\Knowledge.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

Here on the IG, good question, most of my contacts here aren't looking for knowledge so I guess when it really, when I'm trying to convey something, it's for the purpose of...obviously, there's a reason to convey knowledge and the reason to convey knowledge is to get somewhere to get something positive out of that exchange. So, if I am talking to my counterparts about an experience that I had, either A I'm venting that I want their advice on, hey how did you handle a similar event or B I'm trying to convince them to change something. I guess as I mature on the IG, my first thing of communicating knowledge was more venting I guess, as hey I had this crazy experience expecting what the hell did you do? Or, here's a frustration; are you experiencing the same frustration too? But as I'm more mature, it's kind of like hey I'm experiencing this over here I think we can change, do it better this way and here's why I tell you as feedback. So, I guess it really...it's morphing.

Synopsis/Preliminary Analysis: Participant indicated that his primary knowledge provision involved 'venting' as he learned the intricacies of this job. As he became more experienced, he noted that the knowledge he provides became more of an effort to assist others or suggest improvement.

R144: Nodal Assortative with EgoNet dynamics to create Alter Bridges for specific intent of reciprocity. \Cognition\Knowledge Worker Need\Acquiring vs. Contributing Knowledge. \Cognition Dynamic\Spreading Activation Beneficial. \Experience Level\Domain Master. \SG Enabler.

R145: Increased Intelligence, greater TaK with experience. KT shifts to process improvements. \Cognition\Knowledge Worker Need\Contributing Knowledge vs. Acquiring. \Cognition Dynamic\Spreading Activation Beneficial. \Experience Level\Domain Expert. Domain knowledge increases, ability to influence decision-making and process increases. \SG Enhancer.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

Similar to what I answered before...it's the aha moment. If I ask them to explain back to me...like when I was previously a commander, when I asked them to explain back to me what my intent was and they could demonstrate that, and not asking...boom, got it. Or they're feedback...if you're talking about a topic and you bring up something and they respond in a different way. If they respond in a way that asks a question about what you said, you got exactly what I said, in fact you processed information and you give me back another question it enhances the conversation. So, I guess in that case in that way you can sort of see if it was, no kidding, effective knowledge transfer there.

Synopsis/Preliminary Analysis: Indicated that he recognizes that others obtain knowledge from him through their ability to articulate the message in such a way as to manifest understanding. Moreover, recipients who process information and articulate in *some unique fashion may enhance the knowledge transfer experience. Questioning as alert that others obtained knowledge.*

R146: ExK-KT as part of knowledge receipt confirmation with demonstrated process compliance.

R147: Shift to Tak-KE dynamic as enhanced or more "effective KT." Provides additional SG-SM opportunity and stronger KFlow, improves cognitive boundary alignment between individuals (Ackerman, 1998).

Q14. And what method would you say you use to transfer knowledge most with and why?

All of them...you know, email and phone probably my biggest.

Why is that?

They're the easiest. It all depends, you know. Sometimes you need to be in person; so, it all depends. Sometimes I walk down the hall and talk to somebody. If they're not here...if your contact's down the road, obviously it'll be a phone call or email. So, you pick what's most expedient and most effective. There's really no pert answer to that. It's just kind of...is the person available? Where are they? And is it a quick two sentence thing I get in email or is it something more lengthy you need to do on the phone.

Synopsis/Preliminary Analysis: Method choice is situational. Participant indicated expedience and effectiveness dictate knowledge transfer method.

R148: Media choice for KT a function of expediency and other factors. Depends on 1) type of knowledge being transferred, 2) location of recipient, and 3) quality of transfer required. Less complex ExK or TaK KT.

R149: Complex TaK KT informed by R147, where "more effective" KT requires more SG-SM enhanced dynamic with more direct social interchange, typically an TaK-KE dynamic with "enhanced conversation" (Q13).

Q15. And what method would you say you least transfer knowledge with?

Least...in some situations you can't use email for it, so...

Given a choice...

I would always do it in person if I could.

Synopsis/Preliminary Analysis: Participant 7 stated preference for face to face.

That would be your preference...

Yeah...

What would be your least preferred method?

Least preferred is dictation. Writing it out; but, every once in a while it's good. Sometimes email or dictation allows you to formulate your thoughts and give it a good thorough analysis, what you miss on the talking part. I would prefer talking...

R150: Although KT media least preferred is written format, useful for reflection and providing additional understanding and SM. I interpret this as a positive influence on SG-SM dynamic at the individual cognitive level, a specific knowledge worker need more significant than micro-meso organizational SM-SG need during that specific KWrk activity.

Appendix H: Participant 08 Field Journal Notes

Participant 08

20 Dec 2011 @ 1300
Themes: Knowledge = Info, Combo Formal/Informal, Difficulty Answering Least Question, Formality Affects Knowledge Transfer, Value F-to-F, Questioning Indicates KT

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?
Taking maybe what you know or what the subject is and getting information out to your folks, your people. Or, maybe helping them find the right resources to get the information because you don't necessarily know everything.
Synopsis/Preliminary Analysis: Participant 8 indicated knowledge transfer involves passing information to one's work group or enabling them to find information resources. Knowledge = Information
R151: ExK/Information KT part of ISS informal with explicit micro-meso context, "your folks, your people." Homophilic small networking dynamic, more Pattern Tie context with Nodal Assortative connections. In this context EgoNet Centrality is not really applicable. \EgoNet Constraint\Highly Embedded, but not in a negative ICAS Flow context, as ICAS Flow and Balancing Dynamic need is specifically micro-meso, \Micro-Meso TbKM Need\Group SM Need.
R152: Same as R151 but with KNet dynamic more linked to OM and Transactive Memory dynamic, linking Nodes to enhance SG-SM capability via creating new network ties, involves links with \Cognition Dynamic\Organizational Expert to enhance knowledge bridging activities. Enhancing SG-SM dynamic with extending and creating new KNet Node relationships involving organizational experts.

Q02. In your workday, who do you transfer knowledge with most and why?
Definitely the two folks that work for me. My two senior NCOs. Helping them as I get ready to transition from the team making sure that they have a full understanding of how we've been doing business for the past year and a half since they've only been on the team for a couple of months...making sure they feel comfortable with everything.
Synopsis/Preliminary Analysis: Participant indicated that he is transitioning from the team and his most frequent knowledge transfer occurs with his two subordinates in an effort to ensure they are well poised to adapt to his pending absence.
It sounds like the people who work for you are your most frequent contacts...
Correct.
Why is that?
(Participant 8) I think it's because we all sit within 10 ft. of each other. So, it's easy to have conversations. It's easy to transfer knowledge not only about your job but also about every day stuff when people are in close proximity to you. When you're forwarding emails back and forth, hey take this, do this, that type of stuff.

Synopsis/Preliminary Analysis: Participant reported that frequent contact knowledge transfer occurs due to proximity coupled with email.

R153: Nodal Assortative KNet strongly dense and homophilic for TaK-KE purpose of ensuring organizational continuity, optimum complexity, stability while reducing complexity and uncertainty. Overarching need is Organizational Need versus individual or even micro-meso need. Although all levels of Balancing Dynamic are significant, overarching Balancing Dynamic is organizational. Add Balancing Dynamic Need Priority attribute to capture the load balancing of a specific ICAS Flow Balancing Dynamic force intent or type influence to specific level of organizational TbKM activity. Social TaK-KE more closely related to Clan Control authority. I would interpret this as more a leadership mentoring activity.

R154: Formal ISS and ExK-KT dynamic for process and outcome related knowledge. Links more directly to ensuring process and outcomes with guidance for creating future Process Controls and Outcome Controls. I would interpret this as a formal policy and procedure interpretation KT activity for ExK/Information. This is more a simple training activity in a less formal context, creating new skills and additional competencies in preparation of a leadership transition.

Q03. Who do you transfer knowledge least throughout your workday and why?

Probably, of everybody I come in contact with the most, the individual that knowledge transfer least to would be other folks within my organization who have a different function, a different functional area of inspecting or different functional area of expertise because, hey, how ya doing, normal conversations aren't...what do they need to know that I know...

Synopsis/Preliminary Analysis: Individuals participant 8 transfers knowledge with the least are those in disparate functional groups, with different expertise; however, he intimates that some informal conversations, while maybe not beneficial to work related issues, may also occur. Inferred formal and informal social networks with common nodes.

R155: Larger heterogeneous network connections with minimal Nodal Assortative dynamic and minimal Pattern Tie requirements. However, Deville brings out an intuitive observation regarding networked relationships. As an officer, a leader within the organizational unit, there is a greater need to create a balanced network within heterogeneous Nodal Assortative connections for social dynamics. Ultimately, these additional heterogeneous nodal connections are specifically for \EgoNet Centrality\Increasing Centrality. I interpret this type of social networking based on role and responsibility as more towards establishing foundational referential power base versus creating opportunities for ulterior benefit motives, i.e., \EgoNet Centrality\Increasing Holes.

Q04. Most frequent exchange contacts: your relationship with these people?

The two folks that work for me? I'd say professionally and personally. Professionally is everything inspection-related, everything that we do to make sure we're on the same page, that we're all answering questions the same, that we're all transferring knowledge the same to the folks that we support or inspect. But, also personally because you have to take an interest in what they do because they are part of your team. If you don't take a personal interest in it then I think it can affect you professionally.

Synopsis/Preliminary Analysis: Participant indicated that the relationship with his subordinates is characterized by both professional and personal contexts. Further, he implies that these two contexts are interrelated and mutually influential.

R156: Larger heterogeneous network connections with minimal Nodal Assortative dynamic and minimal Pattern Tie requirements.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?

I think it would include them because of the formal stuff that we're doing we do it in a very informal way, I think, if that makes sense.

Sure, and thinking about this in terms of your informal social network, what would you say most frequently discuss?

In terms of the informal? Hey did you watch that game last week? Sports. What are you doing over the weekend?

Pastimes?

Yes, I think all those things, but I think we kind of also talk about work stuff in an informal way. Of informally, as in not necessarily email where it can be tracked.

Synopsis/Preliminary Analysis: Participant 8 indicated that professional, work related discussions are conducted in an informal manner which may lead to more informal subject matter, such as sports, past times, etc.

R157: Informs Q02 R153 and Q01 R151.

Q06. With these folks that you most frequently contact what do you least frequently discuss?

Good question...In an informal way...let me think about that one.

Difficulty answering a "least" question.

[DFL] Note: I interpret least discussed question difficulty in a slightly different context than Deville (2012). I interpret this response as most people with maturity and skills, i.e., those explicitly selected to work within quality assurance activities at an organizational process level, i.e. such as inspection teams that evaluate unit operational efficiency as well as effectiveness, or those in leadership positions, such as this officer. In this context, there is little opportunity for casual conversation that is not significant or has some redeeming value to networked relationships while having organizational value-add. In this context there really may not be a "least frequently discussed" unless conversation spaces are explicitly bounded by an individual in terms of personal preference or prejudices. These might not be readily visible to the participant, but might best be perceived by other's interpretations of what a participant might be uncomfortable discussing. From experience, as leadership responsibility increases, the frequency of strongly personal issues becomes more frequent, as you become as concerned about a person's well-being as much as their skills and competencies. As this participant intuitively observed in Q04 response, in a leadership role, personal and professional relationships increase in symbiotic value within a networking dynamic.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

I think probably when we're out on an inspection and everybody's pieces and parts have to come together to make the whole thing work. You have the opportunity to interact and see how their folks are, no kidding, doing their job. When we're back here at home station, it's quieter, you don't talk about those things. You talk about the more...hey, what's up? How are things going? As opposed to Hey, what are you inspecting? How's your section doing?

So, if I'm hearing you right, it sounds like when you're on an inspection things are a bit more formal in terms of what you discuss, but back here things are a bit more informal.

Correct...Yes...to answer that question things discussed less...I think it's just we're a big team, we all do different things. So, probably what other functional areas do. I think we do a lot of discussion on our personal relationships, family, and what we do but not necessarily how everybody ties together.

Synopsis/Preliminary Analysis: Participant indicated that knowledge transfer while on the road is more formal and work related. Knowledge transfer at home station involves more informal, somewhat personal conversation. Participant elaborated on previous question (least frequently). He indicated least frequent knowledge transfer regards functional integration.

R158: Formal activity, formal communication dynamic. This is observed behaviors.

R159: Less formal activity, less formal communications dynamic. This is more cultural knowledge related.

Q08. What factors do you feel contribute to knowledge transfer in this organization?

Leadership.

OK...can you talk about that a little bit more?

Yep...I think leaders in the leadership that's in place breeds knowledge transfer and the ability to get information out. Because, I've been in organizations where, depending on who's in charge, or either from the highest level or it's branches information can flow and then stop somewhere. Not everybody gets the information. It's up to whoever is in charge of those particular areas to keep the information going to it's people.

Synopsis/Preliminary Analysis: Leadership can facilitate knowledge transfer. However, participant 8 indicated that as information flows down the hierarchy, it can stop at various levels. Formality/bureaucracy hinders knowledge transfer.

R160: Directly correlates to strong Clan Control dynamic to ensure KFlow continues from origin to entire network. Clan Controls directly relate to KFlow enhancing force, strongly influencing shape of Micro-Meso Organizational KFlow dynamic.

Q09. What do you feel might hinder knowledge transfer in this organization?

Email.

How so?

I think people are too reliant on email and I think it's...again, leadership facilitates it, but I also think leadership in a way hinders it because we're so reliant on email that everybody gets mass amounts of email. You usually can tell by who it's from and the subject line whether you're going to read it or not. And, how long it is. And, I don't think it would...everybody's busy, but I don't think it would take too long of somebody's time for...or even if it went down to the branch chiefs or section chiefs to gather their folks for ten or fifteen minutes on a Friday or Monday to say hey this is the priorities and this is what we've heard for the week. And to make sure the face time is there to get the information out.

Synopsis/Preliminary Analysis: Participant 8 indicated that over reliance, including leadership reliance on email, hinders knowledge transfer as recipients may choose to not read emails based on sender and/or length. He also indicated that short weekly face-to-face meetings would be beneficial for knowledge transfer.

R161: Email hinders meaningful KT. Code later half of response to R160 as a factor contributing to KT.

Kind of like a mini commanders call...

Yeah...we've got a conference room that hey Friday's role call is at noon...hey let's do a little thing, let the beer flow or whatever.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

I think being able to have those conversations with folks and kind of the light bulb goes on...and so, just being able to ask those questions and then being able to make sure I thoroughly understand it.

Being able to formulate a question in response...

Yes, I think as information comes I don't truly think...if you've got a room of 10 people and you're trying to pass information or knowledge not all 10 people are going to get what you're saying the first time. And, so it should formulate some type of question. Either folks are blocking you out or they don't care or they just want to move on to the next thing. But, if I can generate a question out of what I'm being told then I probably have some degree of understanding about it. Or, it makes me want to learn more about it.

Synopsis/Preliminary Analysis: Participant 8 indicated that ability to formulate a question based on received knowledge alerts him that he has, at least, some degree of understanding. This question generating ability also alerts him to the fact that others have gained knowledge (i.e., change in knowledge state). Questioning alerts to knowledge transfer to others.

R162: Knowledge Acquisition confirmed. Asking questions. Interprets KT having taken place as a result of meaningful TaK-KE in form of additional questions.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?
Probably career field and functional area and then also just big picture things that you were supposed to do in order to make your career continue to progress or things that can set you back or hinder you.
Synopsis/Preliminary Analysis: Indicated that, categorically, type of knowledge from most frequent contacts is formal, work or career related knowledge.
R163: Informs response to Q06 and interpretation of response. As level of responsibility and leadership authority increases, sphere of activity influence increases, all discussions in a daily setting become significant, regardless of node dynamics. There is always a networking relationship involved, always a level of SM involved to ensure rationale as well as information are communicated, knowledge becomes more TaK-KT focused with closer nodal connections becoming TaK-KE dynamic focused.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?
I think vision of hey this is kind of my intent of how I want to see things go. Let's discuss it and then OK if you don't get it or don't understand it or you disagree with it, OK let's have the conversation and we'll get to where we need to go as a team. As opposed to me just telling them where to go. Let's have a discussion about it and all be educated.
Synopsis/Preliminary Analysis: Participant indicated that type of knowledge he provides to his most frequent contacts is his vision or intent as a leader; however, he emphasized a participative type of leadership style that calls for input from individuals on his team.
R164: Most frequent KT directly correlated to Clan Control and consensus understanding, links to Shared Purpose and Understanding Boundary with strong ties to Goal Congruence at micro-meso TbKM Activity level.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?
They understand it.
(laughs)
What alerts you to that moment when you think, OK they understand what I'm saying?
I think as I pass stuff to them I kind of, as I pass things and try to transfer that knowledge, I'll ask them if they understand what I'm talking about. Do you get it? And then if they say yes...OK, well here you go. Go out and do what you have to do. And, usually by the questions I'll ask them after I say hey do you get it I can usually get a pretty warm fuzzy that OK you really do.
What is it that gives you the warm fuzzy?
The way they're able to answer the questions I pose back at them.
Synopsis/Preliminary Analysis: Participant 8 indicates that he realizes when others obtained knowledge from him by their ability to answer his follow up questions to verify if the recipient "got it".

R165: Understanding, demonstrated ExK-TaK conversion has taken place, no longer Uncertainty or reduced Understanding. Confirmation of KT having occurred is the observed completion of a knowledge cycle where ExK has been converted to individual TaK. This involves a KE dynamic where TaK-ExK has been communicated with SM information and been converted by recipient to TaK.

Q14. And what method would you say you use to transfer knowledge most with and why?

Verbal.

Is that phone or face-to-face?

Face-to-face as many times as I can.

Why is that?

I think you're just...I think of an email, you never know that it's truly read or understood...kind of like the whole text message, instant message, those types of things, people can take it out of context depending on how you write it. Over the phone, they can be sitting at the computer typing an email you really don't know if you have their attention. You really don't know that you're passing what you need to be passed or they're getting it. I think when you're just face-to-face, you're not only being able to see that they're paying attention and pass the information, but you can build the relationship with them. And, then that way you'll get to know who the person is and then you can start to, hey OK this person gets it. I can have a phone conversation or I can have an email conversation with them.

Synopsis/Preliminary Analysis: Participant 8 indicated that he prefers face to face due to the availability of cues that serve as signs of understanding. He inferred that he is suspicious of email or other written forms of communication due to the lack of cues coupled with the uncertainty of whether the recipient read the message. Values face to face

R166: Most frequent is verbal f2f communication for queues and indicators, part of a meaningful KE dynamic.

R167: Email communication least preferred for confirmation activity.

Q15. And what method would you say you least transfer knowledge with?

Email.

Why is that?

Well, now let me...I'd say phone.

Phone. OK...why would phone be your least...

Well, one there's no record of what I'm trying to say; so, I really...in one ear and out the other type...at least where an email, you know, I can send it to them, everything that I'm trying to get across to them and I can call them later or after the fact, say hey, did you get it? Did you understand it? But, phone would, just primarily using phone is my least.

Now, this holds true for your formal relationships. Is that the same for your informal network?

No, I'd say informal probably email...I would least frequently use email for informal.

Synopsis/Preliminary Analysis: Participant 8 indicated that phone is the worst of two unfavorable methods of knowledge transfer for formal network communication. While email is not a preferred method, he indicated that the documentation trail is beneficial in formal knowledge transfer. However, he indicated that his condition reverses for informal network knowledge transfer.

Appendix I: Participant 09 Field Journal Notes

Participant 09

21 Dec 2011 @ 0830

Themes: Knowledge = Info, Formality Affects Knowledge, Combo Formal/Informal Networks, Value F-to-F, Knowledge as Action

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Knowledge transfer is information sharing between one or more individuals.

Anything else?

I'd say it could be anything from verbal to written...telecommunications.

Synopsis/Preliminary Analysis: Participant 9 described knowledge transfer as information sharing between individuals via a variety of methods. Knowledge = Information

Q02. In your workday, who do you transfer knowledge with most and why?

My peers that I work with.

Why is that?

That's who I deal the most with of trying to develop daily work activities whether it'd be stuff for inspections or bouncing ideas off one another to help create a better product for the user.

Synopsis/Preliminary Analysis: Most frequent contacts involve work related knowledge transfer.

R170: Informs Q01. Primarily TaK-KE in daily work activities. Primarily for new idea generation, links to \Understanding Boundary, \Solution Space Boundary, EKCentricity, OI Creativity, SG Enabler, SM Enhancer. \ICASNet Flow Type\Ideation Flow

Q03. Who do you transfer knowledge least throughout your workday and why?

(sighs) **Of all the people that you come in contact with...**

Good question...I would probably say senior management.

OK...why is that?

A lot of times they're just uninvolved.

They're uninvolved with your particular sphere...

With my small piece of the pie of the IG.

Synopsis/Preliminary Analysis: Least contact occurs with those most removed from daily work activities. This may relate to formality/bureaucracy hindering knowledge.

R171: Infrequent KT Vertical Up. Represents perceived 3 Mixed Clustering of sub-nets within minimally dense ties. Heterophilic network dynamic, Neither Tie P

References 11-47 - 84.46% Coverage

Q04. Most frequent exchange contacts: your relationship with these people?
Well, it's unique with our team. We spend so much time together, not only in the office, but away from the office. So, we've become a lot more like a family than we would in a normal office setting, I believe.
You said you spend a lot of time together away from the office. Is that here or on inspection?
On inspections. When we're here, a little bit, but not as much as when we're on the inspections.
Your most frequent contacts sound like your really formal network because you work together and you discuss work and that kind of thing.
Yes.
But, it also sounds a little bit like they're kind of an informal network for you. Is that accurate?
Yes. 100% agree.
Synopsis/Preliminary Analysis: Participant 9 indicated a blending of formal and informal social networks with his most frequent contacts. Formal and informal social networks with common nodes.
R172: More social networking dynamic, personal, physical.
R173: More formal networking dynamic, work related, micro-meso group still physical.
Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?
We'll talk sports, hobbies, families.
Anything else?
No.
R174: Social networking, informal, common topics non-work related.
Q06. With these folks that you most frequently contact what do you least frequently discuss?
Probably, political or religious beliefs. Try to separate those two from...
Synopsis/Preliminary Analysis: (Participant 9) Informal knowledge transfer appears to involve non-controversial topics.
R175: Social networking, informal, least discussed topics non-work related.
Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?
One of two ways; either face-to-face verbal contact where you see acknowledgement or probably 50% of the time it would be through email contact where you actually get a read receipt or written response.
Synopsis/Preliminary Analysis: Participant indicated he relies on visual cues either from recognizing acknowledgement in his recipient or via a written indicator such as in email.
R176: KT Acknowledgment visual signals from direct physical observations.
R177: KT Acknowledgment through written acknowledgment from auto-generated read receipt confirmations. Assumption is information exchange automatically includes KT took place.

Q08. What factors do you feel contribute to knowledge transfer in this organization?
What factors do I think contribute? Probably because we're all more senior individuals and we understand that we have to have information to make the job go on. And because we do use people on the road and people are in between each other, not having to see each other so much that we rely on email to get that point across.
Synopsis/Preliminary Analysis: Participant 9 indicated that level of experience and maturity are important factors in knowledge transfer in this organization. This is particularly true given the high frequency of travel with people often losing contact with those not on the same trips.
R178: KT Enablers, SM Enhancer. This is a motivation factor force, \ICAS Flow\Force Type\Intent. Links to intentional \Goal Congruence Boundary, \Understanding Boundary, \Solution Space Boundary, \EShared Purpose, \EKnowledge Centricity, SG Enabler, SM Enhancer, SM Process, \Clan Control, primarily a TaK/KT dynamic, i.e., "get the point across." Interpreting this level of communication to inform knowledge application, a ExK/TaK Flux dynamic to convert TaK to ExK and distribute. Multiple levels or sub-nets of networking dynamic involved, KNet \Multi-direction. \ICAS Flow\Nature\Align Resources, i.e., "make the job go on."

Q09. What do you feel might hinder knowledge transfer in this organization?
People not being in one organization at all times. Not having that face-to-face contact. (Participant 9) We rely too much on email.
So, the distance and the lack of people interacting with each other?
Yeah...you know, you may be coming back from a trip and someone may be taking some time off, you just don't have that face-to-face contact.
Synopsis/Preliminary Analysis: Lack of physical contact hinders knowledge transfer even with this experienced group who still accomplish knowledge transfer in spite of this hindrance. Inferred value of face-to-face.
R179: KT Inhibitor, negative ICAS Flow force. SG Inhibitor, SM Process. KT dynamic. Formal network connections spanning heterogeneous sub-nets with weak Nodal Assortative connections. \Cognition Dynamic\Attention\Mental Exhaustion, \Understanding\TaK Unavailable, \ICAS Flow\Degree of Influence\1 Extremely Negative, \Force Type\Knowledge. Knowledge differentiated from Knowing, as this is about an organizational Memory Object unavailable to provide TaK, not an active TaK-ExK Flux dynamic within a specific TbKM Activity within which participant is available.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?
I feel that I have got the answer that I need to perform the task at hand. And, if I don't feel like I've got that information, I'll go back and ask the question again. Or, rephrase it to maybe help them understand what the information I'm looking for.
Synopsis/Preliminary Analysis: Participant 9 indicated his cue that he has received knowledge translates through ability to perform. Knowledge bound to action.

Now, that's in a formal sense, right?
Yes.
Is that the same in your informal network?
I would say yes. The same process. It may not be as formal as a salutation or whatever; it could be just Bob or Joe or whatever. But, it's the same format [I'll go back and ask the question again]. [Or, rephrase it.]
Same kind of thing, right?
Yes.
Synopsis/Preliminary Analysis: Participant 9 indicated that the same process (knowledge in action) *accounts for realization of his own knowledge state change with his informal network.*
R180: Formal network personal KT. Personal knowledge acquisition confirmation. An ExK/TaK Flux dynamic requiring SG Trigger and SG Enabler with SM Enhancer. The questions generate this dynamic, the dialog is significant to SG-SM.
R181: Informal social networking dynamic. Identical coding only network dynamic shifts from Tie Patterns to Nodal Assortative and EgoNet dynamic with Alter Bridges. Both are equally strong ICAS Flow forces.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?
Talking about like as far as work, or a more personal nature?
Either one...or both.
What type of knowledge do I receive? That's a tough question...it depends on. I said it could be information on a question I had. I guess it could be just day to day interaction of how they're feeling. When you think about knowledge, knowledge is a broad question. I mean, it could be someone in the office, they're not looking like they're doing too well...going through a divorce or whatever. You see the non-verbals. So, just by picking up on the non-verbals, and asking a question saying hey are you OK? Are you feeling all right? It's also beneficial because that would lead me to believe whether or not they are having thoughts to detract from the work environment.
Synopsis/Preliminary Analysis: Participant 9 indicated a wide variety of received knowledge. However, he focused on cues related to informal knowledge transfer manifesting in those experiencing personal distress. P5 did this as well.
R182: Types of knowledge. Very specifically TaK from visual social interactions and queues. Strong Nodal Assortative connections with Alter Building dynamic. Very EgoNet Centric activity around building inter-personal relationships to better understand emotional state of participant as it may impact TbKM Activity adversely. \KFlow\KType\TaK/ExK primarily TaK in flux, dialog. A \Transfer (KT) activity. \Tacit (TaK).

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

Hopefully...trying to think of a word...succinct, very detailed information. I don't want to try to ramble on but you give them the information they need to perform whatever task or information they seek.

Synopsis/Preliminary Analysis: (Participant 9) Knowledge provided appears to be very practical, intended to assist others in performing some action. Knowledge in action.

R183: \Explicit (ExK), primary KT direction Send. \KType\Procedural. \Understanding Boundary. \SG Trigger, i.e., perceived knowledge need within micro-meso TbKM Activity. \SM Enhancer, \SM Process. Informs coding for R178, R180, & R181.

A minute ago we were talking about your most frequent contacts being people you interact with both formally and informally, does this apply to both categories?

Yes.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

If it's face-to-face, I look at nonverbals. If it's email or electronic then, again, the response via the email. If it's telecommunication, telephone, whatever, it's a little harder but either listen to the sound of their voice or whether or not they actually respond back to the question or information we're sharing.

Synopsis/Preliminary Analysis: Participant indicated he primarily relies on visual cues to alert him to change of knowledge state in others. He also indicated he attends to verbal indicators in others' speech when on the phone to gain an appreciation of knowledge transfer to others.

So, it sounds like nonverbals are very important for you as a sign that they understand, also voice inflection.

Yes.

Q14. And what method would you say you use to transfer knowledge most with and why?

In today's environment? Text or email.

Why is that?

Because I don't have to get drawn into a long drawn out conversation...especially with text. I can send a message back and forth and have a whole conversation in probably ten words or less.

Synopsis/Preliminary Analysis: Participant 9 indicated he values the convenience and efficiency of written communication over verbal methods. However, he also stated that "we rely too much on email.)

R186: Most frequent KT media, formal technology, ISS. KNet dynamic is formal, links more directly to ISS and Process Controls.

Q15. And what method would you say you least transfer knowledge with?

Telephone conversation...not big on telephone conversation.

Why is that?

I can't see...the verbals are probably the biggest one, the nonverbals...but then again when people get on the phone they tend to ramble a lot. I'm not too big on rambling.
Synopsis/Preliminary Analysis: Participant reiterated his preference for non-verbal knowledge transfer, or at least his preference for knowledge transfer where visual cues are present. Inferred value of face-to-face.

Appendix J: Participant 10 Field Journal Notes

Participant 10

3 Jan 2012 @ 0900

Themes: Knowledge = Info, Knowledge as Action, Verification/Confirmation, Combo Formal/Informal Networks, Formality Affects KT, Value F-to-F

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Knowledge transfer...I've never heard of that term...but, just by hearing it I would think it's just passing information to others that I may know of.

Anything else come to mind?

No, not really...maybe, concerning knowledge transfer could be also anything that I feel that's I guess worthy to me that others may need to know about. Maybe that could be another means of transferring knowledge.

Synopsis/Preliminary Analysis: Participant 10 indicated knowledge transfer involves passing information from himself to others. He also inferred a valuation component that he includes to ensure the information is "worthy" to pass on. Knowledge = information.

R188: Code as \ICAS Flow\Force Type\Intent. I interpret response as an intentional engagement to ensure others receive SM information, i.e., "others need to know about."

Q02. In your workday, who do you transfer knowledge with most and why?

Throughout my workday it will probably be to supervisors and then, of course, definitely to subordinates.

Why is that?

For subordinates, hopefully for them to understand...I guess, I was in the same situation or the same scenario. Because I was younger...and, you know, just giving them experience that I've lived and probably helping them out through whatever troubles they're going through. Or, in any professional enhancement that they may be looking at. For supervisors, even though they're writing on me or whatever the case, they're still needing that knowledge because everybody has a different background. So, it may not be as extensive as to a subordinate, but I think there is some transfer of knowledge.

Synopsis/Preliminary Analysis: Participant indicated his most frequent knowledge transfer involves supervisors and subordinates. He stated his knowledge transfer to subordinates is in response to some need they may have which he can assist or in some professional development capacity. With supervisors, he indicated the knowledge he provides may serve to lend understanding from a different perspective. Inferred knowledge in experience (action).

R189: Vertical Up KT in formal network to provide clarification. Less tacit, mostly \Explicit (ExK). Coding as ExK/Information. Code each at same degree of frequency, simply \Frequent. Interpret this more as a SG Trigger, a perceived knowledge gap from senior level management and requirement to provide SM information. This is a KT dynamic.

R190: Vertical Down KT in mixed formal and informal context but more TaK-KT dynamic, i.e., "just giving them experiences that I've lived." \Tacit (TaK). Coding as TaK/ExK mostly TaK. Code this as \Cultural Knowledge in context to "shared experiences and lessons learned." \Frequent. This is more a SG Enabler and SM Enhancer in the SM Process. This implies a stronger Nodal Assortative and ICAS Culture Flow.

Although there may not be sufficient organizational context data about each participant's role in the organization, there are implied roles within a micro-meso and larger organizational KFlow context where different roles provide different levels and types of KT, just as within work teams different people fill different roles within the team, whether contributor, challenger, collaborator, or communicator. An additional Classification Attribute for future coding would be Team Member Role.

Q03. Who do you transfer knowledge least throughout your workday and why?

Least often...it would probably be, say if I have lunch with a friend it'll probably be that individual because maybe we're just talking, you know, just normal stuff; not necessarily work related or anything like that.

When you say normal stuff, can you give me an example of what that would be?

Sports. Maybe talking about each others' families. But, I guess even talking like that you're still exchanging information.

Synopsis/Preliminary Analysis: Participant indicated informal network knowledge transfer occurs least often. These exchanges tend to be more personal discussions.

Q04. Most frequent exchange contacts: your relationship with these people?

Right now it's just, it's like work related. And, normally what I would try to do is people that I consider really close to, I guess, even though I've been on, here just a few months, I usually go to those people and just, you know, pop my head in their office and shoot the breeze with them and see what's going on with their duty section and what's the latest on the next job we're going to be going on, stuff like that.

Now, when you say close to, what do you mean by that?

Acquaintances, you know, people that I probably communicate more with in the building. I'd probably go to them and see how they're doing and things like that.

Synopsis/Preliminary Analysis: Participant 10 indicated since he had not been on the team but a few months the nature of his relationships was mostly work related. However, he inferred that he spends more time on the team his relationships would become closer leading to more informal conversation and knowledge transfer. See also participant 7

R192: Social, homophilic, strong Nodal Assortative, physical proximity networks. \Frequent connection

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?

Informally, probably just what's going on in that current day. Maybe since we're just now coming back from the holiday probably just talking about we've done over the holidays in the last couple weeks. Probably not necessarily anything work related; it's probably just more personal.

Personal in what way?
Just like I said, just dealing with what they've done over the holiday. Did they take any vacations? Maybe some family that was in town.
DFL: \Frequent context of social communication. Type of information discussed. Informal is personal. Informs previous social network connection references.

Q06. With these folks that you most frequently contact what do you least frequently discuss?
Work (laughter)...
Synopsis/Preliminary Analysis: Participant noted that most informal network knowledge transfer centers on personal issues such as holiday activities, family, daily events, etc.
R193: Most frequent contacts in social dynamic least discussed is TbKM Activity. Appears to be a strong separation between work and social, formal and informal network dynamics. Social and informal SSS dynamics are autonomous from work related and formal communications.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?
I would have to say, the first thing that pops into my head, is email. That could be the spark. If there was a subject that came up to where information was passed out, I'd probably even go to that individual that sent the email to find out, you know, maybe more in depth on what the subject is really entailing. Probably going to other individuals to find out what they thought about that email message and did they understand it the same way I did. And that probably how discussion is brought about.
So, that gives you a sense of knowledge flowing throughout the organization...
Right. Especially, like if, not saying I would go to these individuals, and say did you hear about this and did you see that email; maybe it could be, you know, the other way around where they're coming to my section and say hey did you guys read that and does that affect you all and, you know, I think that can be another way of knowledge, information flowing through the building.
Synopsis/Preliminary Analysis: Participant indicated inquiries to email to confirm understanding either by him or to him provide insight that knowledge transfer is occurring across the organization. Inferred confirmation/verification to alert that others received knowledge.
R194: ExK-KT Confirmation, \ExK, \KT, Formal Networking within ISS, begins with a knowledge spiral, involving intentional KFlow activity, i.e., "I would probably even go to the individual that sent the email to find out... more in depth." ExK-KT becomes a SG Enabler, and SG Trigger, identifies within receiver a need for additional understanding. Receiver then engages source if available in a TaK-KE as a SM Enhancer, TaK-KE being both a SG Enabler and SM Enhancer, "what they thought about the message and did they *understand* it in the same way."
R195: Preliminary KFlow as part of intentional additional SM Process, where participant engages in TaK-KE SG-SM activity. This is where KNet expands, seeking out the source to engage in dialog. This would be a KNet Node creating activity or maintaining. I can

code this either way, but am coding in this context as an opportunity to expand an existing KNet sub-net for the participant, a Create Node activity, to facilitate \Understanding, fostering \KCentricity. \KCentricity represents the intentional organizational activity to increase KFlow and ensure ICAS Flow effectiveness. This is a cultural expectation, \Cultural Subsystem. BIT \Understanding is primarily focused by definition on a specific problem space. However, BIT \Understanding as an ICAS metaphor should include additional KFlow dynamics and activities around knowledge life cycle. \Balancing Dynamic\Knowledge Worker Need\Acquisition vs. Contributing Knowledge. In the SG-SM dynamic, this is a primary SG Trigger, \ICAS Flow\Force Type\Intent.
R196: Reciprocal of R195. \Balancing Dynamic\Knowledge Worker Need\Contributing Knowledge vs. Acquiring. Here the focus in SG-SM dynamic is a secondary SG Trigger, the perceived knowledge gap. \ICAS Flow\Force Type\Knowing. Within the SG-SM dynamic, KFlow emerges, which further influences IFlow dynamics.

Q08. What factors do you feel contribute to knowledge transfer in this organization?
I think individuals, or some individuals...OK, I think it's more leadership. I think it's more some of the leadership able to push out some information out there.
Why do you say that?
Since I've been here I've seen a majority of the emails come from leadership. Whatever information they're receiving from above, you know, they're trying to pass down. And I understand that a lot of the leadership is not able to go to each section and do that face-to-face; so, email is probably the, one of the options for the leadership to get as much of the information as possible. But then at the same time if that information affects, say, myself, if I need any more information like I said before, I could always go back to the person I sent the email and follow up.
Synopsis/Preliminary Analysis: Participant 10 attributed leadership as the primary contributing factor to knowledge transfer. Implied formality/bureaucracy hinders and facilitates knowledge transfer.
R197: This is directly related to \Clan Controls. ISS can auto-flow information. However, an individual is responsible for intentional initiation of SG-SM dynamic by initiating a KFlow, with \Force Type\Knowledge, a networking force that simply provides the medium for "getting the information out, trying to pass down."
R198: Informs coding of R195. Can code equivalent. Repeat R195 coding here.

Q09. What do you feel might hinder knowledge transfer in this organization?
I would say individuals not accepting. Like, the information that came about. Like, I guess I'll give an example...an email message comes out and this has something to do with change. Maybe some people may not be receptive of change, of policy, or whatever the case may be. So, I think that would be a factor where people are just not willing to accept maybe new things coming things coming down the pipeline as such as change because, you know, we're kind of...a lot of us are kind of used to how things are running. If it's not broken, why fix it type of mentality.

Synopsis/Preliminary Analysis: Participant indicated resistance to change hinders knowledge transfer.

Kind of like IGEMS...

Right. (Laughs)

R199: \Change, \Uncertainty, \KFlow, \Understanding, \Shared Purpose, \OI Decision-Making, SG Inhibitor, Negative ICAS Force. Key is linking this back to mental models. Code to \Mental Model. \SG Inhibitor, SM Process, ICAS Flow inhibitor, \EShared Understanding, \Goal Congruence Boundary. Creates a negative KNet force. SG-SM occurs, whether by action or inaction. Lack of response, lack of acceptance, lack of active response, lack of action is an action, creates an active ICAS Flow potential to inhibit ICAS Flow activities that would create \EShared Purpose.

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

When I kind of get an aha moment (laughs)...when it's like oh...

What's that aha moment like for you?

It's like a spark in my head. It's like, huh, I never thought of it that way. Or, I never knew that. Or, something along those lines to make me think probably a little bit further in detail on whatever the subject is about. Could it be dealing with change like the IGEMS...is that bettering us? And then my thought process anyway I would try and go deeper, maybe talk to some comm folks, maybe educate myself a little bit more about, say IGEMS, for example. And then maybe I'm able to, whatever the information I gather on my own I'm probably able to disperse that to others. So, they could probably, if they're not able to think like at a high level maybe I could bring them down to my level, like a third grade level (laughs), so the common person could understand in layman's terms, I guess.

Synopsis/Preliminary Analysis: Participant 10 indicated that he grasps change in his knowledge state occurs when he realizes he understands something new or understands a new aspect of something. This leads to further inquiry to uncover more details. He elaborated that he aims to share this understanding with others which appears to further reinforce his own understanding.

R200: Again relates directly to attitude towards learning, a \Mental Model. \Ability, \Understanding, \Solution Space Boundary, \Activation Spreading Active, \SG Enabler, \SM Enhancer, \SM Process. \KFlow individual knowledge acquisition, \Ideation. Ensure \KWrk\Activity \Purpose\Ideation is directly coded to only those specific contexts where new ideas are formulated, as is the case here. Check Q10 Coding for all Participants for consistency of coding. Cross check all Q Reference coding to specific fundamental Classification Attributes for consistency, allowing forces to shape and frame how these fundamental characteristics interplay within ICAS Flow dynamics.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?
That's kind of hard to say...I think it's more probably job related information, since I'm new on the team. Try to pick their brains a little bit. And, it's not just necessarily one person. I'll try to get other individuals' perspective to where I can gather all the information that I collected and then maybe come up with my own conclusion or ways to make it work for me. So, it's probably more just work related to make my performance just a little bit better.
Synopsis/Preliminary Analysis: Participant 10 indicated knowledge obtained from others centers on a particular work related subject but he endeavors to collect various perspectives to inform his own understanding. Confirmation/verification to determine knowledge transfer.
R201: Knowledge Type most frequent job related, tasking specific, KWrk Activity focused. Emphasis is TaK vs. ExK, i.e., "I'll try to get other individuals' perspective...and then maybe come up with my own conclusion." Part of a TaK/ExK Flux to create new TaK, i.e., new understanding, "my own conclusion." \Understanding Boundary, \Attention Boundary, \Solution Space Boundary, \OI Creativity, \OI Problem Solving. Job related knowledge acquisition during KT by active TaK exchange. \

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?
To be more, and this is not necessarily work related, I guess my answer's going to be it's more personal growth. I try to, even though a lot of us are probably the same age in this building, I try to give my take on, I guess, just life in general. It could be education. It could be family life. Volunteering. You know, just trying to put out there it's not all about work and you kind of, got to spread the wealth and kind of balance. Have that balance of everything going on. So, I usually try to give my take on an educational level to where people understand that it's not all about punching in to work and then punching home. You've got to have that life balance. So, that's pretty much what I try to push out to other folks.
Synopsis/Preliminary Analysis: Knowledge participant 10 provides, or intends to provide, to others is more than just work related in nature. He stated his desire to inform others on a range of topics, "life in general." Inferred formal and informal social networks with shared nodes.
R202: Work life balance, personal values. This is a \Cultural Knowledge flow.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?
If I see that they're, first, receptive and not being argumentative if I'm just, you know, making a suggestion. And then the other thing is if I see doing certain things, like if I suggest like hey won't you go to...if you're having family issues, hey won't you go to Airman Family Readiness? Maybe they have some guidance on what you can do for finances or what ever the case. If I see them actually going there and them coming back

to me, hey that was a great suggestion. I never thought about that. Then, I'm thinking they've taken my suggestion and probably took that information I gave them and tried to seek out information on their own.

Synopsis/Preliminary Analysis: Participant 10 stated he relies on visual cues to infer internal understanding, or at least emotional state, in others. He tied this to an example where others may be in some state of need or crisis and inferred that knowledge obtained from him is apparent in others' behavior. Another focus on personal distress to highlight knowledge transfer. See participants 9 and 5.

R203: Insightful observation (Deville), i.e., "knowledge obtained apparent in others' behavior." Again the visual indicator, but this is not from body language, but based on observed behavior. This is an extended time period for Knowledge Confirmation activity. In this case, may extend out into weeks. I would link this to \Cultural Knowledge also, as the TaK-KE providing guidance works its way into social behaviors, new patterns of thinking, but begins with correction actions \(OI) Actions.

Q14. And what method would you say you use to transfer knowledge most with and why?

One on one conversation. Face-to-face...

Why is that?

I think it's just more personable, if that's available. That would probably the first way. Because then the individual is able to see your reaction and then sincerity and all that good stuff. And, then if there's another mean of communication, it's probably by telephone and then by email. But, then if it's something that important, work related or personal, you may want to try to do the best you can to have that face-to-face contact.

Synopsis/Preliminary Analysis: Participant 10 stated he values direct face-to-face interaction due to availability of visual cues from behavior, facial expressions, etc.

R204: \Cultural SS, \Social SS, social networking, homophilic. Nodal Assortative. \MicroD Brokerage\Domain Specific. Add KFlow attribute to correspond to indicate preference, and link to Cognition Dynamic to identify if that preference is available, or not.

R205: \Information SS, more formal networking, can be either homophilic or heterophilic, more Tie Pattern related. \MicroD Brokerage\Domain Specific.

Q15. And what method would you say you least transfer knowledge with?

Over the phone. Or email...email.

Why is that?

Because it's not giving that individual...I guess, your not giving each other that full attention. And then things may be misinterpreted through the email...and it's a lot of typing (laughs).

Synopsis/Preliminary Analysis: Participant indicated misinterpretation may occur in knowledge transfer via email. See also participants 2 and 6.

Appendix K: Participant 11 Field Journal Notes

Participant 11

3 Jan 2012 @ 1100

Themes: Knowledge = Info, Combo Formal/Informal Networks, Difficulty Responding to Least Question, Verification/Confirmation, Knowledge as Action, Value F-to-F

Q01. Please describe your understanding of the term knowledge transfer. What do you think that means?

Knowledge transfer to an organization or...?

However you understand it.

OK...I would say knowledge transfer is the act of exchanging facts or information generally from one person to another. Or, maybe, one organization to another organization.

Synopsis/Preliminary Analysis: Participant 11 indicated knowledge transfer occurs both person to person and between organizations. Knowledge = information.

R207: Q asks KT, but Participant responds with KE dynamic, an exchange. In this context, it is ExK/Information in a KE dynamic. Code as \KE vs. transfer. \KType\KE/Information. \ExK. Person to person implies KFlow\KNet Space\Socio-Physical.

Anything else?

(Shakes head indicating no)

Q02. In your workday, who do you transfer knowledge with most and why?

Throughout my workday I would transfer information to several different groups...

Such as...

First, between the IGI or I guess you would call it the command element within the division to the inspectors, to the inspectors within the division. Second one would be between all the colonels. So, I guess you would say the team chiefs, the decision makers within the IGI. Another would be between myself and the secretary (name excluded)...would be the internal transfer I would call that. My other internal one would be over to the plans and programs division as well, which is kind of our steady state civilian source for trip planning and for policy. So, that would be kind of internal to the division. External to the division, there would be up to the front office folks including (name excluded). And a secondary element of that is with the (title excluded) because he's external to our organization as well. And then with admin as well. And then outside the IG there's communications links to bigger IG elements up at the Pentagon. So, SAF IG, with the other IGs across the other MAJCOMs. And then exterior to the IG which would be, for example, wing commanders, units, and the...officers for inspections. Those would be the primary ones work-related. In terms of the IG...and then there would be also some personal ones work-related which would be certainly like the colonels group or assignments, the assignment system for folks in the...IG, professional development with the...staff which wouldn't necessarily be just IG related but a number of others.

Synopsis/Preliminary Analysis: Participant 11 delineated knowledge transfer among various groups and himself internal to his immediate group and external to a broader range of groups throughout the organization. Participant also included communication external to the organization that provide the same function but in a larger scope. He also inferred that both work related and somewhat more personal contact occurs when transferring knowledge to these various groups.

R208: This is the place of formal Control KFlow. Not necessarily vertical, horizontal, combination specific, just a micro-meso group that spans multiple levels of the organization. I would interpret this as a process knowledge, ensuring specific guidance for specific activities. \Activity\Purpose\Control. \Micro-Meso TbKM Need is primary need. \Heterophilic network dynamic, multiple sub-groups represented as this is a senior level officer.

R209: This is more an outcome Control dynamic where operational management translates control directives into operational activities, interpreting, scheduling, applying logistics constraints, \Activity\Purpose\Coordination. \Micro-Meso TbKM Need is primary need. Moves down a layer in organizational decision-making context, yet, \Heterophilic network dynamic, same multiple sub-groups represented.

R210: More Homohpilic, direct, socio-physical network connection. Here the emphasis remains Micro-Meso Knowledge Worker Need as the primary need.

R211: Broader heterophilic networking connection, Tie Pattern, Organizational Need is primary ICAS Balancing need. Here primary Balancing dynamic shifts to Organizational Need. Communication reflects that shift. Activities are implied for each level and each type of KT.

R212: Widest most diverse Heterophilic networking dynamic, purely Tie Pattern with little Nodal Assortative EgoNet dynamic. These actually represent a type of KT Acknowledgment Signal based on centralized organizational Controls in the form of defined processes, requiring explicit feedback at various times. This level of KFlow activity represents spanning interorganizational ICAS Flow dynamics where external governance and control mandates KT Confirmation Signals. Again, Organizational Need within ICAS Flow is primary force type.

Q03. Who do you transfer knowledge least throughout your workday and why?

Work related...

It could be work related or any other type of contact.

That's kind of a negative...I don't know how to answer a negative because all of those things it just depends on...I could probably say which of those I communicate with the most

Difficulty responding to a "least" question.

(unexpected visitor)

(resumed interview)

It would be a negative in terms of like...out of those groups...which do I communicate the least with? I would say the wing commanders.

Why is that?
Because there's not that much information I need to push to them. I try to limit the amount of communication I have with them except for like key pieces of information. Because I know they're getting overwhelmed with other pieces of information. So, unless I really need to get them something that I think is going to help them or be crucial...so, for example right before an inspection or a piece of information that going to maybe change how they prepare for an inspection, then I'll limit that communication with them.
Synopsis/Preliminary Analysis: Participant 11 stated he limits communication and knowledge transfer with commanders of units to be inspected. This knowledge transfer is limited to "key pieces of information" they require for their inspection.
R213: Least frequent KT, informs coding for R212, i.e., Wing Commanders.

Q04. Most frequent exchange contacts: your relationship with these people?
Well, the nature of the relationship is a professional one for 95% of those contacts with 5% being somewhat of a social in nature. I would say primarily the way I make contact is via email probably 90% of the time with 5% being via phone and then 5% being personal. Certainly, on inspections when we're on the road then it's much more personal interaction, like I never use a phone and very rarely use email. So, it kind of flip flops, probably. But, here within the IG because of the number of people that I'm making contact with, then it's a much higher level being on email so that I can reach a broader audience, frankly. And, I do use, besides email, I do use some text capability too particularly when we're on the road during inspections.
Synopsis/Preliminary Analysis: Large majority of frequent contacts are in his formal social network. Small amount, "5%" are informal.
R214: Primarily Cyber Space networking dynamic, with minimal social Nodal Assortative dynamic involved. Anticipated at senior management level. More a PSS, FSS construct using ISS.
R215: Shift to socio-physical and socio-cyber, but secondarily and infrequently used (implied, i.e., *some* text) networking dynamic in remote locations, where group activities shift to operational activities versus preparatory activities, and where leadership has an opportunity to more directly interact with peers and subordinates. FSS shifts to SSS dynamics versus networked ISS, i.e., information technologies such as email.

Q05. In your informal network in your day-to-day workday what do you most frequently discuss with your contacts?
Still work-related?
While you're at work.
I think most of the time we discuss Air Force issues and Air Force professional development. You know, where the Air Force is going...strategic, I would say, things relative to what's going on, with budgetary constraints or what's going on with the war effort. You know, changes really, that are happening within the Air Force caused by a number of outside influencing factors...probably would be the biggest thing. Second one would be flying stuff...we talk more about either past experiences or currently, you know...like (name excluded) and I talk more about T38 stuff than we need to just because

that something we're doing now and enjoy. And then, certainly family and personal things outside of work would probably be a large percentage of the rest.

Synopsis/Preliminary Analysis: Informal knowledge transfer tends to involve professional issues outside immediate job requirements. He also indicated knowledge transfer regarding past experiences and family comprise other types of communication.

R216: Social networking Nodal Assortative, yet formal work setting context and shifts to social and personal context secondarily. I am coding to two different types of social dynamic, one work related, TbKM Activity related at the Organizational Need level, and one at the more social personal TbKM Work Need primary focus (R217).

R217: More informal, social, non-work related. Not organizational need focused. Cross check this response dichotomy between work related and non-work related, in explicitly defined demarcations with other senior level Participants. Beyond scope of current research, but would be meaningful to establish macro-meso group and organizational level networking dynamics based on member's leadership activities. It would be interesting to see if these types of specific demarcations influence ICAS Flow dynamics.

Q06. With these folks that you most frequently contact what do you least frequently discuss?

Any kind of personal issues, finances, emotional...anything emotional...stress, anything probably that would involve feelings or pain or any of those kind of things.

Synopsis/Preliminary Analysis: (Participant 11) Least frequently discussed issues involve sensitive or painful topics.

R218: Least frequently discussed, most frequent contacts. Informs R217 coding.

Q07. How do you know when, given your definition of knowledge transfer, when that occurs between people in this organization?

Only when I get feedback.

Feedback in what sense?

Feedback can come obviously through voice, but typically what my expectation is is that there will be a response from people. If I've exchanged information via email, for example, that my request would be if a task had been put out there, for example, that there would be a response to that task. So, if I ask somebody to do something, all I expect is an email that says got it. Now, if it is information that, you know, does not involve a task, then I don't really expect information to come back to me that they've gotten it because it's informational only. So, for example, if somebody, if (name excluded) sends out a thing about the blood drive, you know, that's out there. If people want to respond to it that's fine. That's different. I wouldn't acknowledge that. But, if he sent me a note that says hey, you know, these three awards are due to the boss on the 12th of January, then I'm going to respond to that. And to make sure that I've acknowledged that. That's my expectation from others to...at least via email or text. Different, obviously, if I'm talking on the phone because I'm going to hear a response so I know they've received that. Or, obviously in person because they've received that information.

Synopsis/Preliminary Analysis: Participant 11 indicated knowledge transfer across the organization is apparent in the feedback he receives relative to assigning some action to *others. General information tends to disseminate to some point but without much of his awareness of whether knowledge from this information transfers across the organization. Relates to verification/confirmation as alert to knowledge transfer.*

Now, that's in terms of your response, your feedback that you receive. How do you know when knowledge is transferred across the organization?

I guess the only way I would know that is if I see it...

And, what form would you expect to see that?

I'd probably either in something that's printed or via email or text.

R219: Micro-Meso KT Confirmation. Feedback. Anticipated Receive. Voice or Written, independent of media. However, voice response is sufficient acknowledgment that information has been received, not necessarily knowledge, just Coordination (Activity guidance) or Control message has been received. \ExK/Information. \ExK, \KT, \ISS, \PSS. Again, the shift at senior management level is more to electronic communications for expediency.

R220: Same dynamic, role modeled in Send action, an active response to sender. Again, same request from senior management or from subordinates in form of scheduled activity reminder, then acknowledgment is confirmation that information has been received. Here there is a clear demarcation back to information vs. knowledge. \ExK, \KT, \ISS, \PSS.

Q08. What factors do you feel contribute to knowledge transfer in this organization?

I think the easier that a system is to use, for example, if you're using email, or for example, SharePoint, PowerPoint, any of those things, if it's simple to use and simple to learn, then I think knowledge is transferred easier. I would use the example of SharePoint as something that I think as soon as you understand how to use it, it's very user friendly. I think it's user friendly. A lot of information can be stored, quickly updated, quickly transferred, across the organization. (name excluded) just shared we can transfer into Outlook which is...I thought people knew that a long time ago. But, clearly they don't. As long as it's usable then you get a lot more information out of the system. Unlike the opposite example is IGEMS which I think is very difficult to transfer information because it's not user friendly.

Synopsis/Preliminary Analysis: Participant 11 indicated that ease of system or tool use drives knowledge to transfer across the organization. Knowledge = information

R221: Power of ISS well designed, easy to use (adopt), and easy to exploit (adapt) fundamental to effective KT across an organization. Again, perspective is organizational vs. micro-meso group. Therefore, focus is on enterprise level information flows, enterprise level KT. Add an additional \Activity attribute to capture scope of Activity, in context to supporting codings, to include Individual, Micro-Meso, Macro-Meso, Enterprise (representing organizational level). This will provide another analysis point for considering shape and power of any given ICAS Force based on source of force, i.e., legitimate and referential power base.

Q09. What do you feel might hinder knowledge transfer in this organization?

Within this organization, certainly the travel hurts the knowledge transfer because you never know necessarily whether somebody's going to be here to be able to receive information or not, you know. We do have pretty good access on the road but, you know, we don't have the perfect system to make sure that people get information or awareness of whether they've received or not, whether they're local, or they're deployed, or they're on leave. There's no simple data base that shows that. So, travel would hinder it. The other one is training. I don't the Air Force is very good about training people on current systems and software use. I mean, you could use a lot of examples of that. But, whether we're talking about IGEMS or SharePoint or even going into that ad hoc system that they have for the base network notification. The thing is pretty awesome as long as it's set up appropriately. But, I don't think people have it set up appropriately, really. And there's nothing out there...you know, there's a small tutorial there which is not very good. Even trying to get access from the "experts" at the command post, I had to go through three different briefs before they could finally narrow it down to one that they understood to use. So, while some of those systems are out there to be able to do that, the training isn't really there to follow it up.

Synopsis/Preliminary Analysis: Lack of physical proximity due to travel hinders knowledge transfer. Participant indicated this leads to both knowledge flow and awareness of whether others obtained knowledge. He also stated that ineffective training hinders knowledge transfer.

R222: Purely ISS dysfunctional design, difficult to adopt and inflexible in design inhibits KT. Again, SharePoint has capability to track, but requires configuration to employ. Alternative systems create additional informational silos, adding to complexity. Focus in this first part of response is KT inhibited by disconnected networks during remote activity, mobile operations. Strong correlation between networked operations and networked communications. If they become disconnected, impedes KT and ultimately impedes operational effectiveness. \OI Actions, \OI Problem Solving. \Complexity, \Uncertainty. BIT Boundaries

R223: From an enterprise perspective, ISS is crucial to KT across the organization, becomes a primary KFlow force, an SG Enhancer and SM Enabler. Lack of training as well as lack of proper configuration, deployment, design, works counter to effective information and knowledge flows. \OI Actions, \OI Problem Solving. \Complexity, \Uncertainty. BIT Boundaries

Q10. How do you know when you have obtained knowledge from communicating with the people that you frequently communicate with. How do you know when you know something?

(Participant 11) I suppose if I've received it from a credible source, if I'm being told or received it from somebody that I acknowledge as a credible source. So, if I'm getting, you know, information about the T38 schedule from (name excluded), not that he's not always a credible source, but on the T37 H schedule, he's not. But, if I'm getting it from (name excluded), the Ops O, or the squadron, or by one of the schedulers I know that it's going to be credible and that I know what's going on with the schedule. It's similar for, you know, if I receive information about scheduling from (name excluded), I know that's going to be something that he's validated and that it's accurate. I wouldn't necessarily feel that way if I was getting it from just any individual inspector. So, I think I know when I know when I get the information from somebody who's credible, who is reliable, and who has access to hard information.

Synopsis/Preliminary Analysis: Participant 11 indicated credibility of the knowledge source influences his awareness of a substantial change in his knowledge state. Verification/confirmation as alert of knowledge transfer.

R224: Personal KT acquisition confirmation premised on information source, their perceived integrity in providing reliable information. Perceived value of ExK, TaK, or ExK/Information not being captured. This would be a Cognition Dynamic. Add Attribute Perceived Value to Cognition Dynamic. An additional Classification Attribute for Perceived Authority, i.e., Power Base, would be very meaningful at the Participant level. A TbKM Participant Node.

Q11. From your frequent contacts, the folks you frequently interact with, what type of knowledge do you obtain from them?

Within the work environment, primarily I think things related to the schedule, of how we schedule inspections. Things that...in relation to the planning process of how we plan an inspection, budgetary issues for inspections and policy. Probably would be the primary ones, which is the future planning, obviously, and future development of how we do business.

Synopsis/Preliminary Analysis: Knowledge categories involve work related issues.

R225: Work related ExK/Information KT dynamic. Formal communications exchange around operational schedules. Planning activity communication. \Resource Alignment.

Q12. What types of knowledge do you provide or intend to provide to the people you most frequently come in contact with?

In the perfect world, it would be overarching guidance about each of those 4 things. So, I would hope to be able to provide a decision on future policy, for example. I wouldn't want to develop the policy; but, I would want to provide the decision and the clear guidance so that we have a way to go in the future. A decision on how we would, you know, work the current budget or future budgets. To work how we would do, for example, the scheduling process. That's one thing you can here locally that we've revised in the last year, the preparation. I think that, certainly as a division chief, is to provide how we do that more efficiently and to make the decision on providing the process and to be able to do that effectively, not just ad hoc.

Synopsis/Preliminary Analysis: Participant 11 expressed his primary knowledge transfer to others involves decisions that guide action based on existing or emerging policy. Relates to knowledge in action.

R226: Planning and forecast KT. Send. Clarify outcomes and objectives.

R227: Operational activity, process improvement. Clarify procedures.

Q13. And when you're communicating with the folks that you frequently communicate with, how do you know, or at least get a sense of, when they've obtained knowledge from you? How can you tell when that happens?

Only if they respond to me. So, if I get a response, and that would be, like I said if it's via email that they're going to respond. Or, there is some of that but, I know that they've gotten it if I see it, certainly. So, I could have a verbal, I could have a written response, or I could have a visual response where if, for example, when we change the policy for passes. We wiped out the use of comp time. If I hear somebody say comp time, you know, I know that they haven't really necessarily ingrained the process that there is no comp time (laughter). So, there would be a way that I would be able to hear or see that too that they've received that information.

Synopsis/Preliminary Analysis: Feedback plays an important role in participant 11's awareness that others obtained knowledge from him. Relates to verification/confirmation as alert to knowledge transfer.

R228: Send knowledge received confirmation. Written feedback acknowledgment.

R229: Observed behavior change as KT receipt confirmation. Visual indicator.

Q14. And what method would you say you use to transfer knowledge most with and why?

Definitely email would be number one.

Why is that?

I think it's easiest and I can put more information into there faster via email. Because it's broadly used, I can touch people both at work and at home via email. With smart phones now there's pretty much universal access to people having access to an email communication. It's instant. I would say the second one now would be text because so many people are carrying a phone. And, if they don't carry an email capable phone, I think a majority have text available. And, again, that's instantaneous and I can get an instantaneous response back. And, then probably third would be phone if they're not around me. Although if I have the ability to be able to talk to somebody I will walk even within the building, I'll walk in the building before I call somebody on the phone.

Synopsis/Preliminary Analysis: Email or text (written) communication provides the participant an efficient method to transfer knowledge that is verifiable and confirmable. However, participant indicated a preference for face to face communication if possible. Values face-to-face knowledge transfer.

R230: \ISS, \FSS, heterophilic network connections, Tie Patterns. Includes mobile platform where centralized email communication is linked to smart device, providing real-time delivery regardless of geographic location.

R231: \ISS, \FSS, less heterophilic, more direct network connections, implied by nature of technology, unless Participant has EMail groups loaded onto device (unknown). Text messaging using smart phones. Limited size communication, but with instantaneous access.

R232: Verbal f2f communication if geographically co-located. \ISS, \SSS. Again, a function of efficiency and expediency, yet, recognizing the need for direct socio-physical connection.

Q15. And what method would you say you least transfer knowledge with?

I guess out of those things probably would be the phone.

Why is that?

Because if I have the ability to be able to talk with somebody within the organization, I'd much rather do it face-to-face. And, because I think the feedback is...you know, I can get not only a verbal feedback like you would on the phone, but you can get visual cues, all those kind of things which I think is better. For me, personally, it gets me out of the office because I can be pretty comfortable behind the computer and, you know, typing emails all the time. But, I do think it's important to leave the office and get more personal interaction.

Synopsis/Preliminary Analysis: Participant again expressed the preference for face to face over phone verbal communication due to the amount of feedback available. Although he also indicated a tendency to "pretty comfortable behind the computer and, you know, typing emails all the time," which he should counter with face-to-face contact.

R233: Lease preferred KT media is phone. Rationale provided in response to Why is coded to R232.