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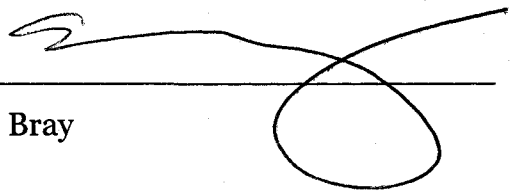


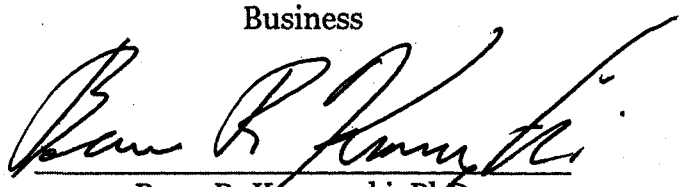
David A. Bray

Knowledge Ecosystems:
Technology, Motivations, Processes, and Performance

By

David A. Bray
Doctor of Philosophy Candidate

Business



Benn R. Konsynski, PhD

Knowledge Ecosystems: Technology, Motivations, Processes, and Performance

By

David A. Bray
B.SCI, Emory College, 2001
MSPH, Rollins School of Public Health, 2004

Adviser: Benn R. Konsynski, PhD

An Abstract of
A dissertation submitted to the Faculty of the Graduate School of Emory University in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Business

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Knowledge ecosystems include the influential relationships among knowledge technologies, motivational antecedents, knowledge transfer processes, and organizational performance outcomes. I perform three studies to investigate these elements of knowledge ecosystems and further contribute to the extant literature.

First, I seek to research how knowledge technologies and organizational structure influence the accuracy of organizational knowledge in turbulent environments – to include research as to whether a top-down or a bottom-up approach to managing knowledge in organizations confronting environmental turbulence is superior. This premise of a bottom-up approach is embodied in knowledge ecosystems, which this dissertation explores from multiple perspectives across the three studies. As part of my inquiry, I suggest that knowledge technologies present knowledge transfer opportunities that augment organizational structure. This specific study employs an agent-based simulation as part of its investigation.

Second, I seek to research how knowledge technologies augment the motivational antecedents of incentives, values, and competence-based trust. As part of this inquiry, I also seek to research whether knowledge technologies and

influence the contexts associated with social dilemmas. This specific study develops and refines a survey instrument as part of its investigation.

Third, I seek to research how the role criticality of personnel influences knowledge sharing vs. knowledge protection. As part of this inquiry, I also seek to research whether the role criticality of personnel ultimately influences organizational responsiveness and efficiency. Of note, I suggest that organizational responsiveness represents a performance outcome distinct from organization efficiency – thus separating two performance outcomes typically treated (to date) as a single performance construct in the extant literature. This study also develops and refines a survey instrument as part of its investigation.

These three interwoven studies inform each other, integrating four elements that conceptually comprise knowledge ecosystems. Cumulatively, this dissertation examines closely both the theoretical and empirical dynamics present in knowledge ecosystems.

Foremost, I would like to extend appreciation and thanks to Benn Konsynski as my mentor and dissertation adviser at Emory University. I also would like to express gratitude to Frank Land for the insights exchanged with regard to organizational learning and knowledge management while at his home in Ivybridge in the U.K.

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Third, I would like to extend heartfelt thanks to several folks at the anonymous organization involved with national security, public health, and emergency response that I employed for the data collected as part of my field research; I hope they know how much they have helped my research efforts. Without the timeliness of this critical data, I am not sure I would be graduating early.

Fourth, I would like to thank the many other professors and friends at Emory University who supported me in my dissertation pursuit. I also would like to

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1. INTRODUCTION

I seek to add to an existing, integrative framework regarding the management of knowledge in organizations, and then link my framework contributions to organizational performance outcomes. Cumulatively, this dissertation attempts to answer an "open call" published in a 2003 *Management Science* article (Argote et al. 2003). This call urged employing a diverse set of fields studying the management of knowledge in organizations to produce integrative research across these fields. Argote et al. also urged future research studying the "fit" and contexts of organizational learning and knowledge management. I seek to do both of these activities. In my efforts to do so, I also seek to build upon the pre-existing, seminal research of James G. March on how individuals learn and make decisions in organizational contexts (Cyert and March 1963; Levitt and March 1988; March 1991; March and Simon 1993; March 1994). I then seek to link these studies to my intended research contributions regarding the management of knowledge in organizations.

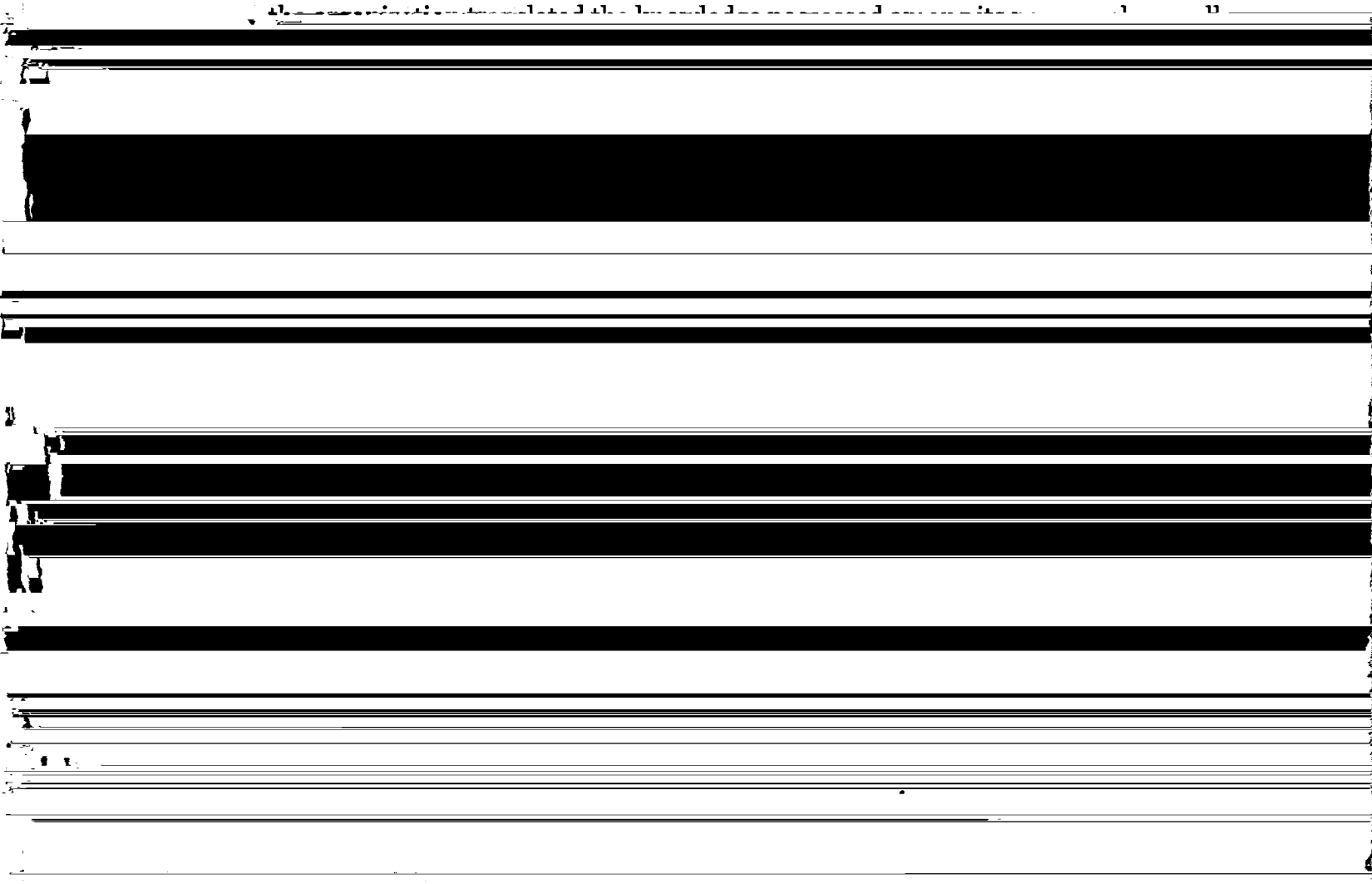
RESEARCH IMPORTANCE

In late 2005, I informally polled leaders at a knowledge-intensive organization as to overarching problems that the leaders confronted. I received several comments, from which three major themes emerged, embodied by the three quotations below:

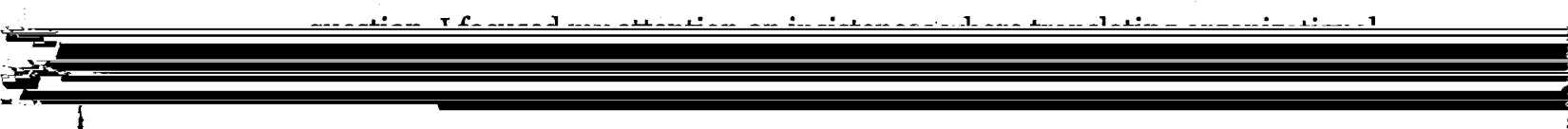
1. *"...I'm being overwhelmed with too many insights and information; how can I know what's important and what I should focus on? ..."*

2. *"...Why is it our organizational design and technology systems seem to fragment our overarching organizational view, not condense it? ..."*
3. *"...We launched a knowledge management system per the user design requirements we received, but now no one's using it? ..."*

To me, these three major themes represented serious questions regarding how



new insights received from external sources, into performance outcomes. Wanting to translate these practitioner concerns into a broader research



but the knowledge was in a highly distributed and fragmented form across multiple departments, agencies, and the White House (Kean and Hamilton 2004; U.S. GAO 2003, 2004a, 2004b, 2006a, 2006b).

These failings are important as they represent three emails where sufficient knowledge existed– but insufficient knowledge transfer exchanges occurred – to mitigate negative outcomes. Which leads to a broader question of why? Researchers can ask whether there were problems with the organizational design of the agencies involved with such events. Researchers can also ask whether the wrong motivations provided to the personnel associated with these agencies – or were the wrongs norms of use associated with knowledge and knowledge technologies established in these organizations.

While I do not intend to answer these important questions with regard to these specific events, I do intend to explore these questions in an abstract form as part of this dissertation research. Moreover, by extension, I hope to apply my research findings eventually so that collectively we, as concerned individuals, can

DEFINITION OF TERMS

In an effort to translate these important questions into integrative academic research questions, defining the abstract terms I will employ as part of this dissertation represents a crucial step.

First, I define knowledge as justified true belief about external reality (March 1991; Nonaka 1994; Argote et al. 2003). Of note, per the knowledge-based view of the firm, knowledge represents the most strategically valuable resource of any organization (Argote and Ingram 2000; Alavi and Leidner 2001)

Knowledge technologies include computer interfaces and networked systems that enable organizational knowledge transfers among human actors (Winograd and Flores 1987; Alavi and Leidner 2001; Gold et al. 2001; Wasko and Faraj 2005). *Motivational antecedents* include organizational incentives, normative values, and competence-based trust that encourage human actors to transfer knowledge intra- and inter-organizationally (Cyert and March 1963; Argote et al. 2003; Bock et al. 2005). *Knowledge transfer* embodies intra- and inter-organizational knowledge sharing, reuse, and protection activities (Alavi and Leidner 2001; Markus et al. 2002; Wasko and Faraj 2006).

The representation of an organizational goal and the coordination of routines facilitating the dissemination and interpretation of relevant knowledge, such that the organization's approximation of reality sufficiently matches external reality, represent a critical component of any organization's *knowledge management strategy* (Nonaka 1994; Argote and Ingram 2000; Argote et al. 2003).

Existing literature suggests that many organizations have been ineffective in managing knowledge (Choo and Bontis 2002) with the implications of such poor

management most severe on organizations where knowledge forms the core of the organizational output. Often known as *knowledge-intensive organizations*

(Alvesson 2004; Smits and de Moor 2004), these enterprises include consulting firms and policy institutions, where usage, creation, and sale or dissemination of knowledge is linked intrinsically to organizational objectives.

Furthermore, managing knowledge acquires a new dimension of complexity when the knowledge-intensive organization also happens to be functioning in an information-sensitive context, where improper information dissemination may threaten the organization's future performance. Specifically, improper information dissemination may cause the organization to: (1) lose a strategic advantage through theft of intellectual property, (2) lose respect, branding, or upstanding with their community or market, or (3) face potentially negative legal responses as a result. Organizations that operate within an *information-sensitive* context often operate as chief authorities for a specific domain of valued knowledge (Ancona and Caldwell 1992; Heckscher and Alder 2006).

With this principle goal of extending research into knowledge transfer and the properties of the relationships between units engaged in knowledge transfer –

FRAMING MY RESEARCH INQUIRY

Of particular note in their concluding article to a *Management Science* Special Issue on knowledge management and organization, Argote et al. (2003) recognize that research on these two topics share a long, inter-related history. The authors trace a history that goes as far back as Adam Smith's ideas on how specialization promoted experience-based learning to more recent work by Richard Cyert and James March's efforts to produce a behavioral theory of the firm (Cyert and March 1963). Argote et al. (2003) also note that research on both organizational learning and knowledge management spans multiple disciplines, to include information systems (IS), organizational behavior, psychology, strategic management, economics, and sociology. While such diversity has strengthened the relevance of such research to multiple domains, the authors query the extent to which a truly cumulative body of knowledge is emerging. The authors strongly suggest future research attempt to unite perspectives across diverse disciplines in an attempt to produce integrative research (Argote et al. 2003).

In an attempt to answer this "open call" for integrative research, this dissertation intends to produce integrative research by building from the original,

include two critical dimensions: knowledge management outcomes (to include knowledge creation, knowledge retention, and knowledge transfer) and properties of the knowledge management context studied (to include properties of units, properties of the relationships between units, and properties of knowledge). Figure 1.1 illustrates this framework introduced by Argote et al. (2003), in addition to highlighting the areas in which I seek to further refine and elucidate elements relevant to the management of knowledge in organizations and associated performance outcomes.

As suggested by Argote et al., knowledge represents the most strategically valuable resource of any organization, ultimately influencing organizational performance (Argote and Ingram 2000; Argote et al. 2003). With this

As also suggested by Argote et al. (2003), "a limited appreciation of the links

across disciplinary perspectives can prove to be inefficient as researchers fail to take advantage of ideas produced in other areas and simply 'rediscover' what is known already." Echoing this strong sentiment, I specifically seek to incorporate and build upon the seminal research of March on how individuals learn and make decisions in organizational contexts (Cyert and March 1963; Levitt and March 1988; March 1991; March and Simon 1993; March 1994) and link his studies to my investigations into the management of knowledge in organizations.

From a more academic perspective, in my review of the extant literature (completed in Chapter 2 of this dissertation), I find three areas where additional research could greatly benefit the extant literature surrounding knowledge management and organizational learning. These three areas include additional research on:

1. *Linking organizational design with norms of use associated with knowledge technologies*
2. *Linking the influence of context on the motivations of use associated with knowledge technologies*
3. *Unpacking "organizational performance" associated with knowledge management efforts as representing more than one construct*

there were times when I also observed other organizations, or individual organizational units, better responding to changing environments. This prompted a practical question of a why different organizations or organizational units responded better or worse, and a deeper research question of what organizational elements influenced organizational responsiveness to changing environments?

Extending this inquiry future, I noted there were instances where knowledge present in an organization at lower-levels of the hierarchy tried to "percolate" up the organizational hierarchy, but for whatever reason was not successfully

However, if an intervention of a communication exercise or communication technologies was performed, knowledge transfer increased – which I might posit as being solely because of the communication technologies, except that asking individuals why they now engaged in knowledge transfer revealed responses that it was worth it, there were incentives, or they did in fact trust their co-workers.

This puzzled me, could it be that individual assessments of the same incentives or other motivational antecedents of an organization, typically treated as a static or a given in most research studies, were in fact mutable. Could individual assessments of these motivational antecedents could vary and change because of other factors, to include the level of supporting knowledge technologies? Translating these observations into a testable theory, I posited – and sought to perform a research investigation with Chapter 4 of this dissertation – that knowledge technologies would augment individual assessments of organizational incentives, normative values, and competence-based trust. In turn, organizational incentives, normative values, and competence-based trust

Again, this puzzled me, could it be that individuals involved with role critical positions valued knowledge sharing vs. knowledge protection differently than their less role critical counterparts – and did these differences have a difference in their perceived associations between knowledge transfer and organization performance outcomes? Research by Markus et al. (2002) on emerging knowledge processes (EKP's) reveals that new product development, strategic business planning, and organizational design include EKPs and represent unique requirements not supported by familiar classes of information systems such as expert systems, organizational memory systems, or repositories. Could it be that the contextual knowledge transfer needs of knowledge workers with high role criticality are different from the contextual knowledge transfer needs of knowledge workers with low role criticality?

Translating these observations into a testable theory, I posited – and sought to perform a research investigation with Chapter 5 of this dissertation – that knowledge workers with high role criticality would perceive a higher contribution of knowledge sharing to organizational responsiveness than knowledge workers with low role criticality. I made a similar posit regarding knowledge workers with high role criticality and organizational efficiency. However, when it came to knowledge protection, knowledge workers with high role criticality would perceive a lower contribution of knowledge sharing to organizational responsiveness than knowledge workers with low role criticality. Similarly, I

than knowledge workers with low role criticality. I discuss details of this theory and my formulation of it in Chapter 5.

Consequentially, this dissertation seeks to provide additional research to help illuminate these three areas in the literature. Specifically, I position my research to research technological, human, and organizational elements at the intersection of *knowledge transfer* (as a knowledge management outcome) and *properties of the relationships between units* (as a property of the knowledge management context studied), with the ultimate objective of linking my study of these technological, human, and organizational elements to performance outcomes. My inquiry also involves some overlap into research on knowledge retention. All of my research focuses on individual-level actions culminating in organizational-level performance outcomes.

With three inter-related studies, detailed in Chapters 3, 4, and 5, this dissertation demonstrates that to best leverage knowledge strategically in turbulent environments, organizational leaders should seek not to directly "manage" their knowledge per se. Instead, I suggest that organizational leaders should cultivate a knowledge ecosystem, which fosters valuable knowledge transfer within the organization through a "bottom-up" (i.e., grassroots) knowledge management strategy that combines knowledge technologies, motivational antecedents, and knowledge transfer.

In terms of theory, this dissertation builds upon the knowledge-based view of the firm, extending earlier research by Argote and Ingram (2000), Nonaka

resources are usually difficult to imitate and socially complex, heterogeneous knowledge bases and capabilities among firms are the major determinants of sustained competitive advantage and superior corporate performance. Extending research by Nonaka (1994) and others, organizational knowledge is embedded and carried through organizational culture and identity, policies, routines, documents, systems, and employees.

However, unlike the resource-based view of the firm that treats knowledge as a generic resource, the knowledge-based view of the firm identifies knowledge as having special characters and thus organizations can possess different types of knowledge-based capabilities. Moreover, per the knowledge-based view of the firm, information systems can synthesize, enhance, and expedite large-scale intra- and inter-firm knowledge management (Alavi and Leidner 2001).

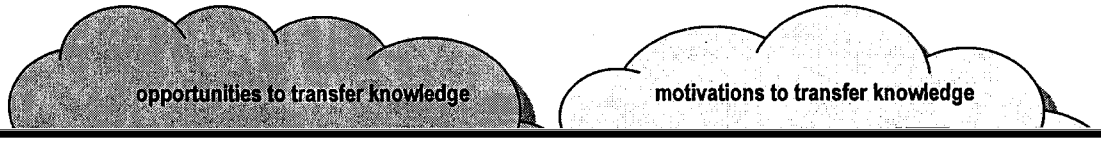
A critical theory link for the knowledge-based view of the firm includes Nonaka's (1994) dynamic theory of organizational knowledge creation. Organizational knowledge can be created through a continuous interaction between tacit and explicit knowledge via four patterns of interactions, socialization, combination, internalization, and externalization. Explicit knowledge is codified knowledge transmittable in formal, systematic language whereas tacit knowledge is personalized knowledge that is hard to formalize and

1. *Knowledge technologies indirectly motivate organizational actors to transfer knowledge by augmenting motivational antecedents.*
2. *Motivational antecedents influence actors to engage (or not) in knowledge transfer.*
3. *Knowledge transfer processes consequentially influence the two separate performance outcomes of organizational responsiveness and organizational efficiency.*

I achieve these contributions by employing three interrelated studies, each from a perspective that helps extend research into the performance outcomes at the intersection of studies involving both knowledge transfer and the properties of the relationships between units engaged in knowledge transfer – i.e., research

congruence of different elements of organizational learning and knowledge management represents my answer to this "open call" for integrative research in these two fields. I now detail the three studies that I perform as part of this dissertation.

STRUCTURE OF THIS DISSERTATION



knowledge in hierarchies of varying size and depth. I then evaluate additional effects of a knowledge management (KM) system that collects and shares knowledge from expert individuals in an organization.

Cumulatively, this first study augments March's original model, which considers all individuals as peers, to consider hierarchical organizational structures and explore whether a bottom-up strategy combined with nominal norms of use associated with knowledge technologies demonstrates greater resiliency to environmental turbulence than other organizational alternatives.

My second study into knowledge ecosystems examines knowledge technologies and motivational antecedents by developing, refining, and deploying a survey instrument at a field site. I seek to test empirically a proposed model that extends existing research to explain and predict how knowledge technologies and motivational antecedents influence knowledge transfer, thereby indirectly influencing organizational responsiveness. I focus on the *influence of knowledge technologies and motivational antecedents* by developing and testing a model detailing how aggregated knowledge technologies, embodied in intra-organizational information systems, provide opportunities that augment individual-level human motivations to engage in knowledge transfer, ultimately influencing organizational responsiveness.

bottom-up vs. a more traditional approach of knowledge "management" from the top-down.

My third study into knowledge ecosystems examines the context of roles and influence of knowledge transfer. As before, I develop, refine, and deploy a survey instrument at a field site. I seek to test whether and how the role criticality of personnel influences the knowledge transfer processes of knowledge sharing and knowledge protection, ultimately influencing organizational performance outcomes. I focus on the *influence of role criticality and knowledge transfer* by empirically exploring how the role criticality of personnel influences two constructs, to include perceived levels of knowledge sharing (inclusive of exploration and exploitation processes) and knowledge protection. I then explore how these two constructs influence the perceived levels of organizational performance, to include the constructs of organizational responsiveness and organizational efficiency. Of note, as a contribution to the literature, I suggest and later demonstrate that organizational responsiveness and organizational efficiency represent two different and distinct constructs of importance.

Cumulatively, this third study explores the differences in the context of roles on the value that humans discern with regard to engaging in or refraining from knowledge transfer. These differences in context have consequences not only for varying individual decision, individual level performance outcomes, and organizational performance outcomes – but also for better understanding of how

All three of my studies echo the idea that bottom-up, knowledge cultivation represents a knowledge management strategy that helps an organization adapt faster to environmental turbulence than top-down knowledge management. Figure 1.2 at the start of this section details the research concepts discussed in this dissertation as loosely grouped equivalence classes.

Serving as the foundation for this interwoven idea, I note that my first study grounds my inquiry by extending March's seminal model of organizational learning of exploration and exploitations, specifically by examining the contrasts between a top-down vs. bottom-up approach with regard to managing knowledge

in turbulent environments. My second and third studies build upon this research by studying the knowledge-related dynamics of a large organization constantly confronting turbulent environments with regard to national emergencies,

performance outcomes, and ultimately varying *organizational performance outcomes* at an aggregated level (Clippinger 1999; Argote et al 2003; Wasko and

[redacted]

of context and a technology intervention in Appendix C.

Given that different organizational contexts will influence whether humans decide to engage (or not) in knowledge transfer, my second and third studies extend the findings of my first paper by investigating the influence of different alignments of supporting knowledge technologies and motivational antecedents on knowledge transfer – and on organizational performance ultimately. I suggest that knowledge technologies augment motivational antecedents, to include organizational incentives, normative values, and competence-based trust, thereby

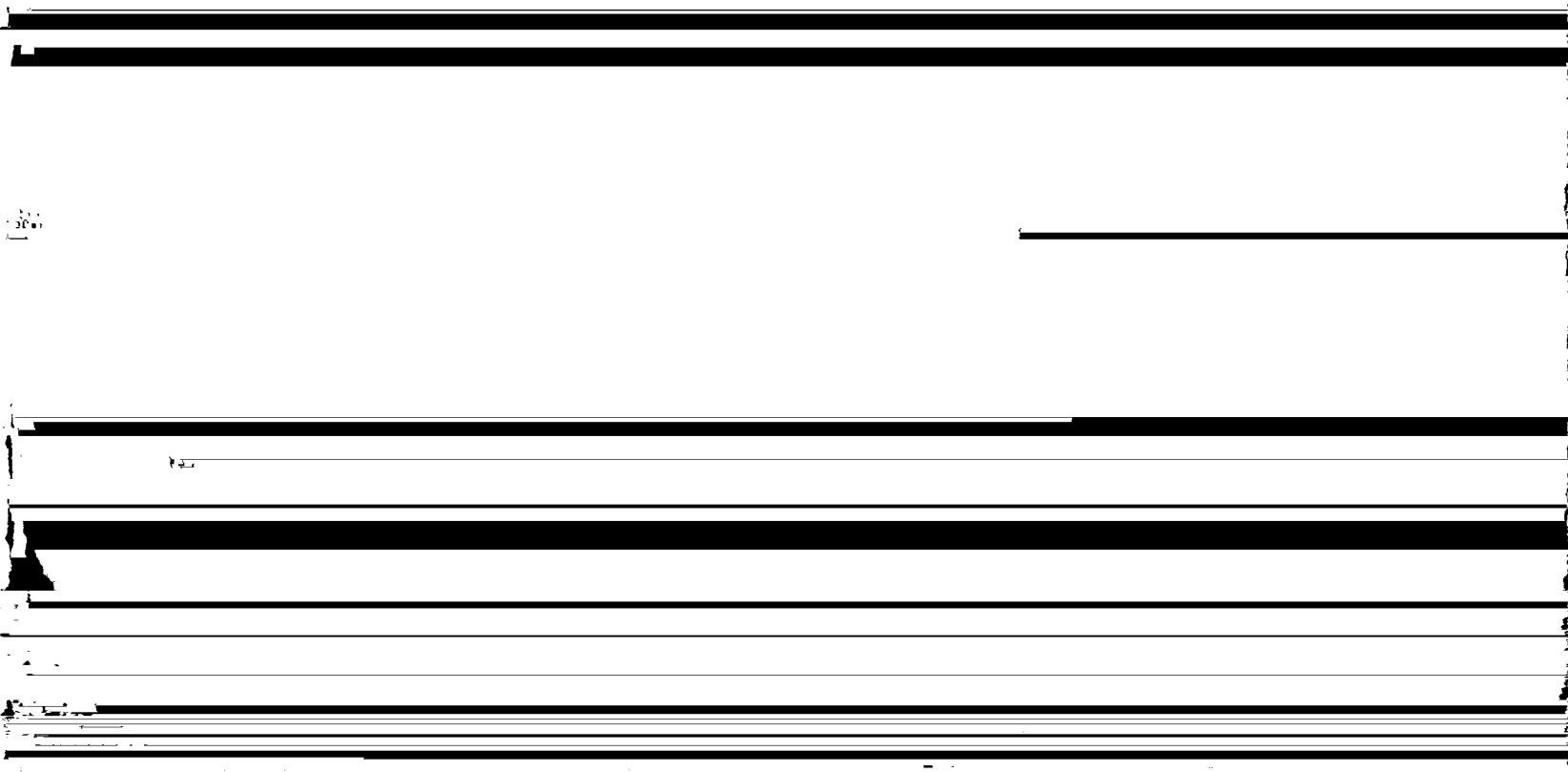
knowledge in organizations will be a second principle contribution of my research. Demonstrating the connective links between technology, motivations, knowledge transfer, and organizational performance will be another principle contribution of this dissertation to IS and management science literature. Discerning how to cultivate knowledge in turbulent environments will be a fourth contribution of this dissertation to the extant literature.

Cumulatively, my three interwoven studies inform each other, linking four elements that conceptually comprise knowledge ecosystems. Specifically,

[redacted]

knowledge ecosystems consist of: (1) opportunities to transfer knowledge – to include knowledge technologies, (2) motivational elements to transfer knowledge – to include motivational antecedents, (3) knowledge transfer, and (4) one or

572; Argote et al. 2003), this literature review informs my dissertation research by assessing the existing state of the literature. Moreover, as with the original integrative framework, my literature review helps identify points of integration across different traditions as well as "gaps in our understanding of knowledge management" (p. 573, Argote et al. 2003). Such an exercise helps illuminate a non-exhaustive set of the unanswered research questions surrounding the



management of knowledge in organizations.

KNOWLEDGE AND INFORMATION SYSTEMS

Alavi and Leidner's (2001) MISQ article represents the seminal review piece on knowledge management and information systems; often cited in subsequent works. Their article frames the knowledge-based view of the firm, extending earlier research by Argote and Ingram (2000), Nonaka (1994), and Grant (1996)

information system with KM, to include four sets of socially enacted, interdependent knowledge processes:

1. *Knowledge creation*
2. *Knowledge sharing (to include storage and retrieval)*
3. *Knowledge transfer*
4. *Knowledge application*

I now highlight six research articles within the IS literature, subsequent to Alavi and Leidner, that research KM at the organizational-level. After this initial review, I will return to earlier research by some of the aforementioned non-IS researchers, in addition to several others.

First, research by Becerra-Fernandez and Sabherwal (2001) consider the link between knowledge processes and an outcome of KM, specifically KM satisfaction among users. Their research suggests that task characteristics moderate the relationship between these two variables, with task orientation comprising internalization, externalization, combination, or socialization. Their research finds either focused or broad knowledge content task-orientation positively moderates the relationship between knowledge processes and KM satisfaction

infrastructure capabilities and knowledge processes positively influence organizational effectiveness. Perhaps the greatest contribution by Gold et al. (2001) includes the survey instrument they developed to explore the link between knowledge enablers, processes, and performance outcomes.

Third, research by Markus (2001) considers steps toward a theory of knowledge reuse, specifically situations and factors surrounding successful knowledge reuse. Her research suggests that each type of knowledge reuse

Further, Markus suggest that, owing to the design process for many knowledge

performance of the firm. IT relatedness also indirectly influences corporate performance through the mediation of KM capability.

KNOWLEDGE AND MANAGEMENT RESEARCH

Argote and Ingram (2000) argue that knowledge transfer serves as a competitive advantage for firms. Borrowing from cognitive psychology, the authors define knowledge transfer as the process through which the experience of one unit affects another. Compared to individuals across firms, individuals within a single firm usually share a greater number of similarities. Consequentially, the authors argue, interactions involving people allow greater knowledge transfer within firms than between firms. Argote and Ingram conclude that knowledge embedded in the interactions of people and tasks affords a competitive advantage in firms.

Though published in *Organizational Behavior and Human Decision*

knowledge society also represents a society of organizations, since he believes the purpose of every organization comprises the integration of specialized knowledge into common tasks.

Second, Hansen et al. (1999) considers the balance between automating KM vs. relying on people to share knowledge through more traditional (i.e. non-IS) means. Codification, through information systems, opens up the possibility of large-scale reuse for businesses, whereas a personalization approach invests more moderately in information systems, with the primary goal of facilitating conversations and the exchange of tacit knowledge. The authors argue the right strategy depends on the volume of explicit vs. tacit knowledge available within a firm and the value of such knowledge.

Third, Davenport and Glaser (2002) recognize that knowledge-sharing programs often fail by introducing unforeseen obstacles making it harder for people to do their jobs. The authors suggest that success depends on integrating

transfer, contrary to Argote and Ingram (2000) earlier research yet supporting other research suggesting weak ties provide access to non-redundant information.

Fifth, Cummings (2004) considers the influence of structural diversity on work group performance in a global organization context. Like Levin and Cross (2004), Cummings also finds that when members of structurally diverse work groups share knowledge external to the group, their performance improves. The author theorizes this improvement stems from active transfer of knowledge through unique sources.

Sixth, Singh (2005) extends management research to consider collaborative networks as determinants of knowledge diffusion patterns. Unlike Cummings (2004), Singh hypothesizes that individuals within an organization (from either the same region or same firm) possess closer collaborative links; thereby influencing a greater probability of knowledge flows. The researcher finds intra-regional and intra-firm knowledge flows represent stronger ties influencing knowledge diffusion among individuals when compared to those across regional or firm boundaries. Curiously, the effect of regional or firm boundaries on knowledge flow decreases when Singh accounts for interpersonal ties in. Belonging to the same region or firm has little additional effect on the probability of knowledge flow among investors who already share close network ties.

KNOWLEDGE AND ORGANIZATIONAL THEORY

The knowledge and management research discussed earlier complements similar inquiries from the perspective of knowledge and organizational theory. Of

note, Nonaka (1994) represents the seminal article from such a perspective, commonly cited by almost all KM studies. Nonaka defines knowledge as "justified true belief" that increases an entity's capacity for effective action.

Nonaka recognizes tacit and explicit as two dimensions of knowledge in organizations. Tacit knowledge comprises cognitive elements, such as mental models of paradigms, and technical elements, such as concrete "know-how" or contextual skills. Explicit knowledge comprises articulated and codified knowledge in symbolic form. While some researchers view the two knowledge dimensions as distinct, Alavi and Leidner (2001) suggest the two represent "not dichotomous states of knowledge, but mutually dependent and reinforcing qualities of knowledge" (p. 112). Tacit knowledge provides the background necessarily for development and interpretation of explicit knowledge.

Nonaka suggests four modes of knowledge creation, with knowledge "from" on the y-axis and knowledge "to" on the x-axis. These four modes include internalization, externalization, combination, or socialization, which later inform

they apply" (p. 580; Argote et al. 2003). I now consider six articles from an organizational theory perspective that inform KM research from the perspective of organizational theory.

First, March (1991) presents a seminal model of organizational learning, pre-dating coinage of the term "knowledge management" in the literature. March's

Organizational experts represent individuals who approximate reality better than the organizational code.

March expands his formative model to consider a more open system, comprising personnel turnover and environmental turbulence. For each iteration, every individual has the potential to leave an organization and be replaced by a naïve individual, with a probability p3 reflecting this personnel turnover. New individuals enter with randomly distributed beliefs. Additionally, every dimension of external reality has the potential to flip, with a probability p4 reflecting external environmental turbulence. March's model intentionally precludes both individuals and an organization from directly observing external reality. Instead, improvement in individual and organizational knowledge levels comes either from the organizational code adapting to the knowledge of expert individuals or from individuals conforming to the knowledge of the organizational code. The organizational code can only distinguish expert individuals by their optimal individual knowledge levels, and cannot pinpoint which specific beliefs are true or false for a given dimension of reality.

Second, Carley (1992) also employs an organizational model to consider

Third, Cramton (2001) extends research by both March and Carley to consider the problems associated with maintaining mutual knowledge among

[redacted]

types of mutual knowledge failures:

1. *Failure to communicate and retain contextual information*
2. *Unevenly distributed information*
3. *Difficulty communicating and understanding the salience of information*
4. *Differences in speed of access to information*
5. *Difficulty interpreting the meaning of silence (or non-contribution of information)*

Markus et al.'s (2002) views regarding information systems supporting emerging knowledge processes.

Fifth, an article by Galbraith (1982) also represents research relevant to KM, yet prior to the coinage of the term. Galbraith suggests organizations should combine their structure, information and decision processes, rewards, and people in a unique way to help create an innovating organization. Of greater note, Galbraith argues that organizational design tries to match the complexity of an organization's structure with the complexity of its environment and knowledge technologies. Galbraith's research mirrors Alavi and Leidner's (2001) knowledge-based view of the firm as supported by information systems, as well as Argote and Ingram's (2000) argument that knowledge embedded in the interactions of people and tasks affords a competitive advantage in firms

Sixth, Weick and Roberts (1993) present a narrative illustrating the importance of conceptualizing a collective mind in organizations to explain organizational performance in situations requiring nearly continuous operational reliability. Similar to subsequent proposals by Orlikowski (2002) and Markus et al. (2002), the authors conceptualize a collective mind as a pattern of interrelations and actions in a social system. Weick and Robert argue that as heedful interrelating and inter-individual comprehension increase,

KNOWLEDGE AND STRATEGY PERSPECTIVES

For the final stream of extant literature involving KM at the organizational level, I consider a strategy perspective. In 1996, a Winter Special Issue of the *Strategic Management Journal* published several papers discussing a knowledge-based theory of the firm, to include a seminal article by Grant (1996).

[redacted]

Grant (1996) takes strong steps toward such a theory, suggesting that:

1. *Firms apply knowledge to the production of good and services*
2. *Knowledge represents the most strategically valuable resource of a firm*
3. *Individuals create and hold knowledge, not organizations*
4. *Firms exist because of the high costs involved with markets attempting to coordinate the knowledge of individual specialists*

Of note, Grant's points on why firms exist mirror earlier points contained with the resource-based view of the firm and agency theory (for details on these two theories, see the discussion in my second research focus). In particular, Grant proposes that even with cooperation, organizations face difficulties attempt to coordinate specialized knowledge, similar to acknowledgements later made by Davenport and Glaser (2002). Rules, sequencing, or routines can help coordinate specialize knowledge by minimizing requested costs of such activities. Coordination also depends on common knowledge shared among individuals in an organization, to include language, shared meaning, and recognition of

Liebeskind (1996) suggests that firms have unique institutional capabilities to protect knowledge from imitation more effectively than market contracting. Second, Spender (1996) revisits sociotechnical systems theory to adopt heuristics from the social constructionist literature to suggest that knowledge can be conscious, automatic, objectified, or collective. Of note, Spender suggests that a dynamic knowledge-based theory of the firm should recognize that organizations represent "activity" systems, similar to Weick and Robert's conceptualization of a collective mind as a pattern of interrelations and actions in a social system. Third, Tsoukas (1996) employs a constructionist approach to suggest that a firm's knowledge represents the indeterminate outcome of individuals attempting to manage the inevitable tensions between normative expectations, dispositions,

several research findings discussed earlier in this review across multiple perspectives.

CONCEPTUALIZING KNOWLEDGE ECOSYSTEMS

Two books provide insightful perspectives into KM and strategy. First, Polanyi

[redacted]

distinguishing the dimension of tacit knowledge prior to Nonaka's (1994) seminal article. Polanyi views tacit knowledge representing knowledge contained in the mind of an individual. In his book, Polanyi also lays the foundation for Markus' (2001) consideration of different knowledge reuse scenarios.

Second, Clippinger (1999) includes several chapters applying complex

exchange time-sensitive knowledge to increase organizational adaptedness and survivability, whereas top-down approaches may confront indeterminacy.

March's (1991) research also considers the accuracy of both organizational and individual knowledge when confronted with a turbulent external reality. Cumulatively, these suggestions from the literature – specifically that a bottom-up approach might be ideal for managing knowledge in organization confronting turbulent environments – inform my research into knowledge ecosystems and the influence of technological, human, and organizational elements on performance outcomes.

I define knowledge ecosystems as incorporating a bottom-up approach towards appropriate "fit" among knowledge technologies, motivational

[redacted]

aforementioned, knowledge technologies include computer interfaces and networked systems that enable organizational knowledge transfers among human actors (Winograd and Flores 1987; Markus 2001; Wasko and Faraj 2005).

bottom-up (i.e., grassroots) approaches are more resilient to volatility (Anderson

1999; Clippinger 1999). This literature also suggests that bottom-up approaches will cultivate emergent knowledge transfer processes that should prove more optimal than directed, top-down alternatives attempting to do the same (Heckscher and Donnellson 1994). As a researcher into organizational learning and knowledge management, I seek test such a premise with regard to knowledge ecosystems.

Knowledge technologies both facilitate knowledge transfer and provide opportunities not afforded by physical proximity to collaborate. I give a specific example of the influence of context and a technology intervention in Appendix C, in which I discuss research into social dilemmas. Extrapolating from social dilemmas research as well as research into human decision making (March 1994), I posit that knowledge technologies reshape the context in which human individuals decide whether engaging in knowledge transfer is appropriate (or inappropriate). Research by Helly and Thibaut (1978), Payne et al. (1993), Messick (1999), and Wasko and Faraj (2005) also support a similar premise.

In addition, the rules of the organization and the identity of the individuals

making the decision can influence whether engaging in knowledge transfer is appropriate (Simon 1991; March 1994). I posit that knowledge technologies can augment motivational antecedents, thereby influencing human motivations, which in turn influence knowledge transfer, which ultimately shape outcomes, including organizational performance.

That knowledge context matters with regard to managing knowledge in organizations is clear, with Argote et al. (2003) particularly stressing that

"Ability, motivation, and opportunity are three causal mechanisms used to explain why certain contextual features affect knowledge management outcomes... properties of the knowledge management context could impact an individual's *ability* to create, retain, or transfer knowledge. Or the context could provide people with the *motives* and incentives to participate in the knowledge management processes. Or the context could provide an individual with the *opportunity* to create, retain, or transfer knowledge" (p. 575; Argote et al. 2003).

For this dissertation, I hone my focus to consider the interplay between opportunities and human motivations with regard to knowledge transfer specifically.

In particular, organizational structure and knowledge technologies influence the opportunity to engage in knowledge transfer, thereby shaping the context in which human actors decide whether to engage in such an activity. "Effective knowledge management results from providing individuals with the opportunity to create, retain, and transfer knowledge" (p. 575; Argote et al. 2003).

In addition, motivational antecedents – to include organizational incentives, normative values, and competence-based trust influence human motivations with regard to knowledge transfer (Gold et al. 2001; Lee and Choi 2003; Wasko and Faraj 2005; Heckscher and Alder 2006). "Rewards and incentives are important components of the knowledge management process. The 'not invented here' syndrome in organizations in an example of how rewards can affect knowledge management outcomes" (p. 575; Argote et al. 2003). If individuals belonging to an organizational unit are not rewarded for reusing internal organizational

(Menon and Pfeffer 2003). Strong rewards can also influence knowledge transfer. Since strong ties are more likely to be governed by norms of reciprocity, strong ties among individuals in an organization can promote the transfer of tacit knowledge (Uzzi 1997). In addition, cooperative norms can also encourage knowledge transfer (Reagans and McEvily 2003) as well as organizational contexts where uncooperative behavior can damage individuals' reputations. Given that I frame this dissertation using March's (1991) model and Argote et al's. (2003) framework, it is worthwhile to examine how subsequent future papers hone and refine the concepts discussed in these two papers. While several of these papers have already been cited in this literature review, four seminal additional papers are of note.

Majchrzak et al. (2005) examine perceived individual collaboration know-how development through information-technology enabled contextualization. Their

of note given that this dissertation examines a knowledge-intensive, information sensitive organization that responds to emergent threats and coordinates responses to catastrophes.

Regarding follow-up studies to March's (1991) model, I highlight several in Chapter 3. That said, probably the most applicable to this entire dissertation and not just Chapter 3 is a study by Jansen et al. (2006) which links exploration, exploitation, and performance outcomes to organizational antecedents. Tthe organizational antecedents that the researchers examine include formal and informal coordination mechanisms. Further, the researchers contribute to a better understanding of how ambidextrous organizations coordinate the development of exploratory and exploitative innovation in organizational units, to include responding to varying environmental conditions (Jansen et al. 2006). Also of note, Lee et al. (2003) perform an study of March's exploration and exploitation in the presence of network externalities. In addition, Kane and Alavi (2005) perform an extension of March's (1991) model to consider group decision support and electronic communication among the agents in the model. Finally, Miller et al. (2006) perform an extension of March's (1991) model to consider interpersonal learning and tacit knowledge.

Cumulatively, these subsequent studies following March (1991) and Argote et