SYM-AM-18-083

PROCEEDINGS
OF THE
FIFTEENTH ANNUAL ACQUISITION RESEARCH SYMPOSIUM

THURSDAY SESSIONS
VOLUME II

Acquisition Research:
Creating Synergy for Informed Change

May 9–10, 2018

March 30, 2018

Prepared for the Naval Postgraduate School, Monterey, CA 93943.

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

Developing a Sense of Reality Within Complex Program Management Environments

Raymond D. Jones, COL, USA (Ret.)—retired as a Colonel from the U.S. Army in 2012 and is a Lecturer with the Graduate School for Business and Public Policy at the Naval Postgraduate School. His last assignment in the Army was as the Deputy Program Executive Officer for the Joint Tactical Radio System (JTRS). Additionally, he served as the Military Deputy for the Director of Acquisition Resources and Analysis in the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]), managed three Major Defense programs for the DoD in addition to his many operational and research and development assignments. He graduated from the U.S. Naval Test Pilot School in 1995 and is a 1983 graduate of the United States Military Academy. He has a Bachelor of Science degree in Aerospace Engineering, a Master of Science degree in Aeronautical Engineering from the Naval Postgraduate School, a Master's in Business Administration from Regis University, a Master's Degree in National Resource Strategy from the Industrial College of the Armed Forces, and is currently a PhD candidate with the Graduate School of Information Sciences at the Naval Postgraduate School in Monterey, CA.

Abstract

How leaders make decisions in complex and chaotic environments could have a significant impact on organizational performance. This study of leaders from across the Department of Defense (DoD) provides the foundation by which a more informed understanding of how program managers' sense of situational reality ultimately leads to timely and relevant decisions. This study specifically focuses on the emergence of four aggregate categories—sensemaking, trust, tacit knowledge, and explicit knowledge—that seem to shape the leader's reality and subsequent decision-making process in highly complex environments. I refer to the integrated nature of these categories as nousmaking, or making reality of the situation and choices based on one's sense of the reality. Ultimately, these factors determine the velocity and quality of the decisions leading to overall organizational effectiveness. Understanding the underlying nature by which leaders gain a sense of reality within the decision-making environment will help shape future organizational structures and processes as well as leader development.

Introduction

Despite the many Department of Defense (DoD) successes, many of the DoD's programs and operations are still vulnerable to underperformance and excessive cost growth during times of increasingly constrained budgets. Since 1975, there have been an annual array of studies, beginning with the Packard Commission, that have had virtually no impact on the ever-increasing trend of cost growth and substandard program performance. Successfully addressing these challenges can yield fiscal dividends that the Department could use to meet priorities such as readiness and modernization needs.

The DoD continues to struggle to overcome the many problems brought about by more than a decade of war and the need to accelerate the procurement of capability, while fighting on several fronts around the world. Often, the necessity of speed of delivery, resulting in underperforming programs, has spuriously suggested that program management is the root cause of program underperformance. The consequence of this assumption has been legislative language that tends to address program leaders' motivations and incentives, rather than the root causes of program managers making decisions that often have little impact on program performance.

Although the DoD has increased its procurement budget over the years, it consistently pays more and takes longer than planned to develop systems that do not perform as anticipated. The DoD spends over $100 billion a year in contracting for goods and services. Over the last few years, the DoD has made several broad-based changes to its acquisition and contracting processes to improve DoD–contractor relationships and rules and has given attention to acquisition reform initiatives with little real improvement. The most glaring example of this failure is the termination of the DoD's Joint Tactical Radio System, which cost more than $17 billion, with little return for the investment.

It is time to examine the root causes of DoD program challenges from a more scientific perspective, rather than from the traditional organizational theory and policy view. The policy changes that have attempted to create efficiencies by using commercial best practices, portfolio management, and additional oversight have failed to produce their intended results. A deeper understanding of how leaders make decisions and the mitigating impacts of those decisions is necessary to truly change the acquisition framework in a way that will result in an improved return on investment for defense materiel development programs. *The problem this research seeks to understand is the underlying nature of why a program manager's decision making does not consistently manifest in improved program performance*. This study is being conducted in two phases. Phase I of this study is a qualitative research effort based upon grounded theory. The results of this study will provide the basis for a quantitative study in which measurable factors such as organizational structure and policy will be examined with regard to the leader's ability to link a sense of situational understanding with the structural realities of the business environment. Commensurate with this problem are the questions that help guide this research, presented in the following section.

Phase I

This research is focused on the first two questions:

a. What is the underlying nature of how decision makers gain a sense of reality by which their decisions are subsequently informed within the unique construct of their functional framework?

b. How do program managers of Major Defense Acquisition Programs (MDAPs) make sense of complex and chaotic program environments, and does this differ from other professions that operate in complex environments?

This study is predicated on the basic assumption that there is an inherent process by which an individual makes decisions. This process involves a deliberate problem-solving methodology and a less-well-defined cognitive and interactive process that influences the ability of the decision maker to gain a sense of reality. While the overall research effort will be a mixed methods approach, the initial study is a qualitative descriptive approach based upon grounded theory. This report begins to address the first question in Phase I and will support subsequent research through which the initial theory will emerge in support of Phase II.

Phase I is grounded in the naturalistic tradition and using a longitudinal qualitative, ethnographic approach to better understand the dynamics and processes of individuals making decisions in a group environment under volatile, uncertain, complex, and ambiguous (VUCA) conditions. By understanding the constructs from with which a program manager derives a sense of reality and understanding of the nature of the world perhaps we can gain insight into how to better inform that reality, leading to more effective judgements and decisions.

We will focus on programs that are at Technology Readiness Level (TRL) six or higher, as defined by the DoD TRL Guide (Assistant Secretary of Defense for Research and Engineering, 2011). This study will examine many complex decision-making environments and compare the fundamental nature of these environments with each other and their relative effectiveness. By exploring a wide variety of complex and chaotic leadership environments, and ultimately cross-coding them, perhaps we can gain a more informed view of how individuals respond to adversity. Ultimately, this insight can lead to better organizational understanding and the changes that will have a greater chance of success.

Phase I leverages previous studies on decision makers in complex and chaotic environments such as Operational Detachment A (ODA) team leaders in highly volatile and ambiguous situations. While the scenarios are different than procurement environments, there are common themes which will help us to better understand why some decisions result in success and some in failure when they are eventually shaped by the functional construct within which they are made. The purpose of this analysis is to reveal a deeper understanding of the very nature of how individuals establish a sense of reality within the context of a complex ambiguous decision-making environment.

Driskell and Salas (1991) presented two conclusions that are extremely relevant to this research. First, "under stress, group members will defer more to the opinions, ideas, and actions of the group leader" (pp. 473–478). This implies that in a stressful time, support staffs will begin to defer more to the leader instead of being the unbiased and objective voice for the leader that informs the leader of the cost of operations, in terms of the manpower, resources, time, and risk involved. Driskell and Salas's conclusions could help us to understand how fundamental confidence is shaped based upon the leader support structure. Driskell and Salas (1991) also explained that "at the same time, the leader will be more likely to reject input from group members" (p. 473). This implies that if the staff were to remain impartial and act as a voice of reason for the leader, the leader who is under stress would disregard the guidance and counsel of the staff and make a decision based on either inadequate information (ignored or discounted information) or intuition (Riabacke, 2006). Hence, the dynamics of external influences become a factor in how leaders perceive and respond to their environment, possibly influencing their sense of reality within the construct of their situation.

Understanding how the complexity of the situation influences the decision maker at a base level will lead us to a richer understanding of the decision process as we begin to contextualize it within a functional context such as program management. The culture of an organization will influence how the organization makes decisions (Riabacke, 2006). Organizations can predict outcomes by examining the epistemic motivation of the staff. With a higher pro-social motivation, the staff or team will be more likely to search, encode, and retrieve information that is more conducive and consistent with group goals (De Dreu, Nijstad, & van Knippenberg, 2008). Furthermore, the research of Kruglanski and Webster in 1996 shows that the staff is likely to "seize and freeze" when it comes to a quick solution, rather than an accurate one, and that once the staff reaches closure, they are usually unmovable (De Dreu et al., 2008).

What Is Decision Making?

Research on decision making has focused more on the organizational and environmental influence of the leader and less on the inherent contextual interaction by which leaders make decisions. For example, models such as the Cynefin Framework (Snowden & Boone, 2007) are used to better understand the decision-making process in environments that range from simple to chaotic. This model describes chaotic environments as those in which relationships between cause and effect are impossible to determine because they are constantly changing and never develop a manageable pattern. Hence, Snowden and Boone (2007) suggest that the leader is simply reacting with the intent of eventually creating the conditions by which a pattern can emerge, migrating the environment into one of complexity rather than chaos.

Complexity tends to be viewed as something with many parts that interact with each other in many ways ("Complexity," n.d.). More specifically, complex decision environments tend to involve many interacting and non-linear elements, and can be retrospective when viewed from a historical perspective, resulting in agents that tend to constrain themselves over time (Snowden & Boone, 2007). While these definitions are important to understanding the environment within which the leader makes decisions, the research has not provided an understanding the cognitive processes by which the decision maker formulates a sense of perspective and understanding of the situational reality and subsequently translates this reality into effective decisions.

Kathleen Eisenhardt (1989) suggests in her study, *Making Fast Strategic Decisions in High Velocity Environments, t*hat performance (or effective decisions) is a function of speed which results from a number of key mediating processes, including accelerated cognitive processing. The ability to make "speedy" decisions of sufficient quality is directly related to the effectiveness of the decision. The notion that effective decisions are related to confidence in the decisions is the basis upon which this study is focused. How decision makers create the reality within which they develop a sense of confidence and conviction in their choices is fundamental to understanding the relative relationship between effective and non-effective outcomes.

Nousmaking

Initial findings indicate that there are four basic categories that decision makers seem to consistently exhibit when confronted with chaotic and complex problems. These emerging categories were observed in our initial round of interviews with Special Operations (ODA) soldiers and will be the basis of subsequent interviews of program managers' decision making in complex and chaotic environments. These four categories include sensemaking, trust, tacit knowledge, and explicit knowledge. Because of the strong interaction of these four categories with regard to influencing the ability of the decision maker to interpret and come to a state of reality (Nous), I refer to this interaction as *Nousmaking*, a necessary process for "speedy" and quality decisions that lead to enhanced performance or effective decision outcomes. Within Eisenhardt's (1989) model of decision making, Nousmaking would encompass the key mediating process, in particular cognitive processing. The interaction of these four aggregate categories was shown to be present in all of the decision environments described by the ODA leaders.

A situation can consist of random, unordered events that cloud judgment and may impact the problem-solving ability of the decision maker. While the defense program environment may not have the same immediate impact to life, the random and inconsistent nature of events can be just as relevant to the decision maker and can lead to second- and third-order effects, which can then lead to major adverse programmatic impacts. The

increasingly complex nature of today's technical and programmatic environment, coupled with the uncertainty of future security threats to the nation, provide for a complex and chaotic environment, similar to other fields at their base level that are trying to understand the stimulus under which the decision maker is formulating a sense of perspective or reality. Additionally, the value of the decisions made in context with the environmental inputs and preferred outcomes can be a seemingly random series of events influenced by the VUCA nature of the environment.

Being able to arrive at a true meaning of the environment and see the reality of a situation is referred to as *Nous*, which in classical philosophy refers to the ability to understand what is true or real ("Nous," 1973). Nous is often referred to as the equivalent of perception that works within the mind (Rorty, 1979). This paper illustrates that in order to achieve a level of perception necessary to translate into an effective decision, there is an inherent level of understanding and processing that must occur, which includes sensemaking, trust, tacit knowledge, and explicit knowledge.

Theoretical Framework

This research leverages the data, information, knowledge, wisdom (DIKW) framework as a loose model upon which to understand the evolution of insight within the decision-making process (see Figure 1).

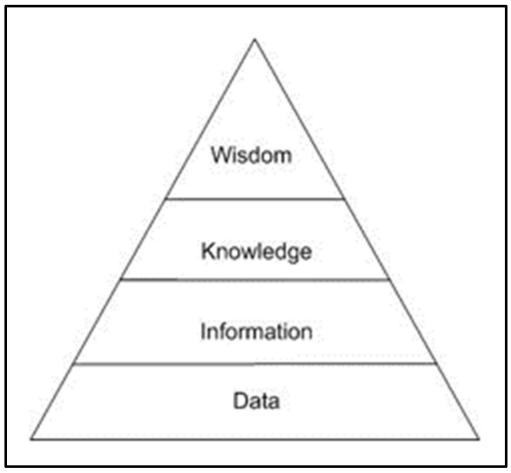

Figure 1. Data, Information, Knowledge, Wisdom (DIKW) Framework

The DIKW pyramid—also known as the DIKW hierarchy, wisdom hierarchy, knowledge hierarchy, information hierarchy, or data pyramid (Rowley, 2007)—refers loosely to a class of models for representing purported structural and/or functional relationships. This basic model proves useful in our research, in that it reflects the insight gained through a deliberate evolution from the "lifeless" unknown of pure data, to the novel insight of wisdom. As one is immersed in a situationally complex environment, making sense of it is predicated on the "data" one internalizes. Lacking any other context, this initial source of input is just as lifeless as the data described in the DIKW model. It is not until a higher level of context is applied to the data that the situation begins to come alive with regard to context. Additionally, this model makes no dispersions on the type of data or the functional environment in which it resides. This definitization begins to occur as the consumer of the data begins to shape it within the context of their environment and derives value and insight as the data transforms along the DIKW framework.

With this as a point of reference, Figure 2 represents a loosely constructed hierarchical model that represents the evolution of "knowing" in the decision-making process, which I refer to as the Decision Clarity Model (DCM).

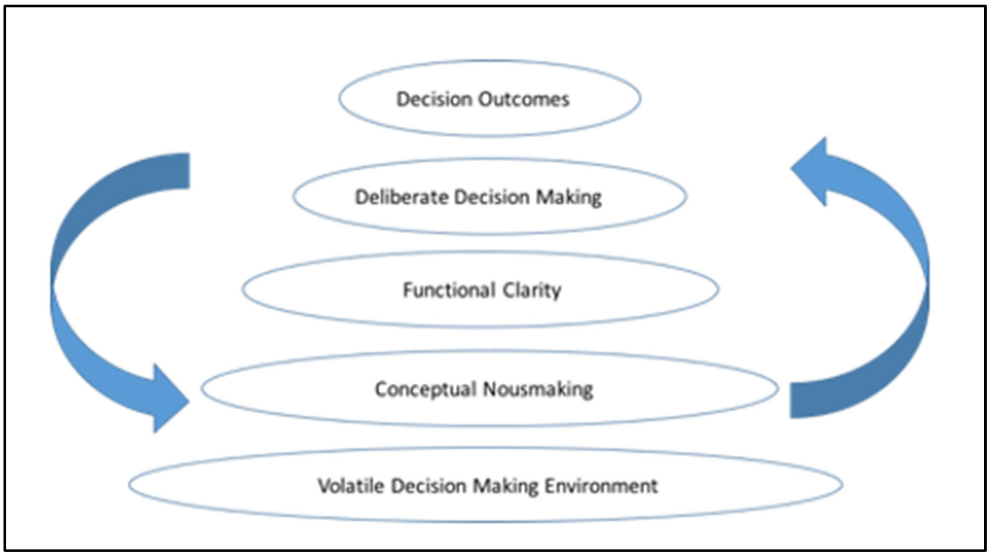

Figure 2. Decision Clarity Model

The DCM represents an evolution of knowing in that at the base level, there exists simply a random, context-free environment consisting of volatility, uncertainty, complexity, and ambiguity. The specific context at this point is not yet relevant other than to say that this environment can exist across many functional domains. It is not until the participant in this environment begins to perceive the environment and applies it to a particular functional construct that the decision-making context becomes relevant.

Conceptual Nousmaking is the point at which the participant begins to make sense of the complex environment through an internal struggle of what is real and relevant. This brings us to our first hypothesis: that there are four key attributes that influence how a decision maker understands and reacts to a particular complex environment.

> Hypothesis 1: There are four aggregate categories that shape and influence a program manager's understanding of a complex environment, consisting of sensemaking, trust, tacit knowledge, and explicit knowledge.

Table 1 summarizes the four categories and the respective attributes associated with each specific category.

Table 1. Conceptual Nousmaking Categories

Second Order Analytic Code	Aggregate Category
1. Retrospective	Sensemaking
2. Plausibility	
3. Social Identity	
4. Organizing	
5. Ability	Trust
6. Benevolence	
7. Integrity	
8. Experience	Tacit Knowledge
9. Know-how	
10. Codified	Explicit Knowledge
11. Logical	
12. Deduction	

Hypothesis 1 will be explored in subsequent interviews with program managers and other leaders that operate in complex environments. Continuous coding will be conducted from subsequent interviews of program managers. This will allow refinement and validation of the initial categories until we have reached a point of saturation. At this point, theory can be proposed upon which Phase II will be quantitatively assessed using the hypothetical deductive process.

The following definitions for the four categories show the inherent relationship with their associated attributes. The initial data collected during initial interviews correlates to the attributes that were derived from initial coding of interviews.

1. *Sensemaking* is the process by which people give meaning to experience and is characterized by the following properties (Weick, 1995):
    a. Identity—helps people identify who they are and shapes what they enact and how they interpret events (Currie, & Brown, 2003; Thurlow & Mills, 2009; Watson, 2009; Weick, Sutcliff, & Obstfeld, 2005).
    b. Retrospection—provides the conditions for sensemaking, such as attention and interruptions, which impact what people notice (Dunford & Jones, 2000).
    c. Organizing—is where individuals simultaneously shape and react to the environment they face. Thurlow and Mills (2009) suggest that individuals will project themselves into an environment and observe the consequences they learn about their identities and the accuracy of their understanding of the event.

d. Plausibility—is more relevant to sensemaking than accuracy since the world is filled with people who have multiple shifting identities (Weick, 1995). This reinforces the value of a larger study group and allows the researcher to explore the possibility of theoretical perspectives.

2. *Trust* is the willingness of an individual to be vulnerable to the actions of another based upon the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party. While there are several terms associated with trust, three characteristics tend to appear frequently in studies associated with trust (Mayer, Davis, & Schoorman, 1995):
    a. Ability—is a group of skills, competencies, and characteristics that enable a party to have influence within some specific domain (Zand, 1972).
    b. Benevolence—is the extent to which a trustee is believed to want to do good to the trustor, independent of personal profit motive (Mayer et al., 1995). Additionally, Rosen and Jerdee (1977) considered the likelihood that the trustee would put the organization's goals ahead of his or her own goals.
    c. Integrity—is the trustor's perception that the trustee will adhere to a set of principles the trustor finds acceptable (McFall, 1987).
3. *Tacit knowledge* is knowledge that is difficult to transfer to another individual by means of writing or verbalization (Polanyi, 1958). Effectively, it is knowledge that one seems to have acquired and that cannot easily be transferred to another individual, even for extremely complex tasks or situations. Polanyi refers to tacit knowledge as "we can know more than we can tell" (Polanyi, 1966). Tacit knowledge can be characterized by the following:
    a. Know-how—involves learning and skill that was acquired through means other than writing them down. Knowing how, or embodied knowledge, is characteristic of an expert who acts and makes judgements without explicitly reflecting on the principles or rules involved (Schmidt & Hunter, 1993)
    b. Experience—is a key to tacit knowledge in that without some form of shared experience, it would be difficult for people to share each other's thinking processes (Lam, 2000), and thus it would be difficult to anticipate the actions of others, given a common framework and understanding.
4. *Explicit knowledge* can be readily articulated, codified, and accessed (Helie & Sun, 2010). Thus, explicit knowledge can be generated through logical deduction and acquired through both formal and informal means, such as practical experience within a relevant context.

Interfield Theory

Interfield theory is a cross disciplinary study that explores the common relationships between various fields (Darden & Maull, 1977). It is this theory upon which we are able to explore how the volatile environment and conceptual decision making in one discipline relates to another discipline. While the intent is to understand what influences the decision making of program managers in complex situations, this paper predominately explores the first two layers of the Decision Clarity Model, recognizing that the functional clarity level introduces a specific context to the Nousmaking within different disciplines. For example, the functional clarity a program manager experiences is based upon the defense acquisition framework, while the functional clarity for Special Operations soldiers is grounded in the combat framework. The DCM assumes that the first two layers of the process are neutral with regard to the situation. Within our definition of Nousmaking, the four categories of sensemaking, trust, tacit knowledge, and explicit knowledge support theoretical discussions within other disciplines, such as organizational theory, psychology, behavioral science, and so forth.

Interfield theory allows us to identify common patterns at the subconscious level of decision making that can subsequently lead us to a richer understanding of how decisions are made independent of policy and regulation. Introducing the functional clarity of the participant's unique operational framework, we will be able to separate the influence of the environmental framework from the innate process of rationalizing a situation. Once the Deliberate Decision Making and Decision Outcome layers are introduced into the scenario, it will become clear how nousmaking shapes the outcome of decisions and their relative impact. This leads to our second hypothesis:

> Hypothesis 2: Nousmaking is independent of the functional clarity of the operational environment in which choices are formulated.

Hypothesis 2 does not presume that the individual's personal experiences and bias are not relevant to formulating a sense of reality. We are simply suggesting that the aggregate categories that make up the Nousmaking process influence the individual's objective reality similarly, regardless of disciplines, and that the subsequent decision making and outcome are influenced and can be altered by the exigent factors of the functional environment in which the individual's reality has previously been established.

By establishing a demarcation between Nousmaking and decision making within a functional construct, a leader's ability to formulate a speedy high-quality decision is impacted by the ability to both establish a sense of reality as well as respond to the unique constructs of a particular functional setting, and one informs the other. This line of reasoning could lead us to a better understanding of why some leaders prevail and some do not, given the same functional constraints.

A large portion of a leader's ability to make a decision is his or her reliance on past experiences. Leaders are selected after a careful scrutiny of records and evaluations by a centralized panel of senior officers. Research shows that in an experienced-based choice, decisions are made from memories of past outcomes, concluding that memory biases may play a role in the overweighting of extreme outcomes and causing more risk seeking behavior, as demonstrated in the preceding paragraph (Ludvig, Madan, & Spetch, 2013). Ludvig et al. (2013) cite five studies that conclude that a bias exists in which "highly salient and emotional events are over weighted in memory tasks." Another conclusion reached is that extreme outcomes are more likely to be retrieved at the time of a decision and that this may be a heuristic used to simplify the situation at hand and to limit the number of outcomes considered (Ludvig et al., 2013). Ludvig et al.'s research would suggest that there are core

processes at work at the base layer at which reality is created that may influence a leader's perspective and will necessarily influence or predetermine the decision strategy within the functional environmental constraint. Studying emergent patterns in transition from a predictable normal routine–centric environment to one of chaos and unpredictability may have significant relevance across various functional domains. The appreciation for the potential of chaos in decision making may have potential relevance in the understanding of both the nonlinearity of making decisions as well as the functional aspects of instability as a means for adapting to new situations in any VUCA environment. Understanding the chaotic and volatile decision-making environment of the battlefield may yield an increased clarity and potential for interpreting decision making in a variety of dynamic and nonlinear decision-making environments. According to Keil (1995), *nonlinearity* refers to behavior in which the relationships between variables in a system are dynamic and disproportionate, whose outcomes are subject to high levels of uncertainty and unpredictability.

Method

Interpretive Approach to Understanding Decision Making in Complex Environments

This study was predicated on the basic assumption that there is an inherent process by which an individual makes decisions and that this process involves a deliberate problem-solving methodology (Drucker, 1967) and a less-well-defined cognitive and interactive process, which influences the ability of the decision maker to arrive at a sense of clarity in ambiguous conditions. Similar to the Buddhist understanding of self and environment in which everything around us is a reflection of our inner lives and is perceived through the self and alters according to the inner state (SGI Quarterly, 1995), this study explored the notion that there are other intrinsic factors involved in decision making that influence the effectiveness of these decisions. Phase I research adopts a qualitative descriptive approach based upon grounded theory (Glaser & Strauss, 1967), in which the interpretations and experiences of the participants remained in the foreground, notwithstanding the fact that some of the interviewers tended to have similar backgrounds and experiences as those being interviewed. During the initial interviews, it was important to maintain a sense of separation from the interviewee in order to limit the bias toward preconceived understanding of the specific events being discussed. In keeping with the approach described by Gioia with regard to giving voice to the informants, it was important to recognize the researcher's expertise, and interpret this pattern in the data, thus providing the best opportunity for discovering new concepts or relationships between existing concepts (Gioia, Corley, & Hamilton, 2012).

While the overall research is focused on program manager decision making in complex and chaotic environments, I was initially interested in a variety of decision-making environments in order to begin to address both hypotheses presented in this paper. The first unit of measure was special operations forces in complex and chaotic conditions and how they developed a sense of reality within the context of these situations. This analysis supports the categorical definitization of the elements within which reality is shaped, or what we are calling Nousmaking.

This initial research study selected participants from a pool of available graduate students within the Defense Analysis Department of the Naval Postgraduate School. Candidates were solicited from the student body enrolled in the Defense Analysis program via email. Respondents were screened and selected based on a required set of criteria, resulting in the identification of 20 research participants. Each participant was interviewed for approximately 60–90 minutes during a semi-structured interview conducted in-person by one of nine identified researchers.

In order to participate in the research study, participants needed to satisfy a number of selection criteria. First, they had to be United States military officers who had served in a leadership position in Iraq or Afghanistan. Second, they had to have experienced complex decision-making situations while in a position of leadership. The final selection focused on Army Operational Detachment–Alpha (ODA) and Navy Sea, Air, Land (SEAL) team leaders. These team leaders tended to have significant exposure to chaotic combat environments, and were in positions to make critical decisions affecting both themselves and their teams. Team leaders from these units were in the rank of O3–O5, the equivalent of captains, majors, and lieutenant colonels in the Army or lieutenants, lieutenant commanders, and commanders in the Navy. This selection of personnel resulted in an exclusively male research pool, and excluded military officers from the Air Force and Marines, due to either inconsistent exposure to similar ground combat operations or lack of availability within the current student body.

Data

The intent of Phase I of this research was to interview a broad spectrum of leaders from varying complex environments and to build a baseline of common categories that exist between the various disciplines. While this initial study leveraged interviews from Special Operations leaders, follow-on interviews will look at a minimum of at least 30 program managers from a broad spectrum of programs that include both challenged programs as well as programs that are performing well against their predetermined baseline.

Data collection for this first round of interviews included three primary sources: (1) tapes and transcripts of the subject interviews; (2) briefings from subject matter experts regarding the operational concepts of ODA teams; and (3) interview debriefing with the entire research team as well as self-debrief and analysis of the data. As part of this research, we used conventional ethnographic analysis methods through the use of memos, notes, and subjective interpretations of the subject's experience depictions. The focus was mainly on the description of events through language by the interviewees to gain meaning to support the experimental interpretation. Analysis of the interviews in a group setting provided varying perspectives of the data, allowing me to explore alternative interpretations and category development. This provided the basis upon which a theoretical direction could be established. The interviews and subsequent interpretation provided a rich basis of data from which to begin to establish a theoretical understanding of the cognitive processes involved in decision making in VUCA environments.

Understanding and subsequent theory requires plausibility, direction, centrality, and adequacy (Charmaz, 2014). It was important to ensure that the descriptive data provided by the interviewees was plausible, lending itself to the development of emerging categories. Throughout this process, a method of constant comparison (Glaser & Strauss, 1967) was used from the many different subject interviews. The data from the interviews was coded, categorized, and evaluated until a systemic pattern began to emerge. The first order coding was the critical link to developing the emergent theory. Incident-by-incident coding was used to compare the relevant ideas identified in the various interviews (Charmaz, 2014). The initial coding helped to establish correlation between the incidents and was the basis from which a framework of understanding evolved.

In order to establish emerging themes, the informants' initial incident coding was put into context and compared against each other. As themes began to emerge, theoretical sampling was used to further elaborate and refine the initial categories. Initially, sensemaking seemed to have a significant effect on the participant's ability to shape the reality of the situation, but it became clear through further research and the memos that there might be a more complex set of variables helping to shape the participant's reality and

subsequent decision-making process. Throughout the interviews, I kept asking myself why an individual with relatively few years of experience generally made the “right” decision under seemingly life-altering situations. This question will be critical to further examine as program managers begin to be interviewed and cross coded with the results from other leader’s experiences. Understanding the basis of this phenomenon could have significant impact in helping to shape the conditions for other complex decision-making environments.

While the respondents kept attributing their successes to their formal training, this simply did not reveal itself as the primary causal factor in the data. Through theoretical sampling from the various interviews, I was able to develop the properties of my categories until I reached a point of saturation, the point at which I was not able to develop new information from the data (Glaser & Strauss, 1967). Subsequent interviews of project managers will follow the same method, providing an even richer body of knowledge, which will add validity to the process of determining the overall aggregate categories of Nousmaking.

Data Analysis

Initial respondent coding began to reveal 12 second-order analytical codes that seemed to be interacting throughout the incidents under investigation. These included retrospection, plausibility, social identity, organizing, ability, benevolence, integrity, experience, know-how, codified knowledge, logical knowledge, and deductive knowledge. Through theoretical sampling and continuous probing of the data from all of the interviews, these 12 areas continued to emerge, leading me to four aggregate categories—sensemaking, trust, tacit knowledge, and explicit knowledge—as characteristics influencing the decision maker during the events being described. These categories seemed to have the closest alignment with the emergent themes and, upon further research, revealed themselves as the most plausible description of the process characteristics being described.

Second-order analytic codes (Table 1) are characteristics associated with the aggregate categories and were revealed during the specific events being described by the participant. As the second-order analytic codes began to emerge, it was useful to begin to search for categories that helped to explain my observations. The four categories—sensemaking, trust, tacit knowledge, and explicit knowledge—seemed to align with the emerging data.

While the timelines and circumstances for the various chaotic events varied across all of the subject interviews, the general nature was similar in that the respondents described chaotic and complex circumstances in which they had to make deliberate decisions based upon limited information. As I decomposed their situations and began to code their narratives, there seemed to be a finite set of characteristics emerging and interacting that helped to shape their actions. The decisions they made were both conscious and subconscious, in that often their deliberate actions without apparent deliberation seemed to be second nature. While virtually all of the respondents attributed this to “good training,” further analysis suggests the presence of more than just training.

The respondents consistently displayed the influence of all four aggregate categories during the time frame in which they were responding to immediate chaotic circumstance. While training manifested as explicit knowledge and allowed the respondents to perform certain actions with little thought, tacit knowledge and trust reinforced this knowledge with the sense that they simply “knew” what to do based upon their instincts. Charging an ambush, for example, in Scenario 2 was reflective of this innate knowledge: The decision was shaped by trust in self, perceived trust from superiors, and trust in the team that was reinforced by training and an evolved sense of the current situation, indicating the

continuous interaction of sensemaking, trust, tacit knowledge, and explicit knowledge. Figure 3 shows a summary of the number of times I was able to identify the influence of the four aggregate categories during the specific chaotic decision-making window for each of the interviewees.

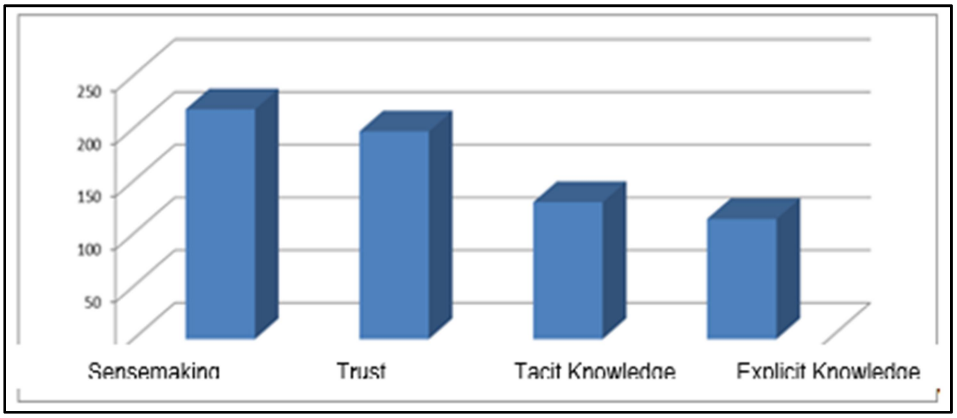

Figure 3. Summary of the Total Number of Observations

Sensemaking and trust seem to be the most prominent categories influencing the respondent during the specific decision-making events, with tacit and explicit knowledge manifesting significantly across all of the chaotic events in relatively equal value. Figure 4 further shows the distribution and number of observations of the second-order codes that emerged during the coding process that helped to define the aggregate categories. Examining the individual second-order codes in relation to each other, there appears to be a higher influence of trust and sensemaking when compared to the other attributes.

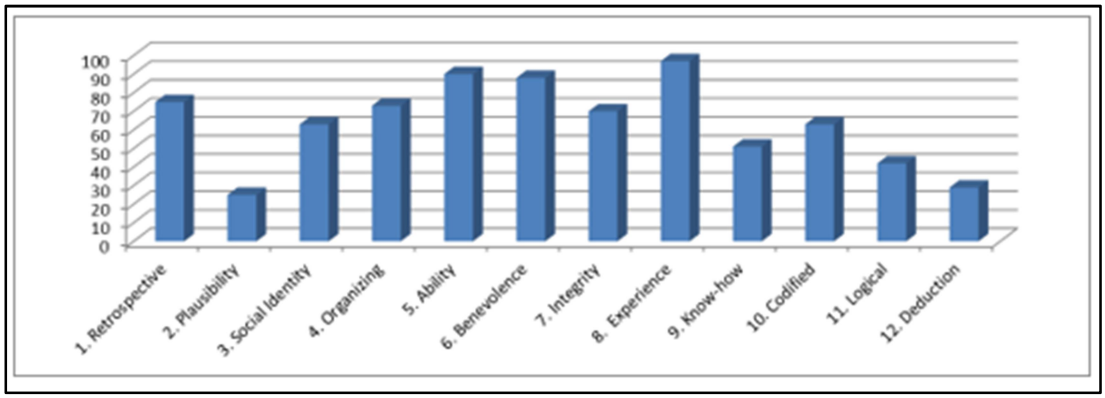

Figure 4. Second-Order Code Summary by Number of Observations for All Interviewees

Discussion

Sonenshein (2007) begins to address the notion that individuals make intuitive judgements in their construction of ethical decisions and suggests that responses to ethical issues are not always based on deliberate and extensive moral reasoning. One can extrapolate from his research that individuals also make intuitive judgements in ambiguous decision-making environments, which ultimately involve ethical and logical choices. While Sonenshein (2007) suggests that individuals are engaging in sensemaking (Weick, 1979) under conditions of equivocality, I further suggest that, consistent with Hypothesis 1, initial findings from these interviews reinforce the notion that decision makers are inherently influenced by the four aggregate categories of sensemaking, trust, tacit knowledge, and explicit knowledge.

What remains to be seen is whether or not these same categories manifest themselves across leaders from different functional environments. If individuals develop their sense of reality similarly, regardless of the functional environment in which they make decisions, this could lead us to questioning the emphasis of focusing on leadership issues as a root cause of defense program failure. One has to then turn to the actual functional constraints of the environment and assess the impact of the actual decision-making environment on program outcomes. If leaders develop their foundation and sense of clarity in similar ways, yet perform differently in different functional constructs, this might even suggest that leaders that are successful in one complex environment may be less successful in others such as the program environment.

The second round of interviews will consist primarily of current and former program managers. Their results will be compared to current data in an effort to establish a sense of validity to the theoretical construct. If data reveals itself as consistent with the emerging results of the Special Operations Forces interviews, this will reinforce the preliminary findings in support of Hypotheses 1 and 2 and set the conditions for Phase II, in which the functional construct of the individual's environment is compared with the conceptual Nousmaking.

There does seem to be a relationship emerging between speed and quality of decision making. From the initial round of interviews, speed and quality seemed to manifest itself and have some relation to performance. It is still unclear what the relationship between speed, quality, and Nousmaking are with regard to the overall decision-making process. As more data is collected and the functional environmental constraints are applied to the process, this relationship will gain additional clarity. By understanding how an individual establishes a sense of reality and how the functional constructs of the individual's environment interact with this sense of reality, we hope to better understand how individuals make effective decisions and how the outcomes of these decisions are impacted by speed and quality. This leads us to yet a third hypothesis:

> Hypothesis 3: Speed and quality of decision making have a direct relationship with the positive or negative impact of the decision and are influenced by the aggregate categories of Nousmaking.

The velocity and quality of the decision is influenced by the decision maker's sense of reality and perceived outcome based upon the functional construct and clarity. Figure 5 represents the relationship between Nousmaking and decision effectiveness, as hypothesized above.

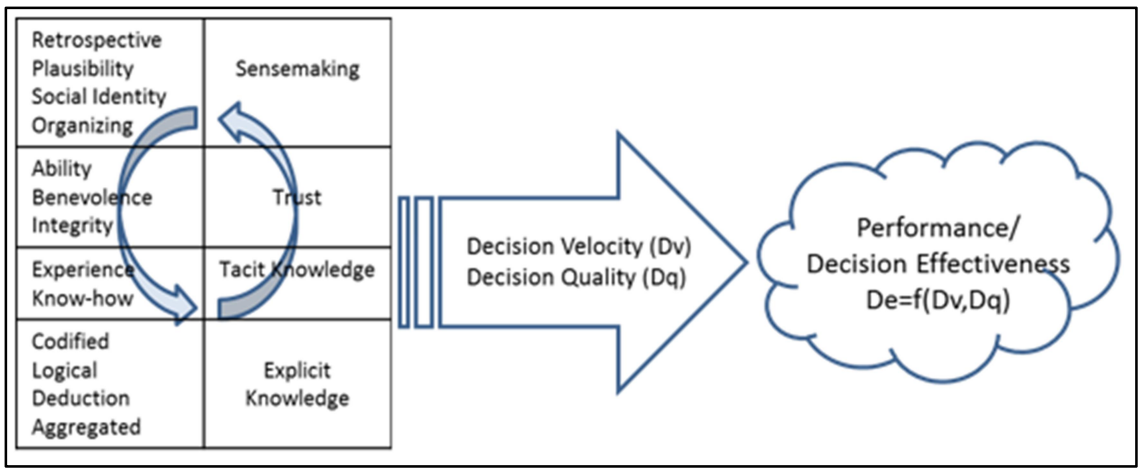

Figure 5. Interactive Relationship Between Four Aggregate Categories and Decision Effectiveness

If decisions are made rapidly but are not reinforced with a level of clarity that informs the quality of the decision, then the overall effectiveness of the decision could be compromised. Additionally, if the quality of the choices is sufficiently high, but the decision comes late, then the effectiveness is also hampered. For example, in the case of Sample Scenario 1, although the respondent could have reached a level of understanding regarding the choice to be made, his overall reality of the situation with regard to the urgency was not sufficiently realized. In this case, I suggest that the combined effect of the four categories, in which a reality of the environment due to the interaction of the four categories resulted in a high velocity and high quality decision, ultimately led to an effective decision and outcome.

Kathleen Eisenhardt (1989) revealed in her article, *Making Fast Strategic Decisions in High-Velocity Environments,* that fast decision makers use more, not less, information than slow decision makers. Additionally, the greater the number of alternatives that are considered simultaneously, the greater the speed of the strategic decision. Her research showed that executives immersed themselves in real-time information about their environment and their firm's operations. The result of this, according to Eisenhardt, was a deep personal knowledge of the enterprise that allowed for rapid decision making. Consequently, the greater the speed of the strategic decision process, the greater the performance in high-velocity environments (Eisenhardt, 1989).

The relationship between performance and speed is illustrated in Figure 6, in which Eisenhardt illustrates the interdependencies of the mediating processes necessary for speedy high performance decisions. The data presented in this paper takes Eisenhardt's reasoning a bit further by offering a definitive relationship between the tangible and intangible qualities of decision making in high velocity and chaotic environments and their relationship to effective decisions. Within the context of Eisenhardt's model, this would further explain the key mediating processes to reflect the relationship between the key mediating processes and the aggregate categories process described in this paper.

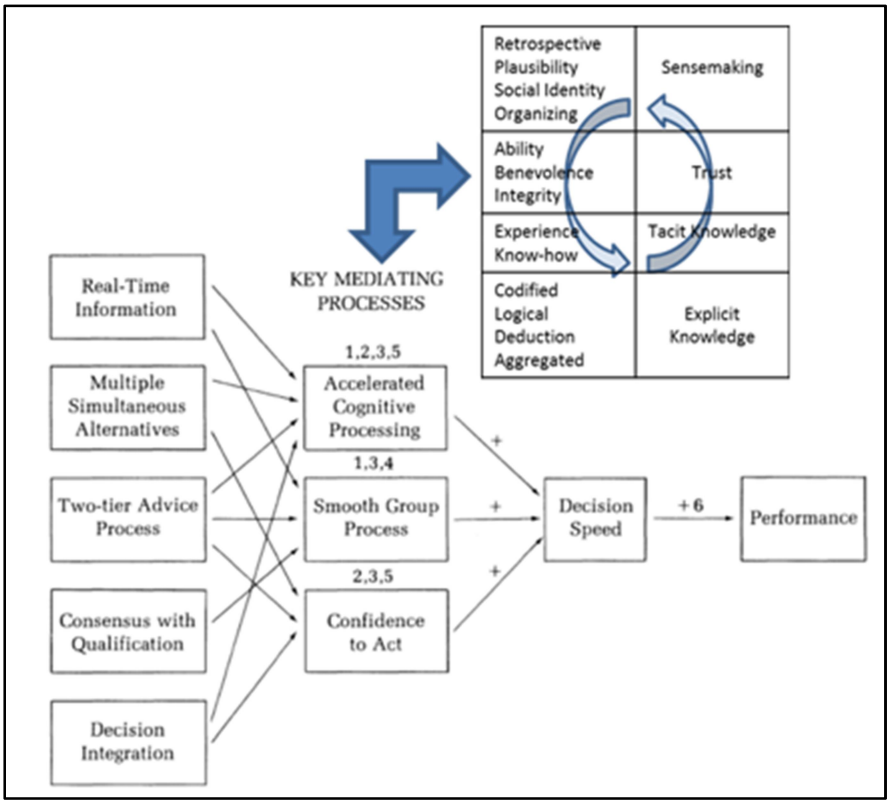

Figure 6. Relationship Between Eisenhardt (1989) Model of Strategic Decision Speed in High-Velocity Environments, With Aggregate Categories

In essence, the decision maker is determining what is real through the interaction of the four aggregate categories that emerged from the respondent data, and subsequently acting on this understanding. The degree to which the decision maker optimizes the aggregate categories and is able to make a timely and high quality decision determines the overall effectiveness of the decision. As we examine more interview data for project managers, we will be able to establish a theoretical basis from which to begin Phase II. Phase II will examine the causal relationship between Nousmaking and the functional environmental construct in which the individual makes decisions. The interdependent nature of Nousmaking and decision making within a functional environment will be revealed, allowing us to design subsequent experiments that examine the effects of varying either the Nousmaking or functional environment and the subsequent impact on the speed and quality of the decision-making process.

Conclusion

The theory presented in this paper represents a qualitative ethnographic study of a group that has the propensity to be required to make life-altering decisions in time-constrained chaotic and complex environments. While this data focused on SoF soldiers, the underlying factors of Nousmaking are presumed to be independent of the functional environmental construct of the participants. While one could dismiss their ability to operate in these environments successfully as a function of their significant training, the results of this study reflect a higher level of cognitive processing that leads to effective decisions and subsequent performance. Using the grounded theory approach to qualitative analysis, interviewees were asked to describe chaotic events during combat situations, in which they were required to make critical decisions. From their stories, I was able to conduct first- and second-order coding from which a theoretical construct emerged to help understand the nature of decision making in these environments.

Four aggregate categories emerged as being relevant to almost all of the scenarios described by the interviewees. These four categories included sensemaking, trust, tacit knowledge, and explicit knowledge. At some point during the decision-making windows, the interviewee exhibited signs that at least one of these categories was at play and facilitated the actions at the moment. Recognizing that decision making is a dynamic process, the interaction of these categories likely played a significant role in helping to shape the interviewee's reality of the environment, involving a perception of the current conditions; trust relationships with subordinates, peers, and superiors; and an innate self-confidence and confidence in their own skills. For the purposes of helping to describe this interactive relationship, I termed this process *Nousmaking*, or perhaps more simply, reality making that provides a sense of clarity in action and purpose.

Practical Impact and Future Research Opportunity

Chaotic and complex decision-making environments are not limited to combat scenarios. Disasters and emergency situations are examples of decision-making environments that have potentially similar characteristics as combat environments in that they reflect the unpredictability and nonlinearity of the situation relative to a more predictable steady state environment. The nonlinearity of these events in which human decision making is predicated by chaos may have certain similarities and patterns that can be studied with regard to their association with the individuals involved in the decision-making process. Complex and high risk business environments can also manifest themselves in a chaotic or unpredictable nature and could be subject to the same cognitive processes as combat. Eisenhardt's (1989) study of high tech companies began to explore the relationship between fast and slow decision making and their potential outcomes. If we better understood the internal influencers that lead to making effective decisions in ambiguous environments, perhaps future organizational and leadership theory and methods could be better tailored to the environment, leading to more predictable outcomes.

Future research should examine in much greater depth the theoretical nature of the Nousmaking process with the goal of mapping these interactions to their relative inputs and desired outputs. Although we will likely never accurately predict the nature of human decision making, better understanding of the integrated parts and their relationships to each other could provide greater insight into the ability to improving decision making across a full spectrum of complex environments.

References

Assistant Secretary of Defense for Research and Engineering. (2011, April). Technology Readiness Assessment (TRA) guidance. Retrieved from https://www.acq.osd.mil/chieftechnologist/publications/docs/TRA2011.pdf

Bourgeois, L. J., & Eisenhardt, K. (1988). Strategic decision processes in high velocity environments: Four cases in the microcomputer industry. *Management Sciences, 34*(7), 816–835.

Charmaz, K. (2014). *Constructing grounded theory*. Thousand Oaks, CA: SAGE.

Complexity. (n.d.). In *Merriam-Webster's online dictionary*. Retrieved from http://www.learnersdictionary.com/definition/complexity

Currie, G., & Brown A. (2003). A narratological approach to understanding processes of organizing in a UK hospital. *Human Relations, 56*(5), 563–586.

Darden, L., & Maull, N. (1977, Mar.). *Interfield theory. Philosophy of Science, 44*(1), 43–64.

De Dreu, C. K. W., Nijstad, B. A., & van Knippenberg, D. (2008). Motivated information processing in group judgment and decision making. *Personality and Social Psychology Review, 12*(1), 22–49.

Department of the Army. (2005*). Army planning and orders production: The military decision making process* (FM 5-0). Retrieved from https://militaryscience.usu.edu/files/uploads/Cadet_Toolbox/Army_Planning_and_Orders_Production_FM_5-0.pdf

Department of the Army. (2012). *Mission command* (ADP 6-0). Washington, DC: Army Publishing Directorate. Retrieved from https://armypubs.us.army.mil/doctrine/index.html

Driskell, J. E., & Salas, E. (1991). Group decision making under stress. *Journal of Applied Psychology, 76*(3), 473–478.

Drucker, P. (1967, January). The effective decision. *Harvard Business Review*.

Dunford, R., & Jones, D. (2000). Narrative in strategic change. *Human Relations, 53*(9), 1207–1226

Eisenhardt, K. (1989). Making fast strategic decisions in high-velocity environments. *Academy of Management Journal, 32*(3), 543–576.

Fredrickson, J., & Mitchell, T. (1984). Strategic decision processes: Comprehensiveness and performance in an industry with an unstable environment. *Academy of Management Journal, 27*(2), 399–423.

Gioia, D., Corley, K., & Hamilton, A. (2012). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research, Methods, 16*(1), 15–31.

Glaser B. G., & Strauss A. (1967). *The discovery of grounded theory: Strategies for qualitative research.* Chicago, IL.

GlobalSecurity.org. (n.d.). Special Forces Operational Detachment Alpha (SFOD-A). Retrieved from http://www.globalsecurity.org/military/agency/army/a-team.htm

Helie, S., & Sun, R. (2010). Incubation, insight, and creative problem solving: A unified theory and a connectionist model. *Psychology Review, 117*(3), 994–1024.

Jean, G. (2006). Army training evolving to develop better combat leaders. *National Defense Magazine.* Retrieved from http://www.nationaldefensemagazine.org/articles/2006/11/30/2006december-army-training-evolving-to-develop-better-combat-leaders

Kiel, D. L. (1995, May 18). *Chaos theory and disaster response management: Lessons for managing periods of extreme instability*. Paper presented at California Research Bureau, California State Library Invitational Conference, Sacramento, CA.

Lam, A. (2000). Tacit knowledge, organizational learning and societal institutions: An integrated framework. *Organization Studies, 21*(3), 487–513.

Ludvig, E. A., Madan, C. R., & Spetch, M. L. (2013). Extreme outcomes sway risky decisions from experience. *Journal of Behavioral Decision Making, 27*(2), 146–156. doi:10.1002/bdm.1792

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review, 20*(3), 709–734.

McFall, L. (1987). Integrity. Ethics, 98(1), 5–20.

Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of "unstructured" decision processes. *Administrative Science Quarterly, 21*, 246–275.

Nous. (1973). In *The shorter Oxford dictionary on historical principles*. Oxford, UK: Oxford University Press.

Polanyi, M. (1958) *Personal knowledge: Towards a post-critical philosophy*. Chicago, IL: University of Chicago Press.

Polanyi, M. (1966). *The tacit dimension*. Garden City, NY: Doubleday & Co.

Pratt, M. G. (2000). The good, the bad, and the ambivalent: Managing identification among Amway distributors. *Administrative Science Quarterly, 45*(3), 456–493.

Riabacke, A. (2006, November). Managerial decision making under risk and uncertainty. *International Journal of Computer Science, 32*, 453–459. Retrieved from http://www.iaeng.org/IJCS/issues_v32/issue_4/IJCS_32_4_12.pdf

Rorty, R. (1979). *Philosophy and mirror of nature*. Princeton, NJ: Princeton University Press.

Rosen B., & Jerdee, T. H. (1977). Influence of subordinate characteristics on trust and use of participative decision strategies in a management simulation. *Journal of Applied Psychology, 62*(5), 628–631.

Rowley, J. (2007). The wisdom hierarchy: Representations of the DIKW hierarchy. *Journal of Information and Communication Science, 33*(2), 163–180.

Ryle, G. (1945). Knowing how and knowing that. In *Proceedings of the Aristotelian Society* (Vol. 46 [1945–1946]; pp. 1–16).

Schmidt, F. L., & Hunter, J. E. (1993). Tacit knowledge, practical intelligence, general mental ability, and job knowledge. *Current Directions in Psychological Science, 2*, 8–9.

SGI Quarterly. (1995, April). *The oneness of self and environment*. Retrieved from http://www.sgi.org/about-us/buddhism-in-daily-life/oneness-of-self-and-environment.html

Snowden, D. J., & Boone, M. E. (2007, November). A leader's framework for decision making. *Harvard Business Review*.

Sonenshein, S. (2007). The role of construction, intuition, and justification in responding to ethical issues at work: The sensemaking intuition model. *Academy of Management Review, 32*(4), 1022–1040.

Thurlow, A., & Mills, J. (2009). Change, talk and sensemaking. *Journal of Organizational Change Management, 22*(5): 459–579.

Vroom, V., & Yetton, P. (1973). *Leadership and decision making*. Pittsburgh, PA: University of Pittsburgh Press.

Weick, K. E. (1979). *The social psychology of organizing*. Reading, MA: Addison-Wesley.

Weick K. E. (1995). *Sensemaking in organizations*. Thousand Oaks, CA: SAGE.

Weick, K. E., Sutcliff, K. M., & Obstfeld, D. (2005). Organizing and the process of sensemaking and organizing. *Organization Science, 16*(4), 409–421.

Zand, D. E. (1972). Trust and managerial problem solving. *Administrative Science Quarterly, 17*(2), 229–239.

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL
555 DYER ROAD, INGERSOLL HALL
MONTEREY, CA 93943

www.acquisitionresearch.net