THE NEUROSCIENCE OF DECISION-MAKING:
FROM HEURISTICS TO MATRICES,
MAKING THINKING VISIBLE

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ABSTRACT

Everyone involved in education is a decision-maker, from classroom teachers to trustees, and the decisions we make are one of the most significant determinants of our effectiveness. Nevertheless, while educators have access to professional development opportunities covering an array of pedagogical skill-sets, there is little training offered in decision-making theory and systemic processes, perhaps based on an assumption that life alone provides the experience necessary for effective decision-making. Research on decision-making indicates that we are neurologically hardwired and habituated to reply on predominately unconscious heuristics when making choices. This dissertation explores the question of how might an understanding and awareness of common decision-making heuristics change, improve, or influences decision-making?

This dissertation is an example of a developmental evaluation. I used a case study model to explore how participants who attended the seminar entitled "The Neuroscience of Decision-Making: Improving Personal and Professional Capacity" came to better understand their decision-making tendencies through an increased awareness of their use of and reliance on heuristics. The practical application of the grounded theory approach explores the question of how the use of a "program matrix," a logic-model based framework designed to make thinking more visible, might make decision-making more systemic and collaborative. The findings indicate that participant's perceptions of their decision making evolved as a result of their participation in the seminar. Similarly, the use of the "program matrix" encouraged a more collaborative and systemic approach to programmatic decision-making.
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CHAPTER 1
MY GOALS AND THE PROBLEM UNDER CONSIDERATION

Introduction

Every one involved in the enterprise of education, from teachers to trustees, is a decision-maker. The decisions we make, potentially, are one of the most significant determinants of our individual and organizational effectiveness and success. Nevertheless, how decisions are actually made is often mysterious and not necessarily well understood (Hammond, Keeney, & Raiffa, 1998).

Perhaps, because we are constantly engaged in decision-making, we rely on the assumption that the techniques, processes, and methodologies that enables us to consistently, or at least frequently, make optimal choices is gained through experience alone. However, to reflectively compare the outcomes of one decision relative to another is difficult and speculative because life, and our work, does not naturally provide control groups. Is it possible, for example, to really know how our careers might have been different had we selected a different college, or passed on a career opportunity at an important crossroad when we can only speculate on the outcome of the alternative path?

Instead, out of necessity and habit, we believe, unless the outcomes are almost catastrophic, that we indeed selected the optimal outcome. This cognitive process, known as hindsight bias, is reflected in our professional decision-making as well (Christensen-Szalanski & Willham, 1991). The willingness to question the assumption that practice alone provides the optimal decision-making skill sets is an important first step in improving our decision-making effectiveness.
While there is an abundance of professional development opportunities for educators in curricular design, classroom management, instructional uses of technology, and strategic planning, there appears to be little formal training specific to decision-making. What is available tends to focus on how to use data to inform a decision, suggesting that access to information is the primary axis of effective decision-making. While organizations and institutions assemble data and outline decision-making procedures and hierarchies, what goes on in the mind of the decision-makers is often less understood (Kahneman, 2011). Decision-making procedures and processes are important, but no more so than understanding the neurology and psychology of decision-making. “But sometimes the fault lies not in the decision-making process but rather in the mind of the decision-maker: The way the human brain works can sabotage the choices we make” (Hammond et al., 1998, p.2).

Researchers who study the neurology of how individuals and groups make decisions emphasize our reliance on heuristics; efficient cognitive processes, conscious or unconscious, used to make decisions more quickly, frugally, and/or more accurately than more complex methods (Gigerenzer & Gaissmaier, 2011). While we are predominately unaware of many of our heuristics, they can be practical and efficient. For example, we make quick, efficient calculations of distance based on the clarity with which we perceive an object. Those that are blurry are judged to be further away, those that are in focus are deemed closer. We are likely unaware when we make this kind of quick, mental calculation. Similarly, when asked to select what statement is more probable, “Bob owns three guns” or “Bob owns three guns and is a hunter” people are more likely to quickly select the later because it is more descriptive. However, because there are more
conditions, it is in reality, less likely. The probabilities are that there are more people who own guns than there are those who own guns and are hunters (Inglis-Arkell, 2014). The point is, heuristics are not fool proof, and can and often do lead to less than optimal, if not dangerous, decisions.

A study of corporate mergers and acquisitions, complex decisions typically anchored in robust data, revealed that 83% failed to create any value for shareholders (Heath & Heath, 2013). In a McKinsey Quarterly survey of 2,207 executives, only 28% rated the quality of their company’s strategic decisions as good, and 60% reported that poor decisions were as frequently made as good ones, with 12% stating good decisions were infrequent (Lovallo & Sobony 2010). Some of the heuristics that underlie such decisions are more than sensory miscalculations – they are outright biases (Hammond et al., 1998).

These examples of heuristics infiltrating decisions are often the result of neurologically hardwired limitations in the amount of complexity we can manage, perhaps beyond what most decision-makers are willing to acknowledge (Miller, 1956). Approaching a decision systemically can also limit the influence of heuristics, although this is not easily accomplished. “Numerous studies illustrate non-systemic thinking confronted by individuals with complex problems” (Maani & Maharaj, 2004, p.24). Nevertheless, making the thinking associated with a decision more visible, and having a basic awareness of how and when heuristics might infiltrate a decision-making process are important steps. “The best way to avoid all of the traps is awareness: forewarned is forearmed” (Hammond et al., 1998, p.10).
My Personal, Practical, and Intellectual Goals

My interest in the neurology of decision-making, and my curiosity about how and if a tool could be designed to facilitate programmatic considerations, is fueled by personal, practical, and intellectual goals (Maxwell, 2013). Personally, I have been interested in the neurology of learning for over a decade. I have been fascinated by the implications and insights recent neurological research has shed on how both children and adults learn (Medina, 2009). My practical interest in the neurology of decision-making emerges from my role as a school administrator in which my primary function is to participate in, facilitate, and/or make decisions. During the course of my twenty-five years of administrative experience I have been involved in the decision-making associated with sweeping curricular initiatives, strategic planning and facility design, as well as career and life altering personnel decisions. Even though I have consistently engaged in my own professional development and acquired an array of administrative skills, I have never formally received any training in decision-making. Nevertheless, my effectiveness, like all others engaged in education, is judged by the quality and outcomes of the decisions I make and am involved in.

I embarked upon this scholarly study of decision-making as an expression of my own interests; however, I also see organizations and individuals alike benefitting from a more informed understanding of how decisions are made. My intellectual aspiration is to build bridges between what the neurologists are discovering about what goes on in the brain when we are engaged in the act of making a decision, and translate that knowledge into meaningful professional practice. Specifically, my research will focus on the following two fundamental questions:
1. In what ways does an understanding and awareness of common decision-making heuristics change, improve, or influence decision-making?

2. In what ways does the “program matrix” influence how decisions are framed, managed, communicated, and made?

I designed a grounded theory (Bowen, 2006) study, using a developmental evaluation approach (Patton, 1994, 2011). My research questions are not hypotheses to be tested under quasi-experimental conditions. Rather, the case study model informed the theoretical basis of this study (Strauss & Corbin, 1997). In order to explore how an increased understanding and awareness of unconscious heuristics might influence decision-making, I designed and delivered a two day seminar entitled “The Neuroscience of Decision-Making: Improving Personal and Organizational Capacity.” Seminar participants were prompted to explore their own decision-making pasts and patterns, and learned about research based decision-making tendencies that tend to influence, and at times compromise personal and institutional decision-making. I then built case studies by following and interviewing selected seminar participants over a five-month period as they reflected on and monitored how heuristics influenced decisions they were leading or a part of.

Seminar participants were introduced to the “Program Matrix,” a tool designed to enable users to approach programmatic decisions systemically, to simultaneously see a proposal in its entirety, while also developing and being aware of the discrete components and details. The Program Matrix is used to surface assumptions early in a planning process, deepening thinking, and reduce the potential for conflict by resolving often unstated differences. Once clarified, assumptions reframed as questions often
become the evaluative measures programs are seeking to validate. A completed Program Matrix articulates the descriptive details of the activities planned and lists the resources required to implement and sustain a program. Outcomes, both long and short term, are described as part of the decision-making process. The Program Matrix is designed to encourage collaborative, transparent decision-making through convenient and timely sharing of information. The Program Matrix enables individuals and groups to frame, reframe, and systemically develop a project as learning unfolds, consistent with a developmental evaluation approach (Patton, 2011).

The two research questions together frame the theoretical basis of the study and provide a practical application in the form of a decision-making model. The seminar established the neurological basis of common decision-making tendencies, and the program matrix is designed to make the thinking that goes into a decision more visible, resulting in outcomes that are more collaboratively and systemically considered.
CHAPTER 2
CONCEPTUAL AND THEORETICAL CONTEXT

Theoretical Context: Design of The Study

Institutions are typically dynamic, complex entities comprised of organizational structures and hierarchies. The decisions that shaped and move organizations are influenced by institutional culture and the proclivities of the people within them. A systemic study of how individuals and groups within institutions make decisions, particularly about programs that are by nature innovative, requires a research methodology that is itself iterative. “Activities that are innovative are often in a state of continuous development and adaptation” (Gamble, 2008, p.13). Inspired by the work and example of Dr. Sanjeev Sridharan, I have pursued a developmental evaluation approach, a qualitative research methodology (Patton, 2011) well suited for studies of organizational innovation. “Developmental evaluation supports the process of innovation within an organization and in its activities” (Gamble, 2008, p.13).

Traditional approaches to evaluation start with a hypothesis that is tested through the measurement of variables that are manipulated in highly controlled, static environments. Developmental evaluation, in contrast, recognizes and embraces the dynamic and evolutionary nature of an iterative learning process. During the course of this study I learned from individuals as they reflected upon and monitored their decision-making while leading or managing programmatic change in their institutions. The intent was not to compare the outcome of one decision relative to another. Rather, the learning emerged through reflections on how an increased awareness of heuristics influences decision-making, as well as how the program matrix could be used to guide decision-
making processes. “Where more traditional approaches to evaluation try to predict the outcomes of the innovation and focus measurement on those goals, developmental evaluation is intended to support innovation within a context of uncertainty” (Gamble, 2008, p.15).

As opposed to a linear, static, logic based model, the conceptual framework of this study evolved through engaging and interacting with the participants who informed the case studies. From the onset I acknowledge that in my role as researcher I am also a participant, both in what I learn from my own reflections and engagement as a decision-maker, as well as through my involvement and relationship with the case study participants as they shared reflections on their decision-making and use of the program matrix. Developmental evaluators not only disclose their relationship to the study, they embrace it as an essential and enhancing part of the research (Patton, 2011, p.127).

Given the complexities and subtleties that characterize individual and organizational decision-making, I have adopted a grounded theory approach. Grounded theory is “meant to build theory rather than test theory” (Patton, 2002). I am using a predominantly inductive process, informed by emerging and recent research in the neuroscience of decision-making. Through the systematic collection and analysis of qualitative data I developed theoretical explanations of how an awareness of heuristics and the use of the program matrix influences and informs programmatic decision-making. “The purpose of grounded theory studies is to explore and understand how complex systems occur” (Brown, Stevens, Troiano, & Schneider, 2002, p.2).
Theoretical Context of Decision-Making

Decision-making is a complex, integrative cognitive process in which active working memory is engaged at the neurological level to select outcomes of competing courses of actions (Fellows, 2004). A legacy of research from the disciplines of cognitive psychology, economics, and computer science shaped many of the initial understandings of how individuals and groups make decisions. The early neurological research of decision-making emerged through case studies involving brain injuries. These often severe cases enabled scientists to identify how decision-making was impacted when particular areas of the brain were damaged or impaired. The case of Phineas Gage is notorious not only because it was one of the first of this kind, but also because of the dramatic nature of the injury. Mr. Gage, a railroad construction foreman, survived an explosive accident in which a railroad spike was driven through his skull. Amazingly, the patient made a full physical recovery. His behavior and decision-making, however, were severely impaired as a result of physical trauma to the left frontal lobe, the area of the brain associated with emotion. This case study was one of the first to confirm the neurological influence of emotion in decision-making. Referred to as the lesion method (Naqvi, Shiv, & Bechara, 2006) this genre of research enabled scientists to localize areas of brain engaged in the different aspects of decision-making.

Emerging technologies such as CT, PET, and MRI and fMRI scans have since enabled researchers to image the brain while engaged in the act of decision-making, increasing our knowledge of what is occurring at the neurological level. We now understand that decision-making is not attributable to a single area of the brain or cell type. Rather, the cognitive, motivational, and behavior processes involved in decision-
making engages multiple neurological circuits in a highly interactive and systematic way (Balleine, Delgado, & Hikosaka, 2007).

My interest in decision-making is focused on the functional and behavioral manifestations of how we make choices. An understanding of the structural, neurological basis of decision-making establishes not only that there are tendencies we all share, but also suggests that much of what influences our decision-making occurs prior to our being conscious of it (Soon, He, Bode, & Haynes, 2013). The question of how aware we are of our decision-making tendencies, and how this influences the outcomes of the decisions we make, is what motivates my study.

The somatic marker hypothesis (Bechara & Damasio, 2005) introduces the notion that our decisions, while perceived as rational, are highly influenced by emotions, many of which we are not conscious of. The Iowa Gamble Task is a clinical experiment that simulates real-life decision-making under conditions of uncertainty (Bechara, Damasio, Tranel, & Damasio, 2005). Making selections from stacks of cards with the goal of mitigating losses and gains, healthy participants (no brain injury or impairment) demonstrated somatic reactions (heart rate, galvanic skin responses) as they pause after a highly predictable number of trials over a choice that would result in a loss. What is of significance is that this happens prior to the subject being able to articulate the reason for their hesitation. Damasio’s theory acknowledges that reason is applied to decision-making, but often after an emotional response experienced somatically has already influenced the outcome. Damasio’s studies seem to indicate that much of what takes place during decision-making happens beyond our conscious awareness, and certainly prior to our ability to articulate the reasoning behind the decision.
Intuition, Reason, and Emotion in Decision-Making

Malcolm Gladwell, author of Blink: The Power of Thinking Without Thinking, argues that decisions arrived at quickly and based primarily on intuition and the experiences of the decision-makers are reliable and can be trusted:

We live in a world that assumes that the quality of a decision is directly related to the time and effort that went into making it...We believe that we are always better off gathering as much information as possible and spending as much time as possible in deliberation. We really only trust conscious decision-making. But there are moments, particularly in times of stress, when haste does not make waste, when our snap judgments and first impressions can offer a much better means of making sense of the world. The first task of Blink is to convince you of a simple fact: decisions made very quickly can be every bit as good as decisions made cautiously and deliberately. (Gladwell, 2007)

In contrast, Daniel Kahneman, awarded a Noble Prize in Economics in 2002, cautions against this kind of decision-making, and instead calls for a more deliberate, rational, cognitively considered process:

In Thinking Fast and Slow, I describe my collaborative work with Gary Klein on determining whether you can trust intuitive thinking. The conclusion is that if you know whether you can trust intuition, your own or somebody else’s, you shouldn’t ask about subjective confidence, because that can be very misleading. Instead you should ask about the probability that a person’s intuitions arise from genuine skill. For that, you have to look at whether the world is sufficiently regular to support skill, which is true for chess masters and recognizing the
emotion in your wife’s voice but probably isn’t true for the stock market.

Secondly, you have to ask whether the individual has sufficient practice to acquire this skill. So confidence is not it. When a person makes a judgment, you have to ask what are the probabilities that this judgment is well-founded given the nature of world in which that individual operates and the nature of the practice that the individual has. (Kahneman, 2011)

Kahneman recognizes our tendency to make quick, impressionable, associative, and effortless decisions, which he labels System 1 thinking (Kahneman, 2011). He suggests we default to this style of decision-making out of habit and self-preservation. Given that the brain represents only 2% of our total body weight, but requires 15% of our cardiac output and 20% of our oxygen consumption, the deeply engrained drive to survive causes us to economize our neurological output. A general “law of least effort” applies to cognitive as well as physical exertion (Kahneman, 2011). This law asserts that if there are several ways of achieving the same goal, people will eventually gravitate to the least demanding course of action. “In the economy of action, effort is a cost, and the acquisition of skill is driven by the balance of benefits and costs. Laziness is built deep into our nature” (Kahneman, 2011, p. 35). Kahneman places a higher degree of confidence in decisions arrived through what he describes as System 2 thinking, a more deliberate analysis of information and calculation of probabilities, requiring concentration, effort, and attention.

Herb Simon, another Nobel Prize Economist, argued that while decision-makers aspire to “optimal” outcomes, they more often “satisfice.” Referred to as “bounded rationality” (Simon, 1982) this theory offers an interpretation of decision-making that
addresses the compromises that characterizes many, if not most, individual and institutional decisions. These compromises are resolved during decision-making as a result of the inevitable limitations in time, the quality of and access to information, and as a result of certain neurological and cognitive limitations. According to Simon, as a result of these limitations, decision-makers have a tendency to apply rationality only after the available choices have been greatly simplified.

This sample of theories establishes many of the neurological, cognitive, affective, and psychological characteristics that guide and influence our decision-making tendencies. A common thread is the evidenced-based suggestion that much of what takes place during decision-making occurs beyond our awareness or consciousness. One of the questions under consideration in this study is how an increased understanding and awareness of these tendencies might influence, and by implication improve, individual and organizational decision-making. The intent is to provide a vocabulary and context that encourages reflection about our decision-making in order to better understand how intuition, emotion, and reason interact in a decision making process in order to better recognize the cognitive patterns and habits we rely on when making decisions.

The ability to recognize heuristics, these cognitive processes and patterns of deliberations we rely on during the act of making decisions, is a framework that can be used to gain insight into our decision-making tendencies. Gerd Gigerenzer and Wolfgang Gaissmaier (2011) argue, based on their studies of business, medical, and legal decisions made by both individuals and institutions, that “heuristics can often be more accurate than complex ‘rational’ strategies.” They suggest that highly technical heuristic modeling can produce decisions that are as accurate as statistics, while being more
efficient. They aspire to build a “science of heuristics” based on “ecological rationality,” a study of which decision-making strategy is better (not best) in a given environment.

In contrast, psychologists and other social scientists advance a perspective that suggests that when faced with complex problems or incomplete information, our reliance on heuristics can lead to cognitive bias or less than optimal judgments. These heuristics, both neurologically hardwired as well as learned patterns of behavior, guide and in some cases highjack our decision-making. The question being considered through this study is, can an awareness of our use and reliance on heuristics lead to more deliberate and conscientious decision-making? In order to do so, we must first be able to recognize some of the most common heuristics.

Common Decision-Making Heuristics

While all thinking has neurological origins, many heuristics are also rehearsed mental habits learned through repetition. A key component of the seminar was for the participants to understand the neurology behind some of the most common heuristics, as well as the behavioral manifestation of others, in order to reduce our over reliance on them.

Framing

How a decision is framed, at its inception, has a tremendous impact on the course of the action selected, often in ways decision-makers are unaware of (Kahneman, 2011). For example, an attempt to entice a shopper to buy a product advertised as containing 10% fat would likely influence a different purchase then had the choice been framed by the more typical, 90% fat-free, even though they are mathematically exactly the same. Studies have shown that even well trained professionals are susceptible to framing
heuristics, suggesting we all are. To test this premise a group of physicians were asked to recommend a course of treatment for cancer patients. Half of the participants read statistics that framed treatments around survival rates, the other half were asked to respond to a framework that emphasized mortality rates, even though the odds were the same in both scenarios. The doctors were almost twice as likely to select the course of treatment framed in terms of survival rates than mortality rates (Tversky & Kahneman, 1991).

Neurological studies indicate that individuals less susceptible to the framing effect showed enhanced activity in the frontal area of the brain, an area that combines emotions and reasoning (Kahneman, 2011). Attending to how a decision is framed, particularly at the onset of a process, has a significant influence on how the subsequent decision-making unfolds. Similarly, as a means of generating alternative options when at an impasse, reframing a decision in a different context often opens new lines of reasoning.

**Loss vs. Gains**

Choices framed in terms of gains or losses significantly influence what people decide. In general, people are risk adverse when choices are framed in terms of gains, and more likely to take a riskier course of action in order to avoid loses, even when the outcomes share the same probabilities. Kahneman’s “prospect theory” emerged from a series of experiments in which subjects were asked to make selections about wealth based on questions framed in terms of either gains or losses. The majority of respondents were more conservative when there was the prospect for gain, and chose much more risky options when presented with the possibility of a loss, even when the mathematical probabilities were exactly the same (Kahneman, 2011). This reinforces the importance of
attending to the framing effect, and that we recognize that we are likely to be influenced by how we perceive losses or gains.

**Preference for the Status Quo**

The inclination of risk avoidance explains the general tendency of groups and individuals alike to prefer the status quo. In a series of experiments in which subjects were randomly given gifts of similar value, either a coffee mug or chocolate bar, and told they could trade, only one in ten persons was willing to make an exchange, preferring instead, to keep what they had, even if of minimal value (Kahneman, Knetsch, & Thaler, 2008; Gowda & Fox, 2002). Similarly, studies have shown that as the number of choices or options increases, people become even more likely to prefer the status quo, often expressed as not making any decision at all. The preference for the status quo appears to be a deeply embedded expression of the tendency to default to a heuristic in which the perceived costs of a choice outweighs the perception of benefits or gain.

**Sunk Cost**

An expression of the preference for the status quo is the tendency to cling to a choice even if it did not yield benefits or if the gains have long since been maximized. As an example, Gourville and Soman (2002) studied health club memberships and found usage spiked the month the bill was due, then decreased throughout the billing cycle, while policies were rarely canceled in spite of usage not being maximized. Financial investments, insurance policies, and in some cases school programs, or even, sadly, under-performing employees are other cited examples of our reluctance to change the course of a previously made decision.
We all have an inherent need to be right, and letting go of something we have invested in is often experienced as the acknowledgement of a mistake. Although it happens beyond our awareness, when we are correct, we experience a burst of dopamine, the neurotransmitter associated with pleasure. When we acknowledge a mistake, we receive no such chemical reward, and are more likely to experience the release of cortisol, the stress hormone. Because it is difficult to admit mistakes, or if an organizational culture makes the cost of mistakes high, our tendency of preferring the status quo is reinforced, even if it means clinging to a decision that is no longer beneficial.

**Anchoring**

During the initial stages of making a decision, the human brain tends to seize upon the information that is presented first. In one of several experiments that produced this effect, a group of MIT students were invited to participate in an auction. Before placing bids they were asked to write down the last two digits of their social security number. Influenced by this initial numerical prompting, the participants with the higher social security numbers were in some cases willing to pay 300% more than those with lower numbers. The act of thinking about and writing down a number influenced how much they were willing to bid (Lehrer, 2010). Car dealers, real estate agents, and others involved in the art of persuasion recognize and often exploit the tendency to be overly influenced by the initial presentation of information. The anchoring effect is not limited to cognition or thoughts. Psychologists have found that emotions and behaviors can also be “primed” by establishing associations (Kahneman, 2011).
Availability

The ease in which an event or an example can be recalled influences decision-making, in spite of what the actual probabilities of how representative the example might be. The availability heuristic is exploited by lottery systems as players overestimate the odds of actually winning because they can easily conjure up the image of a winner being awarded a huge check, in spite of the actual probability. Similarly, studies have found people tend to fear they are more likely to be victims of homicide than stomach cancer (Briñol & DeMarree, 2012) or think that there is a greater danger from a shark attack than by being struck by a part falling off a passing airplane, as surprising as the actual probabilities are (Read, 1995). In these examples, the frequency of reports in the media results in cases easily coming to mind, overriding a considered thought process of more realistic probabilities.

Representativeness

The tendency to overestimate the likelihood of an event, or to overgeneralize traits based on a limited sample, is referred to as the representativeness heuristics. An example prevalent in the world of sports is how basketball players, or other athletes, believe players can get “hot” and go on a shooting or batting streak. A statistical analysis of thousands of shot sequences indicated that there is no such thing as a “hot hand” (Kahneman, 2011).

While batting averages and shot selection might seem like relatively mundane examples, this illusion of pattern has proven to sway a range of financial and strategic decisions. For example, the Gates Foundation invested over $1.7 billion dollars in schools based on research that identified that by a factor of four successful schools tended
to be smaller. The research study that informed this set of decisions, which the Annenberg Foundation, The Pew Charitable Trust, and the U.S. Department of Education’s Smaller Learning Communities Program also participated in, over generalized traits from a research model that looked exclusively at the traits of successful schools. Had the research also studied traits of unsuccessful schools, it would have found that on average, poorly performing schools also tend to be small. Generating characteristics that consider only one profile, then overgeneralizing the results, can lead to a skewed decision. This is the same tendency whenever we stereotype an individual based on the perception of group characteristics (Kahneman, 2011).

**Confirming Evidence**

Most of us perceive ourselves to be relatively objective and receptive to views that we might not agree with. However, a prevailing heuristic is the tendency to ignore and be less than receptive to information or perspectives that run counter to our beliefs or understandings. A study in the 1960s tested this by having groups of churchgoers and non-churchgoers listen to recordings with messages either in support of or in opposition to their views. The dependent variable of the experimental was adding static interference over the recording, making it difficult to hear. Participants were however, able to turn down the distraction in order to better hear to the message. Consistently, participants turned down the static to listen to a message that confirmed their belief, and were less likely to do so for the opposing perspective. The study was later repeated with smokers and non-smokers, and the results were replicated (Brock & Balloun, 1967). Monitoring our receptivity to information that challenges a perspective is an essential element of effective decision-making.
Estimation and Confidence

In the course of our daily lives we are constantly estimating relationships of distance and time, or quantity and volume. Given the nature of most of these kinds of decisions, was I late or on time, we receive regular feedback about the accuracy of our predictions. As a result, we become fairly confident about the reliability and accuracy of our ability to estimate. However, when making decisions that involve higher degrees of uncertainty, in situations in which we are less likely to receive regular and immediate feedback, our tendency is to rely on a heuristic in which we not only overestimate the probability of unlikely events, but also place a high level of confidence in the accuracy of these estimations (Kahneman, 2011).

The Dunning-Kruger effect (Kruger & Dunning, 1999) refers to studies that highlight a pattern in which participants who scored the lowest on a series of tests also grossly overestimated both their performance, as well as how they did in comparison to others. There is actually a high correlation between those with the lowest performance scores and their high perception of ability (Gino, 2013). The implications for decision-making is that high confidence is not necessarily an indicator of a better decision, and in fact might be an indication that further scrutiny are merited. Metacognition, thinking about the thinking used to arrive at a decision, is a more reliable heuristic than a strong expression of confidence.

Memory

We often arrive at or justify decisions about future courses of action based on the confidence we place in the accuracy of our recollection of past events. Numerous studies
show, however, that we should perhaps be skeptical about the accuracy of our memories based on how we neurology store, retrieve, and recall past events.

Neisser and Harsch (1992) conducted a study to determine the validity of “flash bulb memories,” detailed, vivid memories of dramatic events. On the morning the space shuttle Challenger exploded during take off, a group of undergraduate students at Emory University were asked to write down in detail where they were, what they were doing, who they were with, and how they first heard about the disaster. Two years later, the same students were contacted and again asked to provide details about the morning of the crash. While the vast majority of the participants were confident about the accuracy of their memories, about 40% had discrepancies, in some cases dramatic (Chabris & Simons, 2011). Similar studies have verified that the accuracy of our memories is suspect, something the legal profession well knows based on discrepancies of how witnesses who seemingly saw or experienced the same event have in some cases dramatic differences in their recollection of the details. Basing decisions about future events on the perception that our memories of past events are accurate is a heuristic that should be monitored. This does not mean that lessons learned or that past experiences do not have value, they do. However, based on how the brain stores and retrieves events, we should consult sources of information other than our memories when informing a decision.

A premise of this study is that decision-making can be improved by increasing our awareness of the above described decision-making heuristics. A central theme of the seminar was to reveal the heuristics to the participants, then engage them in a series of activities in which they experienced how they employ the heuristics under certain
circumstances. The case study participants monitored their use of and reliance on the heuristics during the five months following the seminar.

**Theoretical Context of Program Matrix**

The types of programmatic decisions under review in this study take place in complex systems, organizations typically comprised of many diverse and autonomous but also interrelated and interdependent elements.¹ This means that there are usually many people involved in decision-making, representing various interests and outlooks, interacting more or less systemically, with access to or interest in information which varies in quality and quantity. This description is consistent with Simon’s notion of bounded rationality, which indicates that decisions tend to be made within the context of limiting factors such as time, information, and capacity (Simon, 1982).

Within this complex context, decision-making can be aided by systems thinking, a conceptual framework that encourages the consideration of problems or possibilities in their entirety, looking for patterns and relationships between the various parts of a system (Rubenstein-Montano et al., 2001). A premise of this study is that in complex systems, a model of decision-making that encourages systems thinking can in essence be a heuristic. Consequently, the program matrix is designed to encourage systemic thinking, to frame decisions in a way that encourages consideration of the various elements, while also presenting an overview of the whole.

The first version of the program matrix, a one page template housed and shared as a PDF file, was initially piloted through a series of program proposals at Punahou School during the 2012-13 academic year. This format proved to be relatively static and limited

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¹ See BusinessDictionary.com, at http://www.businessdictionary.com/definition/complex-system.html
how information could be updated, shared, and accessed by multiple users. Consequently, based on feedback from the initial users, the program matrix was modified and moved into Google Docs (Figure 1) taking advantage of the features in the slides app. In addition to accommodating the summary overview, additional slides of the various elements of the program matrix were added, allowing proposals to be more fully articulated. The Google Docs format was intended to encourage collaboration and transparent decision-making through the open exchange of information as multiple users can be given access a document, enabling them to post questions and comments.

Housing the program matrix in Google Docs slides enables decisions to be considered from both a micro and macro perspective as users can focus on an overview of a proposal, and when need be, delve into the details of the various components of the matrix in order to inform a decision. This macro and micro perspective encourages systems thinking by reinforcing the interrelated nature of the various elements that frame a decision. The program matrix is a dynamic tool in which information can easily be updated in a way that is transparent and accessible to multiple users, allowing groups of various sizes to work in unison or asynchronously.
Figure 1. Program matrix, version II
The first slide of the program matrix provides an overview of the various elements of a programmatic decision. While decision-making involves, to a degree, delving into the details, this overview slide forces a concise summary of a proposal. This format enables decision-makers to manage complexity while acknowledging the limits in the quantity of variables that can reasonably be retained in active working memory. The rationale for this is based on a study of consumer behavior, which found that when our cognitive capacity is stretched or exceeded by attempting to retain fairly predictable quantities of information, people become more susceptible to impulsive decisions (Shiv & Fedorikhin, 1999). The neurological explanation is that when the area of the brain associated with the cognitive task of retraining information is overtaxed, the tendency is to default to parts of the brain associated with emotion. The program matrix takes this into account by presenting an overview that reinforces the interrelated nature of the elements of the system with enough information to enable a decision, while structuring the details in context so that they can be accessed or consulted for deeper deliberation when needed.

Just as TurboTax guides users through detailed worksheets that are brought forward into a summary overview, the subsequent slides in the program matrix, one for each of the color-coded boxes representing a set of considerations, guides the users through the important process of developing the level of detail that substantiates and validates a decision. Decision makers can focus their deliberations on the overview slide, and when needed, consult the more detailed slides for additional information or context. The intent is to reinforce a systems thinking heuristic; being mindful of the overview while having an awareness of the interrelated nature of the various elements of a
A sidebar with the list of heuristics covered in the decision-making seminar is provided to prompt reflection on when an individual or group might be using thinking associated with a particular heuristic (Figure 2).

Figure 2. Heuristic checklist

Each of the boxes of the program matrix allows for the various elements of a proposal to be developed, recorded, and articulated. To establish an initial framework, or schemata, decision-makers need a concise statement of the proposal or problem being addressed (Figure 3).

Figure 3. Title statement
A specific section on “assumptions” is included because decision-making is improved when, early in a process, basic assumptions are surfaced, articulated, and discussed. Authors Chip and Dan Heath discuss the importance of “reality testing assumptions” in order to mitigate the influence of several heuristics, most notably the flaws in our ability to accurately estimate (Heath & Heath, 2013). Assumptions left unstated or unresolved can and often do manifest themselves later in a decision-making process as conflict or confusion. What might manifest as opposing views about logistics or details often, upon more thorough examination, are in reality unarticulated assumptions. Additionally, often imbedded in assumptions are statements of values, or beliefs about what is important. Stating assumptions in basic terms early in the process, when done in the context of recognizing heuristics, clarifies thinking and expedites decision-making (Figure 4).

![Assumptions: Values](image)

*Figure 4. Assumption statements*

The boxes related to “Activities” and “Resources” are inter-related and should be developed in unison (Figure 5). As the activities of a proposal are articulated, it clarifies what resources are actually needed to support and enable a program. The rationale for
developing these elements simultaneously is because often a great deal of predominantly emotional enthusiasm is focused on the activities and what is to be done, but the full potential of an proposal is not realized because the thinking about what is actually needed to advance an idea (budgets, equipment, space, time, human resources) is underdeveloped or underestimated, potentially compromising the project from the onset. Kahneman points out, for example, how the precious resource of time is consistently underestimated when calculating how long it will take to develop a program or project (Kahneman, 2011). The availability of other kinds of resources, such as space, materials, or even information, are often taken for granted or underestimated.

Figure 5. Activities and resources
Thinking about the activities should prompt thinking about the intended outcomes, both immediate and long term. A decision should be informed not only by focusing on the activities, but also by stating with a degree of specificity at the onset what the outcomes of the activities will be, both short and long term. As a proposal is tested, revised, and more fully developed the scope of the outcomes can be phased. A teacher, for example, might initially propose a program or intervention that will take place in his/her classroom as a pilot, but as practices are refined based on feedback loops and additional experience, the program might be expanded to other classes, grade levels, or divisions. Heath and Heath (2013) recommends and cites several examples of how conducting small experiments prior to full implementation is advantageous. This section of the program matrix (Figure 6) should be used to develop the considerations of the direct outcomes and longer-term influences.

![Figure 6. Outcomes and evaluative measures](image)
As important as it is to articulate assumptions early on in a planning process, there is also value in providing a degree of clarity during the proposal stage about what data, artifacts, or evidence can be gathered to assess the impact of a program. These more formative inventories move a proposal beyond anecdotal evidence and provide a more credible indication of the learning that is taking place. In the spirit of developmental evaluation (Patton, 2011) this does not imply a linear sequence of summative assessments that are quantitative in nature. Rather, the design of a proposal can, in its early stages of development, state what evidence will be collected, perhaps in the form of rich qualitative data, to gauge the impact or influence a program is having, as well as inform future decisions about the longevity of a program. An advantage of developing the thinking about evaluative measures early in program development is that it creates opportunities for baseline data collection prior to implementation. This data can then be used as a comparative basis after or during implementation to gauge the impact of a program. This opportunity is lost if not considered during the planning and decision-making stages of program development.

The relationship between assumptions and evaluative measures is reinforced through systems thinking. In many cases, the basic assumptions are what is actually being tested or evaluated. The merits of a program are often determined if the assumptions that motivated a proposal are validated. Consequently, clarifying assumptions early in a decision-making process often reveals what actually needs to be tested, measured, or evaluated.

For example, an analysis of the decision to launch a 1:1 laptop program a school might reveal the following. The rationale for this program might be based on an
assumption that students will improve their writing skills as a result of the increased access to this technology. This could in essence become an evaluative measure. If this is the case, prior to implementation, samples of both the quantity and quality of student writing could be gathered, which could be used as a baseline to compare to samples collected at intervals throughout implementation to better understand if or in what ways the access to the technology influenced the quantity and quality of student writing. Often, not considering evaluative measures early in a decision-making process is a lost opportunity to collect data that might have established a baseline that could have become an important point of comparison. My experience is that there is a tendency to gravitate to a heuristic in which the focus and enthusiasm is directed to “what we are going to do” and less on “how will we know” what the impact will be?

Another decision-making tendency addressed in the program matrix is to leave as an unstated assumption the intended longevity of a program. The purpose in making some form of declarative statement about how long a program is intended to last influences the expectations or need for resources. Not doing so could lead to a decision in which the allocated resources understate what is actually required to perpetuate a program, compromising the potential impact from the onset. An example would be Kahneman’s observations about how the amount of time required to fully develop a project is a resource consistently underestimated (Kahneman, 2011). Statements about the intended length or intent to sustain a program (Figure 7) are an important part of thoroughly informing a decision, recognizing these projections by their very nature will be speculative.
The feedback loops are a vital part of the program matrix (Figure 8). This is an essential element of a developmental evaluation that recognizes and embraces how a program benefits from in-process modifications as the learning occurs. It is also a reflection of systems thinking. As one element of a program is updated or modified, other parts of the system can and will likely need to be adjusted or updated. For example, initial estimates about resources might be adjusted as thinking about evaluative measures is more fully developed. Or, as learning occurs as a result of feedback gathered during initial implementation, statements about outcomes might be adjusted to more accurately reflect expectations.

The program matrix is a tool design to facilitate decision-making in complex systems. It reinforces systems thinking by providing an overview of a program or proposal, while also emphasizing the interrelated nature of the various elements and
considerations. Of particular importance is the surfacing of assumptions, which increases shared understandings and clarifies potential evaluative measures.

Theorists and researchers who study the neurology of decision-making indicate that we rely on practiced and predominately unconscious heuristics when making decisions. As a first measure, being knowledgeable and aware of these heuristics can decrease our overreliance on them. The program matrix was designed to make the thinking that goes into a decision-making process more visible and systemic, thus decreasing our susceptibility to unconscious heuristics by replacing it with a form of heuristic that guides decision-makers through a systemic process.
CHAPTER 3

METHODOLOGY

Establishing a Theoretical Basis: The Seminar

The two day seminar titled “The Neuroscience of Decision-Making: Improving Personal and Organizational Capacity” offered during the 2013 Brain Symposium at Punahou School established the theoretical foundations of the study. Prior to the seminar participants were prompted to reflect upon and write about their decision-making styles and tendencies. During the Seminar participants were engaged in discussion and a series of activities related to the first research question: in what ways does an understanding and awareness of common decision-making heuristics change, improve, or influences decision-making? After the seminar participants were again asked to respond to a series of reflective questions about their decision-making tendencies in the context of what they had learned about the neuroscience of decision-making and heuristics.

The Program Matrix was also introduced in the seminar as an exploration of the second research question: does the use of the program matrix influence how decisions are framed, managed, communicated, and made? Seminar participants were shown how the program matrix might be used to systemically guide a decision-making process, and given time to explore how they might use it to frame and consider programs or proposals they were developing in their institutions. Participants were also shown how the program matrix could be used to promote a collaborative decision-making process through the use of Google Docs.
Rationale for the Program Matrix

Punahou School has a culture of instructional innovation that encourages and generously supports the professional growth of the faculty and programmatic development. The need for a tool like the program matrix, itself a form of heuristic, emerged from a sense that while Punahou strategically budgets resources to support professional and programmatic development, the decision-making processes used to allocate those resources was not necessarily “informed by systems thinking and grounded in complex non-linear dynamics” (Patton, 2011). According to Patton, a systemic, dynamic approach to programmatic decision-making is an essential element of developmental evaluation.

Prior to the use of the program matrix at Punahou, the allocation of professional development funds was conducted through either a relatively linear process of application forms vetted in non-standardized ways, or in other cases through almost impromptu conversations occurring in some cases spontaneously. While this process yielded results, it lacked what Patton refers to as “double loop learning” in which:

those involved go beyond the single loop of identifying the problem and finding a solution to a second loop that involves questioning the assumptions, policies, practices, values and system dynamics that led to the problem in the first place and intervening in ways that involve the modifications of underlying system relationships and functioning. (Patton, 2011)

The ambiguity in the decision-making process, or the absence of a matrix of any sort, often resulted in funding being committed to proposals based on an initial indication of enthusiasm for an idea, which was then frequently interpreted as approval to proceed.
This, however, generally occurred without the project being fully vetted or communicated to other stakeholders who might be impacted, or who in many cases might have been able to contribute. The surfacing of assumptions, considerations of logistics, stated evidence of learning, and systems impacts were developed and discovered in process, if at all. Attempts to engage in these kinds of considerations after the initial perception of approval was established were rarely welcomed and often awkward. Under this system initiatives were implemented, many of them interesting. However, the question of whether the full realization of an idea was achieved and the allocation of resources fully maximized in the absence of a more systemic and deliberate decision-making and planning heuristic remained in question.

Consistent with Patton’s notion of “utilization-focused evaluation,” the program matrix is designed for the specific purpose of facilitating the planning and decision-making associated with professional development and programmatic proposals. It is intended to:

- facilitate ongoing innovation by helping those engaged in innovation examine the effects of their actions, shape and formulate hypothesis about what will result from their actions, and test their hypothesis about how to foment change in the face of uncertainty in situations characterized by complexity. (Patton, 2011)

The program matrix is designed to cultivate the level of thinking about program development that is more characteristic of how Kahneman would describe system 2 thinking (Kahneman, 2011). Using the matrix requires individuals to think deeply and deliberately about the various elements that go into forming and shaping an idea. Framing a proposal, articulating assumptions, developing a plan of action, anticipating
and specifying costs, stating both short- and long-term outcomes, and designing evaluative measures, requires cognitive effort. This process is also consistent with the iterative nature of Patton’s developmental evaluation model, meaning that as a program is in development, learning is monitored and adjustments and refinements are made as planning and implementation take place. If the program matrix is embraced as a heuristic in and of itself, this might over time trigger a cultural shift within the school, resulting in more systemic thinking being applied to other decision-making contexts (Patton, 2011).

**Rationale for a Case Study Model**

As the purpose of this study is to better understand how individuals make programmatic decisions, the deep thinking about how they frame issues, how they weight considerations, and how they select courses of action had to be revealed and surfaced in an anecdotal and potentially personal manner. A case study methodology is most appropriate for a study of this nature because, “The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result” (Yin, 2009). In order to understand how heuristics influence decision-making, I needed to interact with, listen to, and work with individuals as they engaged in and reflected upon their cognitive, emotional, and intuitive processes of making decisions. Consistent with Yin’s recommendation of using a case study model in a “real-life, contemporary context or setting” the individuals who participated in this study were making decisions about actual programs, events, and projects they were creating or working on in their schools or institutions (Yin, 2009).
As this study attempts to make more overt the nuances of decision-making, I wanted to sample multiple perspectives in order to surface common themes or experiences. Consequently, I used a collective case study model and asked five individuals to participate (Creswell, 2012). The sampling is purposive (Miles, Huberman, & Saldaña, 2013) as the five individuals selected are in positions of leadership in the schools and institutions, participating in, making, and influencing decisions.

The participants who informed the case studies were selected based on the following criteria.

**Interest in the Neurology of Decision-Making**

In order to explore how an awareness and understanding of decision-making heuristics influences decision-making, I approached individuals who had registered for the seminar. Based on how the seminar was promoted (Appendix A), I surmised that each of the five individuals had an interest in learning about the neurology of decision-making and were looking for techniques and methods they could use to guide their professional decision-making. This was confirmed in follow-up conversations.

**Their Schools/Organizations**

Two of the individuals in the study work at Punahou School, two are administrators at Saint Andrews Priory, and one is a program manager in a non-profit organization that develops community leadership. The intent was to explore how the program matrix influenced programmatic decision-making at Punahou, at another independent school, and in a non-profit organization. Data collection was triangulated
through working with individuals from more than one independent school, in addition to a non-profit organization that was involved in education, but was not a K-12 institution.

**Leadership Roles**

The five individuals who informed the case studies are all in positions of leadership. The variation in their roles provided a degree of diversity and perspective. One is an Upper School division head, another is a K-12 curriculum coordinator, one is a 9-12 department chair, another is a faculty program coordinator with a K-12 role, and one is a program manager for a non-profit organization. Each individual leads projects and is engaged in programmatic decision-making, but from different positions within similar or comparable organizations.

**Program Development**

Through both position and disposition, each individual involved in the study is involved in the creation and management of programs in their respective institutions. When I approached each individual at the onset of this study, they all had a project in mind that they were interested in using the program matrix to develop. In some cases the timing of when they were able to actually develop the program changed as the study progressed.

**Prior Relationship**

As Principal, I work directly with the two individuals at Punahou and need to acknowledge positionality, although I would like to describe our relationship as highly collaborative. I had no prior relationship with the two administrators at St. Andrews Priory. As a result of her prior role with the Hawaii Association of Independent Schools, the program manager working for the community non-profit organization was familiar
with my prior presentations on the neurology of learning. In the spirit of a developmental
evaluation, my interaction with each individual was in the role of a coach as they used the
program matrix to develop the programs in their schools and organizations.

Each of the case study participants in the study is an experienced educator in a
position of leadership in their respective schools/organization initiating change and
managing programs. They are decision-makers, and by registering for the seminar
demonstrated a pre-disposition and interest in learning about the neurology of decision-
making. When approached about allowing me to monitor their decision-making and use
of the program matrix after the seminar to collect data about how the experience
impacted or influenced them, all were supportive, receptive, and eager to try to develop a
project using the program matrix.

**Grounded Theory**

In order to understand how an increased awareness of heuristics and the program
matrix influenced decision-making, I used a grounded theory approach, consistent with
Creswell’s recommendation that the researcher “focuses on a process or action that has
distinct steps or phases that occur over time” (Creswell, 2012). The five individuals I
worked with in this study first participated in the seminar, then reflected on and
monitored their decision-making as they used the program matrix to create programs in
their schools or institutions. The program matrix is designed to facilitate an iterative
process, making decision-making more visual, systemic, and collaborative. The data
collected as these processes unfolded was “grounded” in the “actions, interactions, and
social processes” (Creswell, 2012) of the five individuals who informed this study.
Data Sources

Multiple sources of data were collected from each of the participants in order to develop the depth of understanding about how they were making decisions, and to identify the dynamics of and influences on their decision-making.

Prior to the seminar, each participant responded to a set of reflective questions regarding their decision-making inclinations, preferences, and tendencies. After the seminar, they were again asked to respond to a set of reflective questions, now in the context of what they had learned about the neurology and heuristics of decision-making.

During the months after the seminar participants agreed to keep reflective journals of their decision-making, monitoring specifically for instances in which they recognized the use or influence of heuristics. As an aid to the theoretical context covered in the seminar, each participant received a summary overview of the heuristics to reinforce their understandings and as a recognition aid (Appendix E). The intent was to also use the journal to record how their planning and associated decision-making was influenced by their use of the program matrix.

By design the program matrix is an easily sharable resource. Consequently, I was given access to each of the program matrices the participants used to develop the program or project in their school/institution. The revision history feature of Google Docs provides a chronicle of how the decision-making evolved, capturing the developmental nature of a decision making process. As a result, the program matrix serves as a record of the development of a program or proposal, which can then be referred back to throughout a decision-making process.
I had the first individual meeting with each of the case study participants in the weeks after the seminar to follow up on any questions they had about the theory that was covered, and to discuss their projects and use of the program matrix. We explored how the considerations and decisions associated with a project might fit into the various elements of the program matrix. I made myself available as a programmatic coach to each case study participant, consistent with the model of a developmental evaluation.

Three months after the seminar, a first round of interviews was held with each individual to collect reflective data about how their decision-making was influenced by their understanding and awareness of heuristics. This also served as an initial sampling of how their use of the program matrix was influencing the development of their program. While each individual had unique points of emphasis, feedback, and insights, the following questions guided this round of interviews.

- Can you reflect on how your decision-making might have been influenced or altered as a result of something you learned or heard in the seminar?

- After hearing and learning about heuristics in the seminar, then participating in decisions in your school over these past few months, can you describe examples of how you are thinking about, noticing, influencing, or making decisions differently?

- Is there an example of a particular heuristic that you seem to be more aware of now – in yourself, others?

- Can you describe how the program matrix might be influencing your planning and decision-making?
• How have others you have worked with responded to or been influenced by your use of the program matrix?

• In the process of using the program matrix and making decisions, have you surfaced and articulated assumptions, and if so, has it influenced a decision-making process?

• If you have worked with or involved others in the use of the program matrix, can you describe how it has influenced their interactions or communications – with you and with each other?

• Is there any particular element of the program matrix that either advanced or hindered a decision-making and planning process?

A second round of interviews was conducted five months after the seminar as projects were further developed and the participants gained more experience with the program matrix. The second round of interviews focused on the following questions:

• It has now been about five months since the Seminar. Are there any general observations you would make about how you described your decision-making prior to the seminar and now? What comments would you make about your awareness or recognition of heuristics, in you or in others?

• Can you think of or describe an example of a decision in which you might have used, or been influenced by something you learned in the seminar?

• What statements or observations might you make about how your use of the program matrix influenced a planning or decision-making process? What observations or comments would you make about how the program matrix influenced the dynamics of others involved in the decision-making process?
• As you have used the program matrix, were there parts of it that you were able to complete more readably? Were there components that required more thought, research, and communication?

• How much technical sophistication did using the program matrix require of you? For example, were you familiar enough with Google Docs to be able to use the instrument? Were you able to figure it out, did you get help? Would you have benefitted from instructions or training?

• As I continue to gather feedback on and modify the program matrix I have created a simpler version (Figure 9). What is your impression, feedback? Does it contain the essential elements? Are there any suggestions you might make about further modifications?

In the context of the research questions, I was also interested in exploring several sensitizing concepts (Maxwell, 2013). Specifically, did focusing on and surfacing assumptions early in a planning process impact decision-making? I was interested in whether decision-making became more systemic as a result of proposals being framed using the program matrix. Additionally, I requested feedback on how the use of Google Docs influenced how information was shared and if this contributed to a more collaborative, transparent decision-making process.
Figure 9. Program matrix, version III
Data Analysis

I followed Maxwell’s recommendation that there is no:
cookbook or single correct way for doing qualitative analysis; your use of these
strategies needs to be planned (and modified when necessary) in such a way as to
fit the data you have, to answer your research questions, and to address any
potentially serious validity threats to your conclusions. (Maxwell, 2013, p. 105)

After each interview was recorded, transcribed, and read I followed a two cycle coding
model. I used in-vivo coding through the first cycle as it enabled me to capture and work
with the language the participants used to describe their decision-making. I also utilized
holistic coding in the first cycle by capturing larger selections of narratives used by the
participants. As I proceeded to the second cycle of coding I began to “fracture” the data
into categories: “In qualitative research, the goal of coding is not primarily to count
things, but to “fracture” the data and rearrange them into categories” (Strauss, 1987).
During this cycle, I looked for patterns in the narratives expressed by each of the case
study participants. The data was organized into a series of tables. The pre and post
seminar responses were first categorized, followed by the narratives collected during the
two interviews conducted with each case study participant. The data was further
analyzed by refining, organized, then reorganizing responses into tables highlighting the
changes and insights the case study participants reported about in their decision-making.
These particular coding techniques were selected because they lend themselves to
grounded theory studies.

I also used my reflective journal to chronicle how the faculty at Punahou have
responded to the program matrix first piloted during the 2012-13 school year, then used
to make decisions about K-8 professional development funding and programmatic proposals during the 2013-14 school year. While the data received from the five case studies was the focus of the research, my journal set context and was a part of my reflective analysis.

**Positionality and Reflexivity**

Herr and Anderson’s “continuum of positionality” outlines a spectrum of relationships researchers have with the individuals and organizations they are studying (Herr & Anderson, 2005). Researchers who are positioned within an organization, have access to information and people, and have influence on outcomes of decisions and behaviors are considered “insiders.” The purpose and focus of conducting a study under these conditions is to contribute to a knowledge base, as well as improve practice for both the individual and the organization. On the other end of the spectrum, the “outsider” is the researcher who is not a member of the organization or group under study, and is observing from the sidelines, per se. While this outsider relationship might seem like traditional applied research, in an action research model the researcher engages and interacts with the participants. A range of research configurations fall along this continuum, including variations of insiders collaborating with other insiders, or a researcher outside of an organization collaborating with insiders (Herr & Anderson, 2005).

Given the nature and focus of my two research questions, I am positioned primarily as an insider as I developed, piloted, and tested the program matrix at Punahou. I also interacted with two members of Punahou’s faculty who attended the seminar and subsequently shared with me their reflections about how their decision-making was
influenced by the experience of the seminar. While I aspired to be collaborative and collegial with these two individuals, I need to acknowledge my role as Principal gave me access to them, potentially influenced their decision to participate in the study, and while their feedback about the influence the seminar had on their decision making seemed genuine, my position was potentially a variable.

While I do not unilaterally make decisions about the allocation of professional development funds at Punahou, I do acknowledge positionally as my role gives me influence over the process. My positionality was in large part what motivated my research as I felt the organization would benefit from both a tool and process that would migrate decision-making about the allocation of professional development funds from what Kanheman would describe as systems 1 thinking, to a model more characteristic of Kahneman’s systems 2 thinking.

In an effort to triangulate and validate the data, I also positioned myself as an outsider through my interactions with the three case study participants employed at other schools or organizations. Their feedback on how the seminar influenced their decision-making, and how they reported their use of the program matrix, was free of hierarchal positionality. While the program matrix was designed for use at Punahou, working with individuals outside of Punahou was an opportunity to achieve external validity and triangulate the data (Herr & Anderson, 2005). In the spirit of action research, I tried to develop a collaborative relationship with all of the case study participants, sharing what I had learned about the neurology of decision-making as I gathered feedback from them about how the program matrix was being used at both Punahou and in other settings.
Recognizing the importance of building reflexivity into the study (Herr & Anderson, 2005), I kept a journal of both my decision making and the decision making of the various groups and committees with which I am involved. This enabled me to monitor and better understand how heuristics were influencing outcomes, decisions, and strategic directions that I was making, as well as the groups I was interacting with. Further, I acknowledge that as a researcher I cannot claim complete neutrality in my data collection process, rather, my obligation is to understand the effects that my own disposition, biases, and relationships with the participants might have on the research process, and to the extent possible, minimize these influences (Clancy, 2013). Even so, just as the purpose of the study was to increase awareness of how heuristics might be influencing decision-making, I recognize and accept that in the process of collecting qualitative data “elements of subjectivity remain beyond our consciousness” (Bishop & Shepherd, 2011). Nevertheless, while interacting with the individuals who provided the data for the case studies, I made effort to monitor and regulate how I might be influencing the feedback they were providing me.
CHAPTER 4

CHRONOLOGY OF RESEARCH AND FINDINGS

The Chronology of Research

Background

I have been interested in, fascinated by, and a student of the neurology of learning for over a decade. During that time, the programmatic planning for three major facilities projects at Punahou School was informed and validated by the emerging body of research on the instructional applications of neurological research. The rationale for the reorganization of the middle school into interdisciplinary teams, for example, was based on our understanding of how the adolescence brain forms neural networks. Similarly, the shared spaces and ample access to green space designed into the early elementary campus was validated by citing neurological research supporting how movement, exercise, and play readies the young brain for learning through the release of BDNF (brain-derived neurotrophic protein) (Brown & Vaughan, 2010).

The planning for these projects involved, literally, thousands of decisions, many of significant cost and consequence. As decision-making is, in essence, an exercise in learning, I began to question how the research on the neurology of learning might apply to decision-making. The literature review led to the research on heuristics, which, as I came to understand, significantly influences strategic decision-making, both individually and organizationally. The seminar, and extension of my own learning, was designed for participants to become aware of and recognize how heuristics infiltrate and influence their decision-making.
The recognition of how decisions associated with the allocation of professional development funds shape the instructional and strategic directions of a school prompted the concept of the program matrix. The program matrix was designed to explore how a more systemic decision-making process might mitigate the influence of unconscious heuristics, thus leading to more thoroughly considered decisions. The seminar focused on the premise that these two elements, the program matrix and an improved understanding of the neurological basis of our decision-making tendencies, could improve individual and organizational capacity.

The first version of the program matrix was piloted during the 2012-13 school year and was used to guide the planning and decision-making of twenty-three programmatic proposals. A revised second version was presented to the seminar participants in June of 2013 and to K-8 Punahou faculty in August during the opening staff meeting of the 2013-14 school year. As additional feedback was gathered, a third revision was shared with seminar participants in October, and used to frame and guide the decision-making of twenty-two programmatic proposals and ten requests for professional development funds at Punahou during the 2013-2014 academic year.

During the seminar I presented the neurological basis for many of our decision-making tendencies, and engaged participants in exercises so they could discover and experience for themselves how we use and often depend on heuristics. Within this context, seminar participants were prompted to reflect on their own decision-making styles and inclinations. These exercises and follow-up discussions enabled participants to discover how heuristics influence both individual and organizational decision-making.
The rationale for and the mechanics of the program matrix were also introduced during the seminar.

The five-hour seminar delivered during the Brain Symposium was the primary focus of this study. Modified versions of the seminar were also presented at the Maui Association of Independent School Conference, The HAIS Schools of the Future Conference, The National Association of Independent Schools Conference, the University of Hawaii Ed.D cohort, and the Parent Faculty Association at Punahou School during the 2013-2014 academic year.

**Study Participants**

I approached five individuals who had registered for the seminar to sample their interest in piloting the program matrix during the 2013-2014 academic year. All five agreed to use the program matrix to lead an initiative in their school, and while doing so, monitor and share their reflections on how their decision-making might have been influenced by what they had learned and experienced during the seminar. I selected these five participants because of the diversity in their leadership roles, schools, and organizations. As they had all registered for the seminar, I presumed an interest in the topic of decision-making. Two are faculty members at Punahou. Participant III is in her twelfth year as department chair leading a group of sixteen faculty members, and Participant II has been a teacher at Punahou for ten years and had recently taken on a new role leading campus wide sustainability initiatives. Two participants are in administrative roles at an all girls’ independent school in Honolulu. Participant V is her third year as Upper School director leading a division of thirty-one teachers and two hundred and fifteen students, and Participant IV is in her eighth year as the Direction of Instruction, a
K-12 curricular role in which she works with forty-five faculty members. Participant I has extensive knowledge of independent school dynamics in Hawaii having worked for the Hawaii Association of Independent Schools for six years. During the study, she was in her first year as a Project Manager with a non-profit organization in Honolulu.

**Chronology of Data Collection**

Data was collected from each participant at five points during the study. The focus was on how their professional decision-making was influenced by what they had learned in the seminar while they used the program matrix to lead an initiative. Data collection started prior to the seminar with the five participants responding in writing to a series of reflective questions asking them to describe their decision-making tendencies and styles. This also established any prior knowledge of decision-making heuristics. At the conclusion of the seminar each of the five participants again responded in writing to a series of questions asking them to reflect on how the seminar impacted their decision-making.

In the weeks immediately following the seminar I met with each of the five study participants to address any questions they had about the theories presented in the seminar regarding the neurology of decision-making and the heuristics. We also discussed the project they would use the program matrix to develop. During that period of time, four of the participants kept logs of their decision-making, some more diligently than others. Two interviews were then conducted with each of the participants, one three months and another five months after the seminar. The first interview focused on how their decision-making was influenced by what they had learned in the seminar. The second interview focused on how the program matrix influenced their decisions as they led a project, and
collected additional reflections on their decision-making in the context of the theories they were exposed to in the seminar.

The Data

Pre-Seminar Surveys

Prior to the seminar each of the five participants described their decision-making style by responding in writing to a series of introspective questions. Participants I and IV described themselves as highly reflective and deliberate decision-makers. Participant IV emphasized her analytical style, describing a very procedural approach in which she relies on multiple sources of information before making a decision. Participant I, as an expression of her intentional style, emphasized how she considers a range of options and thinks through short and long term impacts before making a decision. The other three participants made references to the role of intuition in their decision-making. Participant II described how he is initially reflective and deliberate, yet will make a decision when he intuitively feels the timing is right. Participant III described how she initially has an intuitive sense of the decision she wants to make, then holds this in check to allow herself to be more deliberate. Participant V, at this stage of the study, shared how much she trusts her gut feelings and makes decisions based on intuition. While there were general commonalities in the decision-making tendencies of the participants, they each described specific, yet unique propensities and inclinations. The responses of the five participants indicates that decision-making styles are highly individual, both in tendencies and in the sequence of considerations each individual cycles through when making a decision.
Prior Knowledge of Heuristics

I used the pre-seminar survey to establish whether the participants had knowledge of decision-making heuristics prior to the seminar. None of the participants made any reference to heuristics in the pre-seminar descriptions of their decision-making styles. Two, participants I and IV, did indicate in post seminar data that they had heard of heuristics previously, but did not have an understanding of the neurological foundation, nor had they considered it in the context of their own decision-making. In both of these cases they stated that the format in which the heuristics were presented improved their understanding of them, with one saying it was helpful that I provided examples of the studies and research that confirmed their prevalence. This data established a baseline that enabled me to compare their insights and understandings of how heuristics influenced their decision-making post seminar.

During the Seminar

One of the first exercises of the seminar was for participants to reflect on two contrasting perspectives on decision-making, expressed through the quotes (below) from Blink (Gladwell, 2007) and Thinking Fast and Slow (Kahneman, 2011). Supported by studies establishing the neurological basis of decision-making, this provided the context for the descriptions of the decision-making styles and tendencies of each individual.

Gladwell:

We live in a world that assumes that the quality of a decision is directly related to the time and effort that went into making it...We believe that we are always better off gathering as much information as possible and spending as much time as possible in deliberation. We really only trust conscious decision-making. But
there are moments, particularly in times of stress, when haste does not make
waste, when our snap judgments and first impressions can offer a much better
means of making sense of the world. The first task of Blink is to convince you of
a simple fact: decisions made very quickly can be every bit as good as decisions
made cautiously and deliberately. (Gladwell, 2007)

Kahneman:
A general “law of least effort” applies to cognitive as well as physical exertion.
The law asserts that if there are several ways of achieving the same goal, people
will eventually gravitate to the least demanding course of action. In the economy
of action, effort is a cost, and the acquisition of skill is driven by the balance of
benefits and costs. Laziness is built deep into our nature. (Kahneman, 2011)

Gladwell suggests that decisions made quickly and intuitively can be trusted. In
contrast, Kahneman labels this quick decision-making as “systems 1” thinking, and
argues this path of least effort can lead to less reliable decisions. His studies indicated
that “systems 2” thinking, a more deliberate approach requiring significant cognitive
effort, leads to outcomes that are more thoroughly considered. In circumstances in which
quick decision-making is required, such as emergency room physicians, firefighters, or in
some cases master chess players, expertise and extensive experience enables efficient and
reliable decision-making: “Skilled decision-makers can perform at very high levels
despite time pressure” (Klein, 1999, p. 161).

Seminar participants, reflecting on their own decision-making inclinations,
discussed systems 1 and 2 thinking in small groups, then shared questions and
impressions with the full group. During the seminar each of the five participants were
attentive and participatory. They all asked questions, responded to prompts, and engaged with the other seminar participants.

Post Seminar: Logs vs. Interviews

I met with each of the five individuals in the weeks immediately after the seminar to address any questions they had, to discuss the projects they planned to use the program matrix to develop, and, most importantly, to begin to establish a rapport that was an important part of the research process. I had a relationship with the participants II and III as both teach at Punahou. Participant I had attended a previous presentation of mine on strategic planning, and while we had chatted at conferences, we had not previously engaged in any extended dialogue. I had no prior relationship with the participants IV and V who work at the other independent school. The primary goal of this first round of meetings was to have the participants begin to feel comfortable talking with me about their decision-making, which included the expression of questions, doubts, conflicts, confusion, and pressures.

During this initial meeting, all of the participants responded to my request to keep reflective logs of their decision-making. Four of the five did keep logs during the summer months and through the first few weeks of the school year. However, when I checked in with them in early September, it became clear that for three of the participants, pausing in the course of a busy day to write about, record, and reflect on a decision was often passed over for more pressing or urgent matters associated with launching a new school year. This pattern might actually suggest that while we all are constantly engaged in decision-making, few of us take the time to deliberately record and reflect on the decisions we have made. When asked, all five of the participants expressed
a preference for meeting in person to talk about their reflections and observations. Subsequently, instead of collecting logs followed by a concluding interview, I modified the research design and interviewed each of the individuals twice, once in October while they were in the early stages of the program matrix, and again in November, five months after the seminar.

While the logs I did collect were reflective in nature, the interviews in comparison were richer, deeper, and more candid. During these conversations I was able to ask variations of questions that invited and prompted the participants to elaborate on an observation, reaction, or insight they had about how they had arrived at a decision. The logs were records of events or memories, but were relatively two-dimensional compared to what I was able to learn through the interviews. In those sessions the participants were all eager, insightful, and animated in how they talked about their decision-making experiences. In some ways, it was like panning for gold, as each interview seemed to yield nuggets in the form of statements about their experiences that informed either a modification to the program matrix, or a new insight into how individuals or groups make decisions.

Post Seminar Perceptions of Decision-Making

After the seminar, four of the five participants completed a post-seminar feedback form asking them to reflect on how their decision-making might have been influenced by what they had learned or experienced. One of the participants did not return the post seminar survey, even after two follow up requests, and was inconsistent in her response to emails throughout the study. However, she was very engaged in the seminar,
enthusiastically participated in both of the interviews, and used the program matrix for several initiatives, as did the other four participants.

In the follow up survey and interviews, all five of the participants indicated that the seminar had an impact on their decision-making. The language participants used to express this indicated that what they had learned in the seminar, and reflected upon afterwards, impacted each of them differently. The participants that used the strongest language (I, IV, and V) made references such as: “definitely altered my understanding,” “it was incredibly helpful,” and “uber helpful.” They elaborated by explaining that “I now have a stronger awareness about these heuristics,” or “it will definitely make me think hard and more deliberately about conclusions that my team and I reach,” and “I am much more self aware of things that I naturally do or tend to do.”

Three Months Post Seminar

Becoming a More Deliberate Decision-Maker

One of the strongest responses came from participant IV who, in the first interview, consistently made references to “my previous self,” and “my past iteration of myself” as a comparison of her decision-making pre and post seminar. In the pre-seminar survey this individual described herself as a deliberate, reflective, and analytical decision-maker. She was one of the participants who post seminar mentioned she had heard of heuristics, but not in the neurologically based context they were presented in during the seminar. While she did describe herself as deliberate prior to the seminar, afterwards she acknowledged that, “Before the seminar I thought I was a pretty good decision maker. I thought I was pretty good about thinking through things. After the seminar with learning about the heuristics… I think I’ve even slowed down the process
even more.” She elaborated by stating how she perceived herself to be thinking more systemically and intentionally about decisions, taking time to anticipate how a decision might impact areas of the school beyond where a decision is focused. This individual was contemplating a curricular change in a content area, and cited how originally she might not have been thinking through how other divisions in the school might be influenced. She said the considerations outlined in the program matrix helped broaden this planning.

**An Element of Doubt**

One surprise result of my analysis was learning how the seminar introduced an element of doubt about their own decision-making for two of the participants. Participant II shared how his increased awareness of the heuristics created a degree of uncertainty and discomfort. He stated, “coming out of this experience [the seminar] I feel apprehensive about moving forward with new ideas. I feel less confident in my own thought process, wondering if I have considered all of the influences that might be at work.” As we spoke further during the course of the interviews, I came to understand that this individual, whom I found to be highly self-reflective and self-aware, was questioning not only how the heuristics might be influencing him, but was wondering if he might inadvertently be using heuristics to influence others. He recognized his capacity for persuasion, and was really questioning and monitoring how he was using his knowledge of heuristics to influence the decision-making of others he was working with.

Participant IV also expressed some doubt: “It was certainly uncomfortable to hear that we are so susceptible to these mental shortcuts, which may lead to some pretty bad decision-making.” What she learned about the heuristics seemed to create some
uneasiness for her: “After your seminar it’s made me really question a lot of those things that we as a school do.” She was, however, not paralyzed in her decision-making, as she also stated, “Like you said, being aware of them, [the heuristics] at least makes us pause and think.” Prior to the seminar this individual emphasized her reliance on research to inform a decision, whereas post seminar she expressed being more attuned to the subtle effects of the heuristics, particularly the framing effect.

**Increased Awareness of Tendencies**

Two of the participants used more moderate language to affirm that the seminar had impacted their decision-making. Participant III found herself, “thinking about the reasons I use to make decisions, even if it is just a minor decision.” Participant V explained, “I’m much more aware of how things are being presented and decisions that have been made or that are going to be made.” They seemed to express a degree of curiosity about the neurology, “I’ve wondered about this, regarding how it is that the brain uses short-cuts.” The person who stated this was one of the reflective thinkers, describing her approach to decision-making as deliberate and measured. She indicated what she had learned about the influencing a decision.

**Attuned to Heuristics**

Another example of how one of the participant’s perceptions of their general decision-making tendency changed after the seminar was participant V, who initially described herself as a highly intuitive decision maker. Prior to the seminar she expressed that she was confident making decisions based on gut feelings. As she monitored her decision-making in the months after the seminar as she used the program matrix, she revealed in her log and shared in the interview: “I like to think that I go with my intuition,
I don’t. I go back and reason through it.” While leading the planning for a school event she noticed how she initially had a strong “sense” of what she wanted to do, but in actuality, through the use of the program matrix, came to realized how she does go through a reasoning process, looking closely at the rationale she was basing her calculations and estimates on.

This same participant was probably the most attuned to the heuristics. Immediately after the seminar she requested an overview, a cheat sheet of sorts, which I created using the same graphics from the seminar slides and included a brief definition of the heuristic as a prompt (Appendix E). Based on her feedback and recommendation I sent the overview to all of the participants. This individual kept this overview on her desk next to her laptop, and shared that she would refer to it while in meetings or writing in her log. As we spoke, she frequently used the language of the heuristics, and was particularly attuned to the framing effect. While our discussion focused on school related decisions, she also shared that her father was in the hospital and that she was in the midst of some very significant family related decisions. Interestingly, she frequently referenced how sensitized she was to how the doctors were “framing” her father’s medical options. This indicated a strong awareness of heuristics on her part, applied to personal decisions outside of her professional capacity.

**Alternative Framing**

Participant III, who, prior to the seminar, had no reference to heuristics, used the framing effect to suggest an alternative framework for how I had presented the concept of heuristics in the seminar. Consistent with the bulk of the literature, I presented the heuristics as “traps” that need to be monitored and mitigated. This participant expressed
how she was using her new awareness of heuristics in a manner that she described as “purposeful” as opposed to a “trap.” She shared that she had become much more intentional in how she framed issues brought before her department based on her new understanding of how framing can influence the course of a discussion or the direction of a decision. She did not express that she was being deceptive or manipulative; rather, she explained that she felt she was using the framing effect to lead her team more effectively.

**Five Months Later**

I maintained contact with each of participants throughout the fall semester, checking in and sharing additional literature about heuristics, neurology, and decision-making. The second round of interviews with the participants, conducted one month after the initial interview and five months after the seminar, focused on the longer term impacts of the seminar and the participants experience with the program matrix as they developed a program or proposal. As an expression of their unique decision-making styles, each of the participants had a different story to tell about decisions they had been engaged in over the course of the five months, all narrated in the context of themes from the seminar.

**Heuristics and Hiring**

Participant I, who had described herself initially as a reflective, contemplative decision-maker, had just concluded a busy period leading a job search. The process was highly collaborative, involving several people throughout the process leading up to the final decision. As the paper credentials of candidates were screened and interviews were conducted, the participant described an increased awareness of her decision-making inclinations. As the candidate pool was narrowed and the second round of interviews
scheduled, the participant described how she monitored herself for confirmation bias, one of the heuristics covered in the seminar. She reported that she did not have knowledge of this heuristic prior to the seminar.

She shared that her awareness of this heuristic became particularly important as she conducted the reference checks. She acknowledged that she did have preferences for certain candidates based on information she has access to from sources beyond the paper credentials and interviews. She monitored how she conducted the references checks, careful to not simply confirm her inclinations, but also asked questions that might challenge some of her preferences, “I’m making sure that I’m making it [the hiring decision] not based on a heuristic, but based upon what is best for the organization.” This demonstrates the efforts she was making to monitor her own patterns of thinking and decision-making, and that she was aware of the potential heuristic of seeking out or gravitating to information that would confirm a previously held perspective. This is consistent with statements she made after the seminar expressing how she had a stronger awareness of the heuristics in general and felt she could recognize them when she, or someone else, was making a decision. While this participant primarily focused on the heuristic of confirming evidence, she did feel that her decision-making process had changed “in a sense that I am more self-aware.”

**Phases of Change**

In the second round of interviews, participant II reiterated how the seminar introduced an element of doubt as he discovered heuristics in his decision-making, and realized how he used them to influence the decision-making of others. In his pre-seminar description, he described himself as reflective and deliberate, but listened to his intuition
when he felt it was time to make a decision. In our first interview he spoke at length about this element of doubt, whereas prior to the seminar he felt confident in his decision-making, and was surprised to find himself pausing afterwards. He did not necessarily perceive this as a weakness, rather, he just found himself being very careful and deliberate.

I raised the question of doubt in our second interview as I wanted to learn more about the apprehension he expressed after the seminar. He shared that he had continued to explore how heuristics might be rendering him less than objective, potentially even enabling him to manipulate others by using what he had learned about heuristics to influence their decisions. He explained how he had gone through a series of phases after the seminar. In the weeks immediately following, he described a period of doubt, characterized by hesitation as he wondered which heuristic might be influencing his choices. As he became more skilled in recognizing the manifestation of heuristics in his own decision-making, he went through a period he labeled “strategic manipulation,” finding he could use a heuristic to influence others to agree to a desired outcome. He revealed how he experimented, playfully, with framing by carefully presenting options to individuals using particular language to see how it might influence their support or endorsement of an idea.

This individual used the program matrix to advance a sustainability project that engaged a broad range of school personnel, from physical plant workers, to teachers and administrators. He described how he was attentive to how he framed decisions for physical plant workers differently than he would if he was trying to get a teacher, or administrator involved. Through recognizing the differences in points of references,
priorities, and language, he adjusted the framework to fit the orientation of the individual. After this experimental stage, which he discovered might have the potential to actually be manipulative, he reverted to his natural inclination of being highly reflective, yet trusting his instincts about when it was appropriate to make a decision.

This individual expressed some of the strongest endorsements for the program matrix by emphasizing how he felt that information that was openly shared mitigated the influence of heuristics, or at least was a more positive form of heuristic. In addition to his comments about the program matrix, this individual spoke extensively about the influence of school culture on decision-making. He felt very strongly that how individuals within an institute interact, communicate, and share information has a tremendous impact on how decisions are made, perhaps in ways similar to how heuristics influence decision-making. This suggests that organizational culture can become a form of heuristic by similarly influencing decisions in ways individuals are not aware of.

**The Importance of Framing**

Participant III described her decision-making style prior to the seminar by explaining how she initially has an inclination of what she would like to do, but then becomes reflective and analytical, taking time to consult with others before she decides. She used the second interview to talk extensively about a decision her department was entangled in regarding a course designation and graduation requirements. It was evident that she had a clear sense of the outcome she desired, and described in great detail the positions of others involved in the deliberations. She outlined the considerations influencing the pending decision, which could have a significant impact on the course offerings and staffing of her department.
When I inquired if there were any specific heuristics she was noticing, she stated that she was thinking about them in an “integrated way,” aware that heuristics, in general, were influencing her decision-making, as well as the others involved. She described how she was trying to slow down her thinking, and demonstrated an awareness of how her use of language would influence others. She spoke about being attentive to the framing effect, and described how it so often influences the outcome of the decision. The example she discussed in the interview involved whether a class was to be designated as a “seeker course” which fulfills certain graduation requirements. While the adults tend to frame the “seeker” designation philosophically, she suggested that student decisions are made for practical reasons having to do more with convenience and time of day, a completely different framework. As department chair, this was important to her as the decisions the students make determines teaching loads, staffing, and potentially the full-time status of employees, making this decision a good systems case study.

This participant used the interview to discuss this decision, which was clearly weighing heavily on her, in part because there was a high degree of uncertainty about who and where the decision would be made. This ambiguity, coupled with the influence of a very strong personality forcing the decision, was a source of tension for this participant. While she was clear and composed in expressing the rationale for her position, the dynamic of a strong and persistent individual was challenging for her. One of the steps this participant took in her capacity as department chair was to invite the deans to a department meeting to “clarify some of the assumptions” being attributed to why the students were selecting the course in question. She felt this would have a significant impact on how the decision was framed. While she did not ascribe this
directly to the seminar, the program matrix is designed to surface assumptions early in a
decision-making process. One of the suggestions made during the seminar to help groups
work through disagreements is to spend time talking about and clarifying basic
assumptions. When I inquired about how this department validated or substantiated their
assumptions, she referenced a student survey. As rational as she was in how she framed
the decision, it was also evident how concerned she was about the potential undue
influence of one strong individual. Her decision-making dilemma raised questions not
only about the influence of heuristics, but how a strong personality might have
disproportional influence over a decision, particularly in the absence of a process or tool
like the program matrix.

**Both Rational and Intuitive**

Participants IV and V are on the administrative team of their school and were
intimately involved with their board in making strategic decisions that altered the
composition, identity, and future of their school. The very survival of their all girls’
school was potentially in jeopardy as a result of significant enrollment challenges. The
decision was made to create an all boys’ school which would be a part of, but be run
parallel to, the all girls’ school, altering the historical and instructional composition of
their institution.

While they were going through this decision-making process, confidentiality was
essential as the announcement and messaging needed to be meticulously managed.
Consequently, during the first round of interviews both of these participants focused on
the decision-making associated with the program they were using program matrix to
develop. However, during the second interview, when they could both be more candid,
they were able to openly reflect on their observations, experiences, and role in the significant decisions made at their school.

Participant IV, prior to the seminar, described herself in very strong terms as a highly reflective and analytical thinker. She elaborated on this by explaining how she relies heavily on research and information when making a decision. This tendency was well suited for the role that she played in her school during the decision-making process as the board of trustees relied on her to present the research on how gender influences instruction. She found that the board wanted a concise synthesis of the research, and she was tasked with creating a summary in a consumable format. She made this point in reference to several studies presented in the seminar that explained how decision-making tendencies are neurological altered when faced with abundant amounts of information and high degrees of complexity.

Of all the heuristics, she was most aware of her potential for confirmation bias, and recognized it in the others she was working with. She described the strong emotional dynamic of the decision-making group as they weighed the prospect of altering the configuration, culture, and history of an all girls’ school. Consequently, she monitored how she and others attended to the research she presented. She wanted to be very careful, in her words, to not “cherry pick” studies or facts that confirmed a previously held perspective. As she delved deeper in the research, she found, inevitably, that there were studies that favored both sides of the co-ed, single gender argument. It was apparent how responsible she felt for presenting a balanced perspective. Once the decision had been made to proceed with two single-gender schools existing side by side, she consolidated studies that supported the single gender option.
This participant was also acutely aware of the power of framing. She described how one of the educational consultants the school had retained helped her reframe the rationale for the decision in positive, rather than “dire” terms. As the research summaries were being prepared for the board, the participant described how they initially had cited research that referenced boys “in peril,” highlighting how boys were floundering in schools. She concurred with the consultant’s suggestion that the decision be framed by providing examples of studies emphasizing boys thriving in schools that catered to their gender-based needs. She felt this adjustment in framework significantly altered the outcome of the decision. Interestingly, the board gravitated to the “in peril” model, which she felt created more of a sense of urgency. In contrast, the decision was made to frame the public messaging for admissions by accentuating the positive aspect of single-gender education, which they felt would influence parent decisions about where to send their children to school.

As we discussed how the board came to this monumental decision in the history of the school, a case study in and of itself, I asked her to reflect on her own decision-making process, given that she was a significant stakeholder by virtue of being the mother of a boy who would be kindergarten eligible. We were both cognizant of the fact that she describes her professional self as a highly deliberate and analytical decision-maker who relies heavily on research. In question was whether she would approach a personal decision similarly.

Her ability to express the depth of her reflections was apparent as she articulated the considerations she personally weighed. During this part of our conversation I was able to ask follow up questions to see if the availability heuristic played a part in her
personal decision-making. I wanted to explore how her familiarity with the needs of her son might influence her professional recommendation to the school. She responded by using language from the seminar, referencing the Kahneman-Gladwell dichotomy: “I’m definitely the more systems 2 type thinker, but I am appreciative, I am aware of or acknowledge…I see the value of the gut thing, where you definitely know.” She went on to explain that her initial, intuitive inclinations were that two single gender schools existing in parallel was a feasible model, and in a very practical way, was a solution to the enrollment challenges of the school. This is an interesting observation in that pre-seminar she described herself as deliberative and rational, yet noticed and acknowledged her strong, initial intuitive inclination about supporting an all boys school, which she then embraced after a careful and rationale process. On the personal side, she definitely plans to enroll her son, who is now featured in the promotional flyer.

The decision to reconfigure the school was also the focus of the interview with her colleague, participant V. In our second interview she was very open, expressive, and animated in how she told the story of the decision to open an all boys’ school. I framed the question by asking if she felt the decision was reached intuitively and emotionally, more “Gladwellesque,” or if it was more of a rational process informed by research, analysis, and careful strategic deliberation, more characteristic of Kahneman’s systems 2 thinking.

Both of these participants told the story of how a year prior, while at a school picnic at the beach, they were engaged in a conversation about the future of their school. When the Head of the school arrived, she joined their conversation, and shared that the previous night, potentially in a dream, she was overcome with the inclination that the
solution to the school’s conundrum was to admit boys, but preserve their single gender legacy by keeping two distinctive entities under one umbrella.

This revelation triggered a yearlong strategic process involving consultants who led the board through a careful analysis of business and feasibility plans. The educator’s role was to review and synthesize the research on gender related instructional models. Both of these participants shared how inspired they were by the conversation that took place on the beach at the school picnic. It did appear that the decision-making process started with the end in mind of creating a boys’ school, which was later analyzed, scrutinized, and validated: “Our guts were saying, this is the right thing to do, but this has got to be a decision based on reason, not just — I was visited by the Queen.” Both of these individuals spoke passionately about that moment at the school picnic, describing it as the catalyst for the entire decision-making process.

**The Influence of Heuristics on a Major Decision**

This participant, more than any other, referred directly to specific heuristics, in both occasions going directly to her desk to show me how she kept the overview next to her laptop and referred to it throughout the day. As we discussed her school’s decision to open a boys’ school she spoke extensively about the framing effect. She spoke with conviction about the importance of managing how the decision was framed and announced to the different school constituencies and public. She emphatically stated how important it was to never use the word “co” in order to avoid any implication that the move was towards “co-education,” which would have been perceived as an abandonment of the single gender legacy of the school. Her implication was that a simple prefix, “co”, a form of framing, would have a tremendous impact on parent’s enrollment decisions.
She spoke about the importance of “priming,” referencing the multiple ways in which the administrative team had prepared the community for what was to be a monumental announcement in the life of school. Consequently, the communication strategy was meticulously and carefully rolled out through a sequence of announcements to the internal and external school communities, alumni, and press. She spoke extensively about the considerations involved in bringing a community along in a decision of this magnitude. She pointed out, as another example of the framing effect, how their word choice, tone, and the timing of the announcement impacted the response of the community to a potentially controversial decision.

This participant used the program matrix to plan a school community event at the beginning of the year as part of this priming process. Although she could not reveal in our first interview that the event was associated with the eventual announcement to open the boys’ school, she explained in our second interview that the purpose of the event was to “prime” the announcement by demonstrating that the school was a cohesive, unified community. She explained how important it was that the decision be perceived as coming from a position of strength, building for the future, as opposed to a response to enrollment challenges.

Reflecting on how this decision impacted her personally, this participant spoke about how, prior to and immediately after the seminar, she perceived herself to be a highly intuitive decision-maker who “trusted her gut.” As we discussed her role in the decision at her school, it was clear she was emotionally involved, as an employee, past parent, and alumna. Administratively, her role was to help anticipate how the parents might interpret and respond to the decision, and to anticipate the instructional and cultural
impacts on the school. As an alumna, she had to sort out her own feelings about the legacy of the school possibly changing, and anticipate how other generations of alumna would respond to the decision. As a past parent, she communicated with her daughter and her friends as they reacted to the announcement. It was evident that this decision, both in terms of magnitude and duration, impacted and taxed her professionally and personally, more so because she was not even able to talk to her spouse about it for almost eighteen months due to the carefully guarded rollout.

In spite of describing herself as a highly intuitive decision-maker prior to the seminar, this participant in the months following expressed how she discovered that she was in fact more rational. As she monitored and reflected on her own processing of the decisions she was involved in during the fall semester, she acknowledged that she does indeed have a strong, initial, emotional tendency when approaching a decision, as she did in this case. However, recognizing this tendency, she seemed to come to a better understanding of how she then proceeds to go through what she described as a highly rational process of thinking through, deliberating, analyzing, and informing a decision. The decision to include boys at her school was a significant change for her, perhaps more so than for others given her multiple roles and connections to the school. Even so, it was clear that she not only endorsed the idea, but was also a strong advocate and key player in the messaging. She seemed to relish her role of communicator and was emphatic about the importance of framing the message in a particular way in order to influence the decisions of the current parents, as well as those that would become a part of the admissions process. She attributed this tendency, in part, to the seminar: “More than anything [the seminar] caused me, and it still does, to really think about my thought
process.” One of the main purposes of the seminar was to help the participants become more reflective decision-makers by providing them with information, context, and a vocabulary to monitor the considerations they base a decision on.

**Response to the Program Matrix**

The program matrix was used to guide the development of twenty-two proposals at Punahou during the 2013-2014 academic year. The Junior School Administrative Team, the administrators that work directly with K-8 faculty, reviewed all of the submissions. The Professional Development Review Committee, a K-12 administrative entity that makes the decisions about the allocation of funding for sabbaticals, fellowships, and other professional development endeavors, reviewed ten of these proposals. Participants II, III, IV, and V used the program matrix during the fall semester and provided feedback about how the matrix influenced the planning and decision-making associated with a project or initiative they were leading in their school. Participant V’s project was delayed until after the writing of this dissertation, however, given her extensive experience working with schools and non-profits throughout the islands, she was able to provide perspective and feedback about how the matrix might be applied to other institutional settings.

**The Program Matrix as a Placeholder**

One of the most consistent themes from the seminar participants was how the program matrix functioned as a “placeholder” because it “gave decisions a structure,” and “made thinking visible.” Participant II was one of the most enthusiastic users and described the matrix as “a template for growth, for learning.” This individual used the matrix to further an ambitious endeavor of using the campus landscaping as a curricular
tool. This required collaboration between a diverse group of participants from a variety of departments, roles, dispositions, cultures, educational backgrounds, and life experiences. He used the program matrix to consolidate the planning of this project as a way of migrating a diverse group towards common philosophical orientations and decisions.

This participant’s project involved using the natural elements of campus to teach students about the diversity of an eco-system. His own learning, however, was more focused on the diverse eco-system of individuals he interacted with while advancing the initiative. Moving this project forward required coordination between the instructional, maintenance, and administrative entities within the school. The challenging dynamic for him was the absence of common values and beliefs between these roles, which tended to manifest in moments of decision-making. This participant suggested a slide be added to the program matrix outlining the complex web of relationships between all of the people involved in the decision-making process. He thought a diagram of the system of individuals and departments that have a role in decision-making would be helpful in navigating the web of who and where decisions are actually made in a large organization. His feedback and advice was that as important as it is to outline assumptions, outcomes, and evidence of learning, it was equally important to develop a shared understanding of where in the organization decisions are made. His experience was that it was often unclear where, when, or who was actually making decisions, and his recommendation of adding a slide that clarified this organizational dynamic would decrease disruptions and delays.
Even though he considered and tried several projects before settling on this particular one, his confidence grew as he gained experience with the program matrix, “it’s something now that I can trust, that I can go to when I need it.” As evidence, he requested an additional copy of the matrix to use on a second project he decided to take on, as did two other participants. The fact that they opted to use the program matrix to initiate a planning process beyond the scope of this project is an indication that they found it useful.

**Intuitive or Not**

It was important to establish whether the design and format of the program matrix made it relatively intuitive to use. After a general overview, could users complete a matrix without extensive additional instruction? During the piloting stages of the first version of the program matrix, some of the administrators and faculty using the tool seemed to struggle with both the concept and format. One administrator in particular seemed to resist the first iterations of the program matrix. The spatial orientation of the program matrix challenged her preference for linear processes, demonstrated by the way she printed her first proposal on paper in list form, as opposed to working on-line in Google Docs using the schematic presentation slides.

The second version of the program matrix was presented in the seminar in the context of the research on the neurology of decision-making. The rationale behind the design of the matrix was explained, followed by an overview of the format and a demonstration of the functionality. This version was also shared with the K-8 faculty during the first meeting of the school year. The faculty did not, however, have the benefit of the seminar, which more fully established the rationale and neurological
context behind the program matrix. The third version of the program matrix was shared with the participants of the study in October, and was distributed to all K-8 Punahou faculty submitting proposals throughout the school year (Appendix D).

All five of the seminar participants expressed a preference for the third version of the program matrix, as did the Punahou faculty who submitted proposals and had seen and worked with both the second and third versions. Participant IV pointed out that moving the assumptions earlier in the planning process by listing them directly below the title statement clarified the planning process. Additionally, the language of “evidence of learning” as opposed to “assessments” seemed gentler and resonated with users. The question of whether a proposal was to be perpetuated, along with the anticipatory thinking about the resources that might require, was imbedded in the slide for “longer term outcomes” as the section labeled “sustainability” was not as clear to users in the first two versions. These revisions to the program matrix are an example of a “developmental evaluation” as the tool was modified during the research process as information was gathered and considered.

Each of the participants stated that the seminar demonstration showing how to use it enabled them to begin working with it immediately, suggesting that the process was relatively intuitive. The Punahou faculty that used the program matrix for professional development proposals also indicated that while the introduction done in the faculty meeting was brief in comparison to the seminar, they were able to get started, and for the most part figure out how to use the tool on their own. If they were not able to do so, administrative support was available.
Participant I did suggest I allocate more time in the seminar to go over how to use the program matrix in greater detail for those that might not be as familiar with the technology. Participant II, who attended both the seminar and faculty meeting, suggested that in addition to the overview presented during the meeting at the beginning of the year, a separate session might be held for faculty who needed or wanted a more detailed explanation. Just as students demonstrate a range of learning needs and styles, so is true with faculty. Consequently, offering a variety of formats to go over the rationale, structure, and technology of the program matrix would better meet the needs of a larger number of users.

A consistent theme expressed by the seminar participants in their interviews and the Punahou faculty who responded to a survey soliciting feedback, was that even though how to use the program matrix was initially relatively clear, actually working through a proposal was the most effective way to become proficient: “As with any tool, the more I used it the more familiar I became with it. The latest iteration is helpful and seems to be self-explanatory.” Or: “The concept and design were relatively intuitive, but I did avail myself to more explanation and/or training from both Mike and Cathy K-C.” Another faculty member shared:

The matrix was straightforward and although it was clearly explained at the opening faculty meeting, for me, the best thing was just to go ahead and do it. Having feedback once the matrix was submitted was very helpful, especially in finding any areas that needed clarification or further expansion. The administrator who struggled with, or seemed to resist the first version of the program matrix did eventually became more proficient, confident, and supportive. She
worked through several relatively more complex proposals and was able to successfully coach groups through the completion of their proposals. I was not able to determine if this administrative resistance was a result of my positionality, or whether it verified that using the program matrix over time improves proficiency.

**Technological Ease of Use**

Although some of the users at Punahou experienced a learning curve with the technology, all five seminar participants expressed that they had the technical skills required to use the program matrix. Several actually seemed surprised that I had asked, and explained that they generally just jumped in and felt confident they could figure out a function if they needed to, as several did. Participant I did suggest offering a PowerPoint version for individuals less technically able, although she recognized that would limit the collaborative features.

I worked directly with one faculty group at Punahou that seemed a little disoriented with the technology during the initial stages of a proposal. I found that if I manned the keyboard and filled in the various components of the matrix as they talked, which I projected onto a large screen the entire group could see, it freed them up to engaged in a more open and flowing discussion. This seemed to improve the dynamics of this group by liberating them from the technology. It also allowed me to coach them through the decision-making components of the program matrix. As I listened to their conversation, I could point out when they were talking about “resources” or if they had just identified a potential “outcome.” Playing this role enabled me to coach the group through the thought process, which in this case seemed helpful.
The Exploration of Assumptions and Evaluative Measures

Working directly with this group enabled me to prompt them to explore their assumptions more deeply, something I found decision-making teams do not habitually or naturally do. Throughout this process I needed to prompt both groups and individuals to spend more time thinking and talking about the assumptions imbedded in a proposal. The tendency is to leave assumptions unstated, creating the illusion of shared understandings, which later often manifests as conflict or disagreements. As groups became more comfortable stating assumptions earlier in a planning process, they were more likely to develop understandings that could be referenced when it came time to make a decision.

I also found that if individuals and groups were able to articulate assumptions, they were better able to think about the evaluative measures, or evidence of learning. Assumptions, clearly stated, often can be translated into the very questions that need to be explored, tested, or measured. For example, Participant III used the program matrix to submit a proposal to build a “parcourse” on campus — a system of exercise equipment stations. Two of the assumptions she included in her proposal were “students, faculty, staff, and parents value health, wellness, and being physically fit” as well as “there is a need for more exercise equipment on campus.” As she developed her proposal, she came to see how she could collect data about usage patterns as a measurement of need and interest to test and validate these two assumptions.

Communication and Collaboration

While some proposals were submitted by individuals (i.e. sabbatical applications) the writing and planning involved in completing a program matrix in every case involved
several people working together. Participant I described the program matrix as a tool that “helps organize their thoughts, makes sure all of the moving parts are there, which is beneficial, and I think it also helps with communication.” While the communicative properties of the program matrix were referenced by several of the participants, the notion of the program matrix fostering collaboration did not surface as a theme in the interviews, even though it was one of the sensitizing concepts being explored.

The design of the program matrix was based on the premise that the online format would foster and encourage collaboration because it enabled multiple people to work on a shared document. The fact that this did not surface on its own as a theme during the interviews does not necessarily imply that the program matrix was not used collaboratively, but perhaps suggests that is it not obvious how it can be better utilized to do so. Another influencing factor might be the more public nature of how a proposal is developed as a Google Doc. The “culture of excellence” at Punahou tends to encourage faculty to share proposals that are more of a finished product representing their best effort. The collaborative nature of the program matrix instead encourages the sharing of ideas early in the development of a proposal when ideas are more fluid and less polished. As collaboration invites and requires participation, the more open access of the program matrix is still being reconciled at Punahou as groups become more comfortable working on an online document that is shared earlier when an idea is less refined and still in the process of being developed. Nevertheless, the “share” feature allows users to exercise a high degree of control over when and what kinds of access users are given.

Every individual or group that used the program matrix worked directly with his or her supervising administrator or myself, another change prompted by this process.
Prior to the program matrix, ideas or proposals were often developed in relative isolation, and then brought forward for administrative approval when finished. Instead of being perceived as a gatekeeper, deciding “yes or no” at the end of a process, the Supervisors and I became partners in planning, helping to develop the various considerations of a decision. Even though funding was not approved in every case, the interactions that took place during the process of building the proposal seemed to provide a relationship that made receiving the disappointing news more manageable. I met with each of the individuals whose proposals were not funded to explain the considerations and rationale for the decision, which they seemed to understand and appreciate. Those who did receive funding stated in their feedback that the process definitely was more inclusive than it had been. They also expressed that they had a better understanding of who and where the decisions about funding were being made.

**The Neurology Rationale for the Program Matrix**

The visual layout and technology in which the program matrix is housed is intended to facilitate systemic planning and decision-making. Even though the program matrix was simplified through the three iterations, it still requires a significant investment of time, energy, and mental effort to think through the assumptions, resources, outcomes, and evidence of learning that make up a proposal. Kahneman states that we are not naturally systems 2 thinkers in large part because of the additional mental effort required. The neurologists suggest that because we are hard wired for survival, we by default conserve energy, and mental effort consumes energy (Kahneman, 2011).

Participant II shared that she had faculty ask if “they had to fill this out?” when she presented the program matrix. I encountered some initial resistance at Punahou,
although less so from faculty requesting professional development funds, perhaps
because the potential distribution of resources was an incentive. Nevertheless, there was
an element of resistance from some faculty and even some administrators who were
steered to the program matrix to frame a proposal in order for a decision about funding to
be made. They seemed to struggle with or passively resist the process of stating
assumptions, providing evidence of learning, and thinking through a proposal in a
systemic manner prior to a decision being made. This might have been simply because
the format was different and therefore required more cognitive effort, consistent with
how we neurologically respond to change. Thinking in a systemic manner about the
various considerations of a proposal was also more extensive than what had previously
been required, which might have contributed to some of the early resistance, reinforcing
the neurologically hardwired survival instincts.

I am aware of issues related to positionality of the proactive researcher as I had
influence over how proposals were submitted. It is possible there were sentiments that
the changes in the process were being advanced purely in the interest of my dissertation.
My goal was to improve the system of allocating professional development funds,
making it more research orientated and collaborative. The decision-making culture being
changed in the school was the observed pattern of predominately emotional or intuitive
commitments being made to an idea or a direction prior to the more in-depth thinking
about systemic impacts. The practical requirements for implementing and sustaining an
idea were often addressed after the fact or resolved during implementation. Using the
program matrix to inform and validate a decision about a proposal required more effort
and collaboration, which might explain some of the initial resistance. In every case, the
resistance came from individuals who had not attended the seminar, suggesting the research based context and rationale seem to help validate why the program matrix is useful in guiding decision-making.

While all of the participants spoke about their decision-making in the context of heuristics, Participant V referred to the program matrix as a heuristic in and of itself. She explained this connection by using examples of heuristics discussed in the seminar, referencing how she used the program matrix to prime decisions. She mentioned the importance of surfacing assumptions in order to clarify and focus a decision, making a direct reference to the neurological limits in our capacity to manage complexity, “If we keep the basic assumptions to a minimum right? That we don’t get so mired in the details.” She was not suggesting that details were not important in planning, but pointing out how complex decisions are made when focused on a broader context.

Another interesting example was Participants V’s reference to the program matrix mitigating the influence of memory bias. She used the matrix to plan a community event for her school, which they planned to replicate as their school prepared for what was to be a significant change in structure and culture. She felt the matrix provided an outline of both the tasks and the decisions, which could then be referenced as the event was replicated. Her point, based on what she had learned in the seminar, was not to rely on memory, which is neurologically suspect, but to have a tangible record of the thinking, planning, and decision-making, which she felt the program matrix provided. While all of the seminar participants recognized heuristics in their own decision-making, she had the most significant insight into the connection between the program matrix and the neurology of the heuristics.
CHAPTER 5

SIGNIFICANCE: PERSONAL, PRACTICAL, AND INTELLECTUAL GOALS

As outlined in the introduction, my research was motivated by personal, practical, and intellectual goals. The two research questions are interrelated and interconnected, the first framing the theoretical context of the neurology of decision-making, and the second tests the applied practical application of the program matrix, a tool designed to foster systemic decision-making.

1. In what ways does an understanding and awareness of common decision-making heuristics change, improve, or influence decision-making?

2. In what ways does the “program matrix” influence how decisions are framed, managed, communicated, and made?

As a way of exploring the first research question, I created the seminar, “The Neuroscience of Decision Making: Improving Personal and Organizational Capacity.” Offered as a professional development opportunity, the seminar establishing the theoretical foundation for the study by synthesizing research on the neurology of decision-making, highlighting how we rely on and are influenced by heuristics. The practical application of this theory, expressed in the second research question, is an inquiry into how the use of the program matrix influences programmatic decision-making.

**Personal Goals: Impacts On My Professional Learning and Practice**

My research is motivated by the belief that understanding learning at its neurological foundation is the key to instructional improvement. For over a decade my strategy for bringing about instructional change has been to reference neurological
research as the validation for how learning environments and curriculums should be organized and designed in order to best meet the learning needs of students. Bringing about this magnitude of change in a school requires making thousands of decisions. Just as understanding the neurology of learning validates certain instructional practices, the research on the neurology of decision-making suggests that an awareness of common heuristics can improve individual and organizational decision-making, and the use of a systemic tool, like the program matrix, can make thinking more visible, resulting in more communicable and collaborative decision-making. Like most educators, I have had ample training in curricular design and instructional methodology. As an administrator, I have been a student of leadership theory. Nevertheless, often the most taxing aspect of my role is my engagement in decision-making. Longevity has provided experience, yet I recognized that I have received little if any formal training in how to make decisions, a pattern I have found for most educational leaders. While professional development opportunities on leadership theory are plentiful, there is an absence of training focused specifically on decision-making tailored to the circumstances and issues encountered in schools. This perhaps reflects an assumption that experience itself is the best teacher, or that some individuals are simply endowed with better judgment. In the same way I was motivated to understand learning at its neurological foundation, I was similarly inclined to explore the neurology of decision-making in order to approach strategic planning more consciously and systemically.

Recognizing that the act of teaching is a form of learning, creating the seminar as a professional development opportunity contributed significantly to my own professional growth. The research and literature I read while designing the seminar enabled me to
better understand and recognize the neurological basis of many of my own decision-making tendencies. As I came to understand the theory of heuristics, I began to recognize them both in myself and in the groups I work with. For example, it was uncomfortable at times noticing moments of “confirmation bias” as I observed how I was drawn to research that confirmed a perspective, and had to will myself to attend to studies that challenged a previously held notion. Delving further into the literature prompted me to pay closer attention to how I frame decisions. I better recognize how significantly word choice influences the direction of a discussion leading up to a decision. I am now more inclined to double check initial intuitive solutions to problems in an attempt to be a more “systems 2” thinker (Kahneman, 2011). I am now more attentive to framing issues analytically based on data and verifiable information, as opposed to proceeding on an inclination based on a perception. I recognize examples of the “availability” heuristic infiltrating mental models when high personal familiarity with a potentially isolated example has undue influence on a decision. In many cases I have experienced the almost surreal sensation of being both participant and observer. While I am involved in an array of programmatic and institutionally strategic decisions, I also now observe groups I work with respond in many cases just as the literature suggests we might, particularly when faced with highly levels of complexity or ambiguity.

**Impact on Others — Implications for the First Research Question**

My goal in creating the seminar was to provide a professional development opportunity for educators and organizational leaders. The seminar was designed to engage participants in a series of reflective activities to help them better understand their own decision-making tendencies in the context of research on the neurology of decision-
making. My first research question was an exploration of how this increased awareness and understanding influenced how participants made decisions.

A basic premise of this research is that an increased awareness of heuristics would improve decision-making. While the intent of the study was not to prove this point, it stands to reason that an increased awareness of how these predominately unconscious heuristics influence decision-making would mitigate potential biases or errors of judgment. The design of this study was to interact with seminar participants as they were engaged in actual decisions in their schools or organizational settings over a period of time. The nature of the decisions made in the months following the seminar were not controlled experiments designed to compare the outcome of one option relative to another. That was neither the purpose nor structure of this study. This research was an exploration of how an increased understanding of the neurology of decision-making in the context of an awareness of the theory of heuristics influenced the participants’ decision-making.

Just as immersing myself in the literature review while preparing the seminar made me a more reflective and deliberate decision-maker, that was also the case for all five of the participants who informed the case studies. For example, Participant IV spoke of herself in terms of “my previous self” as an expression of how much she felt her decision-making had evolved in the months following the seminar. Even though she originally described herself as a highly intentional and deliberate decision-maker, a disposition she brought to a complex professional decision she was involved in at her school, she also recognized that when she made a personal decision about what school her child would attend, she acknowledge that she listened to, and made the decision based
on, her “gut feeling.” This suggests that for some types of decisions we might be more “Gladwell like,” meaning we listen to our intuitions, and in other circumstances, we become more deliberate and cognitively engaged, as Kahneman would advocate we should. Perhaps it is less a question of whether we should be more systems I or systems II thinkers, but have the ability and versatility to recognize different kinds of decisions benefit from different approaches.

Another example of how one of the participants perception and understanding of her decision-making style evolved pre and post seminar, was Participant V. Pre-seminar she perceived herself as being a highly intuitive decision-maker, but came to realize, after monitoring her decision-making after that seminar in the context of what she had learned, that she was actually much more rational and thoughtful. As she reflected on her decision-making while engaged in a historical and emotional decision at her school, she came to understand that while she does have strong intuitions, she is actually more rationally reflective than she had described herself pre-seminar. She was able to apply what she had learned about heuristics not only to the professional, school related decisions she was involved in, but she also saw examples of heuristics in significant quality of life decisions she was making regarding her father’s health.

Participant II also gained insights into his decision-making as he worked through a period of uncertainty as he questioned how heuristics might be influencing his decision-making. During what he labeled an “experimental period,” he explored how he might be using heuristics to prompt others towards a particular decision. After a period of self-reflection, he described himself as a combined intentional and intuitive decision-maker. He continues to trust his intuitions, but now goes through a highly reflective analysis
prior to deciding on a direction or outcome. What he learned about heuristics increased both his awareness of his own decision-making, as well as the influence he can have on others.

Participant I, who described herself as a very deliberate decision-maker prior to the seminar, reported that what she learned about the neurology of decision-making increased her intentional tendencies. Through her reflections of her decision-making, she expressed an increased ability to monitor for and mitigate the influence of bias while involved in a significant hiring decision. Keeping the needs of the organization in focus, she managed potential subjective preferences, and used her understanding of heuristics to lead a process that was thorough and objective.

Participant III used what she had learned about heuristics to reframe the very premise of how I presented the concept of heuristics. As opposed to being seen as unconscious traps to be avoided, she emerged from the seminar with the insight of using her new understanding of heuristics to more intentionally frame decisions in positive terms for the team she leads.

The feedback from the seminar participants indicated that they all increased their awareness of their decision-making tendencies as a result of what they had learned in the seminar, and found ways to apply the theory to their practical, professional work. I cannot with certainty say the participants made “better” decisions, which was not my intent. I can suggest that an increased awareness of how they are now making decisions has improved their understanding of why they arrive at the choices and conclusions they do.
Practical Application: Decision-Making Theory and the Program Matrix

While my personal goals were to better understand how I was making decisions and translate that into a seminar that might be of value to other professionals, my practical goals involved creating a tool and a system that could be used at Punahou, and potentially other schools, to improve programmatic decision-making. Punahou has strategically resourced the professional growth of the faculty, recognizing how professional development funds can be a catalyst for instructional improvement. The need addressed by this study was to create a systemic process, grounded in research on the neurology of decision-making, to guide programmatic decision-making in order to more fully leverage the impact of resources.

Multiple Iterations of the Program Matrix

The program matrix went through three iterations based on feedback from the primary users. The first version was a schematic template based on a logic model that framed the considerations of a programmatic proposal. Housed as a PDF file, this relatively static format did not lend itself to collaboration and continual iteration. I migrated the second version to Google Docs, enabling the multi-user tools to encourage collaboration and iteration. However, based on feedback from the users, the overview seemed overly complex, which might have triggered some resistance as it was more cognitively challenging. The third version simplified elements of the overview, and proficiency with the technology improved with use. Over the course of the two years the program matrix was created and refined, it was used to develop a total of fifty-five proposals. These proposals included applications for sabbaticals, attendance at
professional conferences, curricular activities related directly to classroom instruction, and community events.

**Systemic Process and Mental Effort**

Prior to the use of the program matrix at Punahou, it was not uncommon for programmatic proposals to be funded after a relatively intuitive commitment was made to an idea that in isolation had merit, but was not necessarily systemically developed, vetted, and lacked reflective learning loops. Most proposals under this system focused on what the applicant would do, and outlined, often incompletely, the resources that were needed. There was little if any elaboration on evaluative measures or data that could be collected to monitor or validate whether the expenditure had the desired instructional impacts.

In contrast, proposals submitted using the program matrix involved a more systemic approach, outlining assumptions, activities, resources, intended outcomes, and evaluative measures. Framed within a schematic overview, proposals were initiated by articulating the assumptions upon which the request was based. This was a new step in program development and was therefore in some cases a novel mental habit, but an important one. Assumptions, stated or not, are often the basis upon which most decisions are made. Surfacing, understanding, and sharing assumptions early in a planning process contributes to common understandings and potentially reduces disagreements that if left unresolved will emerge during decision-making.

In addition to stating assumptions and outlining the basic activities of a proposal, the use of the program matrix prompted more explicit thinking about the intended immediate and longer-term outcomes of a project or proposal. This more systemic and research based approach enabled those submitting proposals to more thoroughly consider
data or evidence that could validate whether the activity or proposal resulted in the intended changes. While each of these components of a proposal was thoroughly considered and expressed, the succinct overview enabled decision-makers to make a recommendation based on a contextualized understanding of a project in its entirety. The data gathered and the feedback received from users of the program matrix indicated that the process of developing programmatic proposals, compared to prior years, was more systemic and inclusive.

The more systemic approach to framing and informing a decision inevitably requires mental effort, similar to how Kahneman suggests we move from the more natural and comfortable systems 1 thinking to the more demanding systems 2. The seminar participants and those who submitted proposals at Punahou using the third version of the program matrix endorsed and embraced the process. It could, however, be inferred that the seminar participants, by enrolling, demonstrated an interest and receptivity, and those who submitted proposals at Punahou were incentivized because there was funding available. However, those who did not receive the requested funding affirmed that the program matrix guided a process that they felt was well considered and thorough.

Nevertheless, there was some resistance during the initial versions of the program matrix, particularly in the first iteration. This occurred both at Punahou and at the school of one of other seminar participants. This is perhaps explained because the process of completing a program matrix requires thorough and careful considerations of the various elements of a proposition. Prior to the use of the program matrix at Punahou, applications, if written, were done in the more familiar form of a descriptive narrative.
The program matrix, in contrast, using the words of one of the participants, “makes thinking visible,” meaning that in addition to providing a description of the intended activities, the applicant must also establish the relationships of the various elements outlined in the overview. This systemic thinking was new, and as a result challenged the heuristic of the preference for the status quo.

In addition, given the neurological limits on the amount of complexity that can be entertained while making a decision, the program matrix is intentionally designed for conciseness. This forces users to synthesize, which requires cognitive effort. Ultimately, decision-makers benefit from summaries. However, preparing a concise summary requires an investment of effort to think through and articulate the various elements of a proposal in a succinct manner. It is a different form of persuasion and runs counter to the habituated preference for long narratives, which in my experience decision-makers rarely consume thoroughly. As groups and individuals worked through the process of completing a program matrix, the proposal was contextualized and had a systemic framework, leading to a more thoroughly considered decision.

**The Program Matrix as a Form of Heuristic**

Participant V pointed out that the program matrix is a heuristic in and of itself. It fits the definition of a heuristic as it is a mental framework that can be used to guide a decision-making process. If it is a heuristic, which I believe it is, then its purpose is to make thinking more visible and communicable, as opposed to unconscious, as most heuristics are. Participant II described the program matrix “as a tool for learning,” explaining how decision-making is a form of learning. He used the program matrix to explore assumptions, share information, and outline outcomes in an attempt to migrate a
philosophically diverse group toward a common course of action. The visual nature of
the program matrix and the ability of multiple participants to have access were useful to
him.

That being said, this particular individual was acutely insightful, and at times
vulnerable to a cultural tendency in the school of not necessarily being overt or
collaborative in the planning associated with decision-making. The design of the
program matrix is based on the assumption that an accessible tool used to openly share
information leads to more thoroughly considered decisions. While the program matrix
facilitates a process that lends itself to open exchanges of information and collaboration,
this participant pointed out that while the tool might mitigate positional power or
institutional politics, it can not in and of itself overcome these variables, particularly in
the short term. Even with the tool and processes in place, the cultural and political
context of the institution still has a significant bearing on how decisions are made. This
in part explains why this participant suggested a slide be added to the program matrix to
outline the individuals or departments that are or need to be involved and consulted in
order to facilitate a decision-making process. Just as the thinking that goes into a
decision benefits from clarity, this participant felt the decision-making structures should
also be clarified.

This dynamic played out differently in the case of Participant IV, who was from
the other independent school. She described the program matrix as “placeholder,” an
online tool in which all of the information associated with a programmatic decision could
be consolidated and openly shared. She felt that in the cultural/political setting of her
school, this more open approach was helpful and healthy. These two responses to the
program matrix indicate that the cultural and political dynamic of a school or institution needs to be taken into account. The program matrix presumes a degree of acceptance for information or ideas being openly shared. It should not be assumed that this is the accepted norm of all institutional cultures, and is a key consideration if the program matrix is to be introduced in other schools.

**Collaboration and Culture**

The program matrix is designed to foster collaboration among those submitting proposals and the decision-makers. Prior to the use of the program matrix at Punahou, professional development funds were often allocated in relative isolation. Typically, a formalized proposal which had received initial approval from the curriculum coordinator would be submitted to an administrator for “approval” in the form of a “yes or no” decision. This process focused on the resources being requested and the intended activities, but did not typically invite a discussion to explore assumptions and broader systemic impacts.

The use of the program matrix to guide decisions about the allocations of professional development funds at Punahou became a more inclusive process. All eight of the K-8 administrators were involved with the teachers in their respective divisions as proposals were being developed, which had not previously been the case. This earlier involvement familiarized the administrators with the details of the proposals during the conceptual stage, and helped the teachers understand the broader impacts and considerations that would influence the eventual decision about funding. In addition to participating in the early thinking about proposals being submitted in their divisions, the online format and subsequent discussions enabled the administrators to have a better
understanding of all of the other proposals being submitted K-8. While the process guided by the program matrix was neither “perfect” nor heuristic free, decisions were more inclusive and were based on a more thorough understanding of the rationale and systemic impacts of a proposal.

While the process of developing proposals was more inclusive, the collaborative potential of the program matrix did not surface as a highlight in the feedback, and was not necessarily apparent to the users. One explanation for this might again be a reflection of school culture at Punahou. It was not uncommon, prior to the program matrix, for funding to be allocated in relative isolation, or, when submitted for approval, the preference was to produce a highly polished and finished narrative, which did not invite discussion or modification. This stands in contrast to the design of the program matrix, which encourages a more collaborative process in which ideas behind a proposal are shared early in the process and are developed through multiple iterations with input from several sources. The administrative role is less about saying yes or no, but that of engaging decision-makers as consultants who can help frame, modify, and presumably refine a proposal as it is developed in order to make institutional decisions more collaboratively.

The program matrix was designed to change the decision-making process. However, evolving a school’s decision-making culture takes time. In order for the program matrix to become more fully institutionalized, the school’s decision-making culture has to shift so that it becomes more acceptable to invite and encourage participation in proposal development earlier in the process. As opposed to individuals gaining initial approval for funding after working verbally in relative isolation, then
producing a written narrative on paper in seemingly final form, the online format of the program matrix requires an idea to be made visible and shared earlier in the process. Earlier prototyping invites participation and feedback from a larger number of decision-makers, resulting in multiple iterations as proposals are developed. Prototyping in this way requires a cultural shift as individuals and groups need to be comfortable sharing ideas that are still in formation, as opposed to being presented as a finished product. Doing so invites greater participation as a proposal is in development, and will inevitably lead to multiple iterations. This more collaborative approach encourages systematically considered decisions, more characteristic of Kahneman’s systems II thinking.

**Customize to Institutional Needs and Structures**

Recognizing that institutional decision-making is influenced by organizational structures and cultural context, I asked each of the participants for their recommendation about customizing the program matrix to reflect the unique characteristics, cultures, and organizational structures of their schools. Surprisingly, the three participants outside of Punahou all discouraged this idea. One stated that the elements of the program matrix were thorough, the format clear, and the technology manageable. Another suggested that instead of modifying the format, more attention might be given to training schools in how to use the instrument as designed. She saw value in it for non-profit institutions similar to schools, and encouraged me to share the tool with other organizations.

The program matrix did go through three iterations, and as such was modified to better fit the needs of Punahou, which the feedback indicated it did. It will undoubtedly go through more modifications, but the emphasis, per the feedback offered from the participants, will be to spend more time orienting those that will be submitting proposals,
as opposed to customizing and adopting the format of the tool to meet the particular organizational structures or cultures of individual schools.

**Contribution to Wider Body of Knowledge**

The seminar, offered as part of Punahou School’s Brain Symposium, was designed as a professional development opportunity for the educational community of Hawaii. While the five participants who informed the case studies were the genesis of this research, a total of twenty-eight participants from both public and private schools, as well as several individuals from the non-profit sector, attended the seminar. The feedback gathered from the participants indicated that the activities and concepts were presented in a format that was engaging, the theory relevant, and the program matrix applicable.

In addition to the five-hour seminar offered during the Brain Symposium, modified presentations were done at the Maui Association of Independent Schools Conference, the Hawaii Schools of the Future Conference, and the National Association of Independent School Conference. Seventy educators registered for a one-day, post-dissertation seminar during the 2014 Brain Symposium. There was an approximate combined attendance of two hundred and fifty participants in these additional four sessions, comprised predominantly of independent school educators, with a smaller number from public schools. The modified, shorter sessions delivered at the regional and national conferences focused on the neurology of decision-making as this format did not lend itself to the same level of interaction possible in the five-hour seminar. Nevertheless, the format did allow for the participants to engage in several of the activities that enabled them to experience first hand how we do with great frequency rely
on unconsciously heuristics. The program matrix was introduced in the shorter sessions, focusing on the rationale behind the design.

I appreciated and was a little intimidated by the invitation to present a three hour version of the seminar to the University of Hawaii Ed.D. cohort, a group of peers and faculty mentors. I was reassured and inspired by their level of engagement and responses to the content and activities. This group demonstrated an interest in the research and theory explaining many of the dynamics of institutional decision-making. Given the range in the types of schools represented, the questions about the program matrix indicated that the systemic approach the program matrix facilitates seemed to resonate. It was also apparent through the dialogue during the session that many present were thinking about how the organizational and cultural dynamics in their schools would impact, influence, and in some cases impede the use of such an instrument.

In addition to the sessions offered at the educational conferences, I was also invited to do a presentation for the Parent Faculty Association at Punahou. This group of approximately thirty parents was intrigued by the neurological research, which was a novel concept for most. The theory behind heuristics seemed to have a special appeal to them, particularly parents of high school students. Their questions focused the discussion on how they might best guide their adolescents as they entered a stage of life in which the consequences of their decisions became more significant. Several parents seemed particularly interested in how the concept of the program matrix might be used to frame college selection decisions.

This presentation was followed by a meeting with a parent book club that had decided to read Thinking Fast and Slow. This smaller group was working through what
is clearly a difficult book. The questions they asked guided the discussion to the theme of how they could best coach their children to become more deliberate decision-makers, regardless of age. While I designed the seminar for educators or and organizational leaders, these parent meetings were excellent opportunities for me think about applications of this theory in family related constructs.

An unintended outcome was that the program matrix was used in several sections of the CAPSEED course at Punahou, a required class for seniors. Approximately sixty students used the program matrix to plan a community based service project, a key element of the course. The first classes used the second version of the matrix during the summer session and found it useful enough that the teacher decided to use the modified version three during the fall semester.

**Practical Application of Neurological Research**

The research of the neurology of decision-making is written in the scientific genre, typically identifying the location of the brain activated during decision-making. For example, a recently published study at Oxford University identifies a newly discovered area of the brain called the lateral frontal pole, located in the frontal cortex, responsible for planning and decision-making. The significance of this study is that this particular area of the brain is not found in monkeys, suggesting that our specie’s decision-making capacity is what makes us uniquely human (Neubert, Mars, Thomas, Sallet, & Rushworth, 2014). This is an example of a genre of research that is primarily descriptive, and by design does not offer suggestions for how to improve decision-making. The literature on heuristics, in contrast, is less technical and more behaviorally descriptive. Studies of this kind are more likely to provide examples of how we use and
rely on mental processes to make choices, often with less than desirable outcomes. The literature from this research is more likely to provide suggestions about how to make better decisions, frequently in the form of what should be avoided.

My goal in referencing the neurological basis of decision-making was to establish how much of our decision-making resides beyond our conscious awareness, and is revealed in the form of habitual heuristics (Bechara & Damasio, 2005). The intent of the program matrix was to make thinking visible, and in doing so mitigate some of the influence of heuristics, or, more importantly, become a form of heuristic itself. The elements of the program matrix provide an outline that can be used to inform a well-considered, systemic decision. The rationale behind the technology in which the program matrix is housed enables opens access to information, increasing the possibility for decisions to be made more collaboratively based on shared understandings. The goal of this study was to build bridges between the science of the neurology of decision-making, the theory of heuristics, and the practical application of the program matrix.
CHAPTER 6

TRANSFORMATION OF PRACTICE

The act of conducting action research can be professionally transformational. The robust review of a body of literature, weighing the considerations that go into a well-designed study, the in-depth, personal interactions with the participants of a study, the assemblage of data, the analytical immersion, and wrestling thoughts into written words to shape a narrative is a process that transforms how we think about and approach questions of professional practice. In my own professional practice, for example, I found that the study enabled me to become more understanding of my own decision making, and made me more attentive of the framing effect and the necessity of clarifying assumptions. This reinforced the value of making the thinking that informs a programmatic decision more visible which, if conducted in a culture that fosters the open exchange of information, can create a highly collaborative process. The literature review indicated that the framing effect, of all of the neurologically based heuristics, has the most significant influence on the direction and outcome of a decision-making process. This was verified through the data gathered from the case study participants as they reflected upon and described their decision-making experiences over a five-month period. As I monitor my own decision making, I find I am now much more attuned to how issues and decisions are framed in both my personal and professional life. The tendency for individuals and decision-making groups alike is often to plunge ahead with the task at hand based on the assumption that there is a shared understanding of what the decisions and options actually are. While experienced decision-makers bring context to emergency situations and can proceed quickly, strategic decision-making benefits from an intentional
and well-considered attention to how a decision is framed at the onset of a process. 

Taking time to consider how decisions are framed can become a habit of professional practice that if done with intention will influence the quality of the decisions reached.

Similarly, surfacing, examining, and clarifying assumptions before proceeding too deeply into a decision was identified through this research process as a worthy practice. Too often decision-making groups make the mistake of assuming shared assumptions. Clarifying and testing the assumptions upon which a decision is based is like running water through a purifying process. Just as heat disinfects, frank discussions about the values and points of view that frame and influence a decision can be the difference between, for example, the quality of water coming from a known source, like a fresh spring, verses unfiltered water collected through a creek of unknown origin. The program matrix, by making the thinking associated with a decision more visible, can act as a water purifier of sorts, not necessarily sterilizing the process, but certainly leading to a more consumable and fruitful outcome.

The content knowledge gained through the study of the neurology of decision-making created context, but the engagement and interaction with the faculty and case study participants was the catalysts for the transformation of practice. My observations of how the case study participant’s decision-making evolved as a result of what they learned through the seminar helped me better understand my own tendencies. They became mirrors into my own decision-making. Similarly, working with faculty, administrators, and the case study participants as they used the program matrix to guide programmatic decision-making affirmed the value of using a tool that makes thinking
more visible, and as a result encourages collaboration and the systemic consideration of options.

While the program matrix was intended to encourage a systemic approach to a decision-making process, how decisions are made still takes place within the cultural context of an institution. The program matrix might, over time, influence how decisions are made in a school or organization; it does not however, appear to in and of itself, trump institutional culture. By making thinking visible, the benefits of the program matrix are more fully realized in a culture that openly shares information. Certain strategic and programmatic decisions lend themselves to this, and there are of course types of decisions that require confidentiality or the timely release of information. Nevertheless, should an institution profess transparency in its programmatic decision-making, the program matrix, because it enables collaboration, can be used to facilitate a process that systematically engages an organization.

The research process, combined with a deeper understanding of how we make decisions, has changed the mental model in which I fundamental approach my professional practice. I now frame initiatives or decisions as research questions. Just as the program matrix offers a structure to guide how a decision is reached, this research process has altered how I approach questions of practice. I am now more attentive to how an issue is framed, I create opportunities to question assumptions, and I think about how evidence can be gathered, considered, and evaluated in order to inform a decision or a strategic direction. Just as robust neuro-networks are formed through practice, the immersive nature of conducting action research has influenced me to think more like a
researcher/practitioner. It has altering the mental model I use when approaching issues of professional practice.

My learning and decision-making will continue to evolve, and hopefully through that process contribute to the improvement of the professional practice of others. I created the seminar for the purposes of this study, but have continued to develop it, and will be presenting at a series of upcoming conferences. I modified the format to meet the interest of a projected enrollment of seventy for a one-day workshop at Punahou School’s Brain Symposium this June. I will be presenting a summary of this research at the Oxford Brookes University Colloquium, in England, later in June. I will present a workshop at the East Asia Counsel of Schools (ERCOS) Leadership Conference in Kota, Kinabalu, Malaysia in October, 2014. I have submitted a proposal to present at the National Association of Independent Schools (NAIS) 2015 annual conference. These conference presentations are not only intellectually engaging, but they fulfill the very motive of why I entered the field of education. While I have been in administrative roles for the majority of my career, I am a teacher at heart. This action research process has not only been about my own learning, but it has been motivated by my desire to teach, and share with others.
REFERENCES


The Neuroscience of Decision-Making
Improving Personal and Organizational Capacity

Presented by: Mike Walker, Principal Punahou School
Punahou School
June 12, 13
11:30 – 2:30

This two-day workshop is designed to help both individuals and institutions become more systemic decision-makers. The research on the neurology of decision-making suggests that our human tendency, out of habit and necessity, is to rely on patterns of predominately unconscious heuristics when making decisions. The most effective way to overcome these heuristics is to become aware of them, "The best way to avoid all the traps is awareness: forewarned is forearmed." (Hammond, Keeney, & Raiffa, 1999).

The first day of the workshop will be an engaging immersion into the neurology of decision-making, exploring our heuristics, and learning how to manage, leverage, and where need be, overcome tendencies and patterns.

In day two you will have the opportunity to develop a case study of a decision you will be or have made at your school using a "program matrix" - a tool designed to systemically approach and guide the kinds of decisions regularly made in schools. The "program matrix" is a framework that lends itself to more deliberate, collaborative, and communicative decision-making.

To register contact Mike Walker mwalker@punahou.edu
APPENDIX B

PROGRAM MATRIX, VERSION I

**Program Matrix**

Problem or Opportunity Statement: What is it you are trying to improve or address?

**Resources:**
- People
- Time
- Space
- Materials
- Financial

**Activities:**
- What you/participants will do

**Outputs:**
- Direct results of Activities

**Outcomes:**
- Changes, improvements
- Short term
- Long term
- Who else will be impacted, influenced?

**Assumptions:** Basic Assumptions

**Evaluative Measures:** How do we know?

**Feedback Loop**

Sustainability: Is the intent to perpetuate the program? If so, what other considerations or resources will be needed?
APPENDIX D

PROGRAM MATRIX, VERSION III
APPENDIX E
HEURISTICS OVERVIEW

Intuition vs. Reason
Quick, Intuitive (Gladwell)
System 2 Thinking (Kahneman)

The Framing Effect
How a decision is contextualized (framed) has a significant influence on decisions i.e., loss vs. gain, positive vs. negative, either or...

Priming
Presenting information at the onset to influence how a decision is made.

The Anchoring Trap
Similar to priming: the brain gives disproportionate weight to first information received, i.e., first suggestions, initial price

Representativeness
We estimate the likelihood of an event by comparing it to an existing example that already exists in our minds, i.e., stereotypes

Availability Heuristic
Judging the probability of an event, and making a decision on how easily instances come to mind. i.e., shark attack vs plane crashes, influence of media

Sunk cost trap
We tend to make decisions in ways that justify past choices, even when they no longer seem valid.

Confirming evidence trap
Tendency to seek out information that confirms or supports existing point of view.

Overconfidence
Tendency to be overconfident about abilities. Tendency to underestimate costs and amount of time it takes to accomplish a task.

Memory Bias
The accuracy of our memory is fundamentally questionable. Caution when over-relying on memory for basis of decision.
APPENDIX F

PRE-SEMINAR SURVEY

The Neuroscience of Decision-Making

Pre-Seminar survey

Participant: _______________________________

Please take a few minutes to reflect on your approach to making work/professional related decisions. You can respond directly on this document, and return as an attachment. Please take as much, or as little space as you need.

1. Describe the considerations or conditions you tend to rely or draw upon when making professional or programmatic decisions. Ultimately, do you go with your instincts, or gut feelings, or are you a more reflective, deliberate, analytical thinker? Can you describe your style or tendencies? Under what conditions do you gravitate in one direction or the other?

2. When in the midst of making a relatively difficult or complex decision, what most strongly influences your decisions, i.e. information, memory, persuasion, recent experience, a combination? Can you describe your level of awareness about the variables influencing your decision-making?

3. When you find yourself in the midst of a difficult or challenging decision, can you describe a process, a pattern, or sequence of steps that you tend follow?

4. If you or the group you are working with gets stuck in the midst of making a decision, can you describe a method or a technique you might typically, or have used to move toward a solution or decision?

5. Can you describe certain kinds of decisions in which you would consider yourself to be a relatively unbiased decision-maker? Can you describe certain decisions that you recognize you might be more susceptible to biases or influences you might not be aware of?

6. How would you describe your decision-making ability and confidence in relation to the people you work with? Would you describe yourself as more decisive, or is your inclination to rely more on the input and inclination of others involved in the process?
Thank you all for coming to the session. I hope you found it worthwhile, and left feeling you gained some new understandings and insights.

I appreciate the feedback some of you have already sent me. It looks like there are going to be some interesting applications of the program matrix. I am very interested in hearing how these projects go so please send me periodic updates so I can continue to further develop and modify the instrument.

In the interest of feedback, I would really appreciate you taking a few minutes to respond to the prompts below.

I am attaching an overview of the heuristics that you can use as a review. I am also resending the pre-seminar survey so that you can compare how you might respond now, after the two days.

Again, I so appreciate the way you engaged, how you responded to each other, and the feedback you provided me.

1. Can you provide examples of new learning or insights you gained from the seminar? Did the information or examples provided alter or advance your understandings about decision-making?

2. Are there any examples of information that was presented that was not clear, or that you were doubtful or skeptical about?

3. Was any of the information covered or examples used uncomfortable to hear? Was there anything that you felt might have been exaggerated or inaccurate?

4. Was the style of presentation helpful and effective? Should there have been more information, less? Was the pace appropriate? Were the visuals effective? What method of delivery worked best for you?

5. My basic premise is: We are all decision-makers — we are susceptible to heuristics — awareness of the heuristics can decrease our reliance on them. What feedback would you give me about that point of view, based on what you learned in the seminar?

6. Was the relationship between the heuristics and the program matrix clear? Is it evident to you that the program matrix can decrease our susceptibility to the heuristics?
7. What feedback can you give me about the program matrix? What is clear, what is not?

8. Any general comments?