An Empirical Test of a General Theory of Problem-Solving

by

Justin Hall

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Abstract

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The purpose of this research is to better understand how marketers and consumers solve problems. This research first reviews the problem-solving literature, discusses several areas of confusion related to problem-solving, and offers solutions. After resolving the confusion, this research then develops a theoretical model of problem-solving. Four hypotheses are derived from the model, and then empirically tested.

The model states that the distinct cognitive domain of problem-solving begins with problem recognition. Given a problem, associative memory and associative activation provide a solution (H #1). This solution is either satisfactory or unsatisfactory. If satisfactory, the individual engages in the satisficing process and accepts the solution (H#2). If unsatisfactory, the individual engages in the decision-making process and searches for information related to an alternative solution (H #3). Thus, the difference

between satisficing and decision-making is the search for information (H #4). Problem-solving ends when an intended solution is chosen.

A pretest and two studies are conducted to test the four hypotheses. The Pretest demonstrated situations that elicited problem recognition. Study 1 tested hypothesis #1 and found that at least 75 percent of the time associative memory and associative activation provided a solution. Study 2 tested hypotheses #2, #3, and #4. Hypotheses #2 and #3 were tested using a two-way ANOVA, Chi-Square, and Point Biserial Correlation and hypothesis #4 was tested using an independent sample t-test and Point Biserial Correlation. Results of all empirical tests confirm each of the hypotheses, which in turn support the theoretical model.

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Chapter 1

Introduction

Problem-solving has been a topic of interest to marketing scholars since the origin of marketing as an academic discipline (Bartels, 1962, Shaw and Jones, 2005). One of the earliest articles in the field dealing with solving problems was Arch W. Shaw's (1912) "Some Problems in Market Distribution;" and one of the earliest books was *An Approach to Business Problems* (Shaw 1916).

Problem-solving has retained the interest of researchers over the decades because problem-solving is a fundamental concept of marketing. Marketers and consumers alike engage in problem-solving throughout the day. For instance, marketers apply problem-solving methods to marketing functions such as sales, advertising, and distribution (Kelly and Lazer, 1958; Alderson and Green, 1964), and consumers engage in problem-solving when making purchasing decisions (Engle, Kollat, and Blackwell, 1968; Howard and Sheth, 1969).

Through the years, the problem solving literature has developed into an extensive body of work covering a variety of marketing topics. Some of these topics include problem-solving processes (Dewey, 1910; Simon, 1960), approaches (Graham, 1986; Calantone, Graham, and Mintu-Wimsatt, 1998), typologies (Howard and Sheth, 1969), orientations (Sirdeshmukh, Singh, and Sabol, 2002; Mintu-Wimsatt and Calantone, 1996), competence (Atuahene- Gima and Wei, 2011), support systems (Wierenga and Bruggen, 1997; Alpar, 1991), joint or group problem-solving (Aarikka-Stenroos and

Jaakkola, 2012), and creative problem-solving (Burroughs and Mick, 2004; Isen, 1999). But despite this extensive body of research, the fundamental understanding of what problem solving is and, more importantly, *how* marketers and consumers solve problems remains unclear.

It remains unclear for three reasons. First, problem solving is often conflated with decision-making. Some use problem-solving and decision-making synonymously (Simon, 1960; Kahneman 2011), some suggest problem-solving is an element of decision-making (Dewey, 1910; Minztberg et. al., 1976; Anderson, 1980), but few, if any, view decision-making as an element of problem solving. In any case, virtually no author offers an argument to support any position. Second, there are a variety of definitions for problem-solving, but little consensus as to the definition. Third, when discussing how marketers and consumers solve problems, researchers use both normative descriptions (what people should do) and positive explanations (what people actually do), but this distinction is often left unclear.

Research Problem

Consequently, in order to understand how marketers and consumers actually solve problems, one must first clarify the confusion in the problem-solving literature. This lack of clarity inhibits the main problem of developing a theoretical model of problem-solving that can be empirically tested.

Research Objectives

This research has two primary objectives. The first objective is to clarify the issues related to the problem-solving literature. The second objective is to develop and empirically test a theoretical model of problem-solving. To the extent the empirical tests

support the model, this research will provide a better understanding of *how* marketers and consumers solve problems.

Organization of Research

Chapter 2 reviews the problem-solving literature, discusses several issues related to problem-solving, and offers solutions that lead to a better understanding of problem-solving. Chapter 3 proposes a theoretical model of problem-solving and derives hypotheses for empirical testing. Chapter 4 describes the research methodology used to test the hypotheses. Chapter 5 discusses the results found from the empirical tests. Finally, Chapter 6 offers conclusions, managerial implications, limitations, and potential areas for future research.

Chapter 2

Literature review

Chapter 2 reviews the problem-solving literature, discusses several areas of confusion related to problem-solving, and offers solutions to these issues that lead to a clearer understanding of how marketers and consumers solve problems.

Problem Solving and Decision-Making

One difficulty in understanding problem-solving is that it is often conflated with decision-making. Problem-solving is sometimes thought to involve an individual (or group) wanting to make a change from the current situation (e.g. Simon, 1960; Kahneman, 2011). Decision-making is usually regarded as an individual (or group) choosing among alternative solutions (e.g. Simon, 1960; Kahneman and Tversky, 1979). Some authors use these terms synonymously or interchangeably (Simon, 1960; Kahneman 2011). Some regard problem-solving as an element of decision-making (Dewey, 1910; Minztberg et. al., 1976; Anderson, 1980), and others regard decision-making as an element of problem-solving. And still for others a decision starts with a problem and/or a problem ends with a decision. However, virtually no author offers an argument to support any of the above positions. Consequently, this research intends to use the literature to build a theoretical model of how problem-solving and decision-making may rationally be interrelated.

What is Problem-solving?

There is little consensus on the definition of problem-solving. Anderson (1980 p. 257) defines problem-solving as "any goal-directed sequence of cognitive operations." Heppner and Krauskopf (1987 p. 375) define problem-solving as "a goal directed sequence of cognitive… operations… for the purpose of adapting to internal or external demands." Minztberg et. al. (1976 p. 246) defined problem-solving and decision-making synonymously as "a set of actions that begins with the identification of a stimulus for action and ends with the specific commitment to action." D'Zurilla and Goldfried (1971 p. 107) defined problem- solving as "a behavioral process which makes available a variety of response alternatives." Sternberg (1999) cited in Leighton and Sternberg (2012) defines problem-solving as "a goal-driven process of overcoming obstacles that obstruct the path to a solution." Scandura (1977) defined problem-solving as "the generation and selection of discretionary actions to bring about a goal state." Atuahene-Gima and Wei (2011 p. 81) define problem solving as "a process of seeking, defining, evaluating, and implementing solutions." Mayer and Wittrock (2006 p. 287) define problem-solving as "cognitive processing directed at achieving a goal."

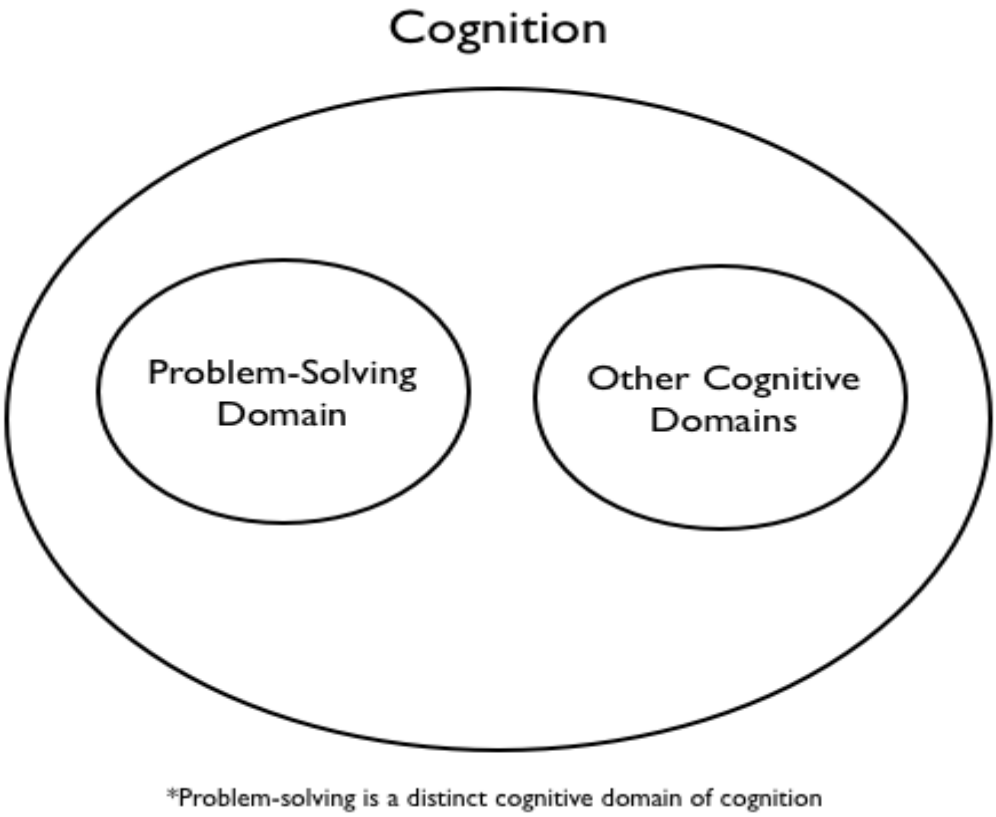
Based on these definitions, three basic principles of problem-solving can be discerned: (1) It is a form of cognition or thinking (Anderson, 1980; Heppner and Krauskopf, 1987; Mayer and Wittrock, 2006), (2) that consists of a process (Anderson, 1980; Heppner and Krauskopf, 1987; Minztberg et. al., 1976; D'Zurilla and Goldfried, 1971; Scandura, 1977; Sternberg, 1999; Atuahene-Gima and Wei, 2011; Mayer and Wittrock, 2006), (3) that has a beginning and ending (Minztberg et. al., 1976; Sternberg,

1999; Anderson, 1980; Heppner and Krauskopf, 1987; Scandura 1977; Mayer and Wittrock, 2006).

(1) Form of Cognition

The first principle of problem-solving is it is one form of cognition. Cognition, or thinking, is defined as an umbrella term used to describe any kind of mental activity (Merriam-Webster, 2015; Neisser, 1967; Lazarus, 1984; Zajonc, 1980; Kahneman, 2011). Cognition takes many different forms (e.g. problem-solving, evaluation, computation, assessment, day-dreaming, justification, etc.) and these forms of cognition are called cognitive domains. A cognitive domain is defined as a specific form of mental activity in which an individual is engaged. Problem-solving is a cognitive domain that is differentiated from other cognitive domains based on problem-recognition (discussed later). See Figure 1.

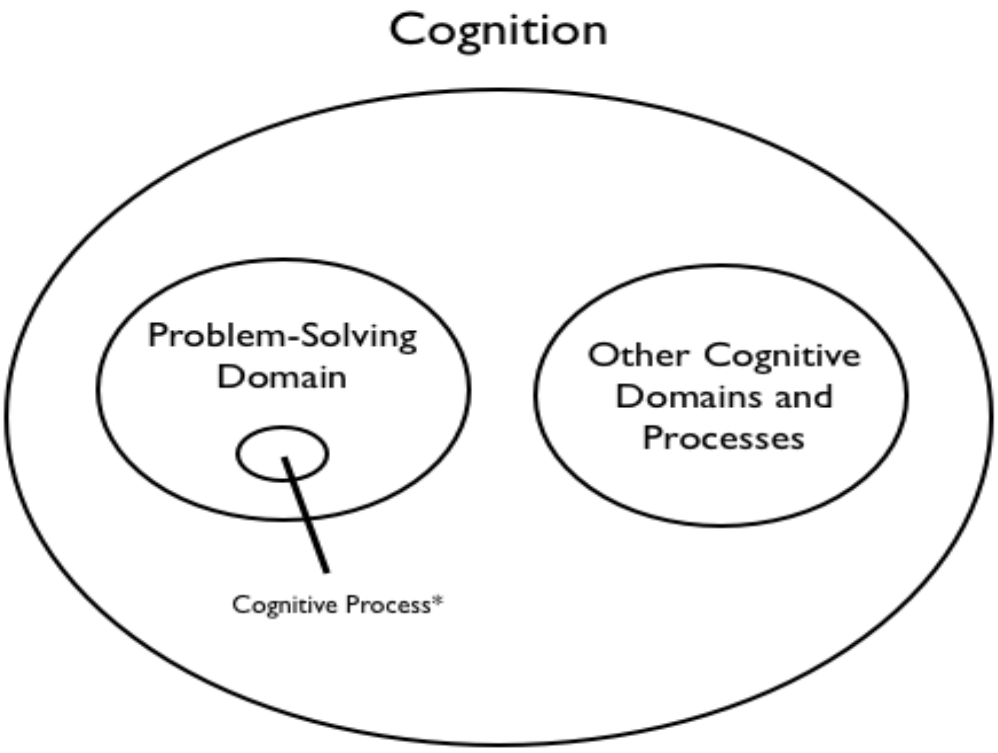
Figure 1: Cognitive Domain of Problem-Solving



(2) A Process

The second principle is that problem-solving is a cognitive process (Dewey, 1910; Simon, 1960), which may be defined as a series of mental steps or activities. A cognitive process acts as an "operating manual" for how the brain works when engaged in a specific cognitive domain (Bazerman and Moore, 2013). There is *a minimum* of one cognitive process per cognitive domain (at least one "operating manual" - how else would one engage in that form of thinking). As a result, problem-solving has *at minimum* one cognitive process. See Figure 2.

Figure 2: Cognitive Process



*All cognitive domains (e.g. problem-solving) have *at minimum* one cognitive process

(3) Beginning and End

The third principle of problem-solving is it has a beginning and an ending. The process begins with problem-recognition (Bruner, 1986; Cowan, 1986; Bruner and Pomazal, 1988), which occurs when a person acknowledges a significant difference between an actual state (where you are) and desired state (where you want to be) (Bruner and Pomazal, 1988). The process of problem-solving ends with the goal of finding and accepting a solution (or the process is suspended). A solution is defined as a behavioral intent that the individual perceives would effectively move them closer to their desired

state. A behavioral intent is defined as the likelihood of performing a specific behavior (Fishbein and Ajzen, 1975).

Based on these three basic principles discussed in the literature, the following definition of problem-solving is offered. Problem-solving is defined as any (1) cognitive (2) process that (3) begins with problem-recognition and ends with the goal of finding and accepting an intended solution. Based on this definition, next is to clarify the cognitive process of problem-solving.

Cognitive Process of Problem-Solving

There are two alternative perspectives to problem-solving. One is normative, the other is positive. The normative versus positive dichotomy in the philosophy of science is the foundation for one of the most important classes of fallacies in all of philosophy: the fallacy of deducing fact from what should be (Angeles 1981). A normative description adopts the perspective of attempting to prescribe what marketers and consumers should do or ought to do (Hunt, 2010). On the other hand, a positive explanation adopts the perspective of attempting to describe, explain, predict, and understand the activities, processes, and phenomena that actually exists (Hunt, 2010).

Normative Cognitive Process of Problem-Solving

Earlier models of the cognitive process of problem-solving (Webster and Wind, 1972; Engle, Kollat and Blackwell, 1968; Howard and Sheth, 1969) suggest that people go through a series of distinct activities. Although the exact number and order of these activities are debatable, research concedes that the problem-solving activities include: (i) recognizing a problem, (ii) stating the problem in a way that lends itself to discovering a satisfactory solution, (iii) searching for alternative solutions, (iv) establishing a criteria or

basis for choosing among alternatives, (v) evaluating alternatives based on this criteria, (vi) choosing a solution from the alternatives, and (vii) implementing this solution.

However, this process of problem-solving was developed to teach marketers and consumers how to improve their ability to solve problems (Dewey, 1910; Simon, 1960). As a result, this process provides a guideline for how one *should* solve problems and not necessarily how one *does* solve problems. Thus, the process just described is normative description (Hunt, 2010; Simon 1959). But normative description is insufficient for theory development (Angeles, 1981; Hunt, 2010). According to Angeles (1981), a theory requires deductive reasoning and it is impossible to have a valid deductive argument when a premise states what is (fact) and a conclusion states what ought to be (or should be). Thus, next is to review the literature for a positive explanation of the cognitive process of problem-solving.

Positive Cognitive Process of Problem-Solving

A more positive explanation of the cognitive process of problem-solving (what actually occurs) is found in the psychology literature. The main development used to solve problems is the dual-processing model. The dual-processing model argues that problem-solving consists of not one, but two cognitive processes. The first process is characterized as (1) fast, automatic, effortless, and intuitive. The second cognitive process is characterized as (2) slow, controlled, effortful, and deliberate (Kahneman, 2011; Bazerman and Moore, 2013; Evans, 2008; also see Appendix A: Frequency of Cognitive Process Description).

However, the concepts characterizing the two cognitive processes are descriptive not explanatory. For example, the first process is typically described as “fast”. But

describing a process (series of activities) as “fast” does not adequately explain the series of activities that occur which allow the process to function “fast”. In other words, using descriptive concepts (e.g. fast, slow, automatic, controlled) to characterize a process does not provide insight into the process itself (the series of activities that actually occurs). Thus, this research must examine the two cognitive processes of the dual-processing model for explanatory concepts.

In order to examine the two cognitive processes of the dual-processing model for explanatory concepts, we must first organize the current semantics jungle of dual-processing terms. A search through the literature found over 40 different terms describing the two cognitive processes of the dual-processing model. Table 1 provides a list of some of the more popular dual-processing terms in the literature.

Table 1: Terms of the Dual-Processing Model

Terms	References
System 1 vs. System 2	(Stanovich, 1999, 2004; Stanovich & West, 2000; Kahneman, 2003, 2011; Evans, 2003; Viswanathan & Jain, 2013)
Peripheral vs. Central	(Cacioppo & Petty, 1983; Petty, Cacioppo, & Schumann, 1983)
Heuristic vs. Systematic	(Chaiken, 1980; Zuckerman & Chaiken, 1998; Chaiken & Eagly, 1989; Johnson, Hashtroudi, & Lindsay, 1993)
Implicit vs. Explicit	(Reber, 1993; Evans & Over, 1996)
Experiential vs. Cogntive	(Epstein, 1994; ; Epstein & Pacini, 1999)
Experiential vs. Rational	(Epstien, Pacini, Denes-Raj, & Heier 1996; Pacini & Epstein, 1999)
Automatic vs Strategic	(Grunert, 1996; Beck & Clark, 1997)
Unconscious (Adaptive) vs. Conscious	(Lipson, 1962; Acker, 2008; Dijksterhuis, 2004; Dijksterhuis & Nordgren, 2006)
Heuristic vs. Analytic	(Evans, 1989, 2006)
Associative vs. Rule Based	(Sloman, 1996)
Stimulus Bound vs. Higher Order	(Toates, 2006)
Automatic vs. Controlled	(Posner & Synder, 1975, 2004; Schneider & Schiffrin, 1977)
Intuitive Judgment vs. Considered Opinion	(Hirsch, 1960)
Holistic vs. Analytic	(Nisbett, Peng, Choi, & Norenzayan, 2001)
Implusive vs. Reflective	(Strack & Deutsch, 2004)
Rational vs. Instinct	(Alderson, 1952)
Reflexive vs. Reflective	(Liberman, 2003)
Affective vs. Cognitive	(Helgeson & Ursic, 1994; Zajonc, 1980)
Heuristic vs. Deliberate	(Kahneman, 2003)
Analytic vs. Nonanalytic	(Jacoby & Brooks, 1984)
Intuitive vs. Technocratic	(Covin, Slevin, & Heeley, 2001)

To organize these terms, this research follows the dual-processing model and places each term from Table 1 into one of two categories based on the similarity among the terms descriptive concepts (organizing by descriptive concepts makes it easier to tell which terms describe which process). For the purposes of this research, the first group of terms is called the Default process and the second group of terms is called the Search process. See Table 2.

Table 2: Two Groups of Cognitive Processes

Default Process	Concepts
System 1	automatic, holistic, unconscious, fast, no-effort, no control, undemanding of computational capacity
Peripheral	low involvement, low effort, heuristic cues
Heuristic	low cognitive effort exertion; low cognitive capacity; relies on memory & easily accesbile information; automatic, no control, fast
Implicit	rapid, unintentional, unconscious, unaware, affective
Experiential	fast, automatic, holistic, nonverbal, affect laden, pre- or unconscious, little to no control
Automatic	minimal effort, without control, unconscious, automatic, parallel, learned, not subject to capacity limitations of working memory, little attention, low cognitive load, effortless
Unconscious (adaptive)	involuntary, automatic, infinite processing capacity, intuitive, "feel", attention not on thinking about problem, aschematic, can't follow rules, affect-laden, divergent
Associative	quick, automatic, affective, preconsciously, reproductive, intuitive, reflexive, little attention, little cogntive awareness, non-analytic, low attention
Stimulus Bound	non-conscious, simple solutions, implicit, procedural memory, involuntary, automatic, reflex, cost-effective, pre-programmed, fast, inflexible
Intuitive	unconscious, holistic, affectivley-charged, automatic, fast, parallel, effortless, and high cognitive capacity
Holistic	associative, intuitive, computations reflect similarirty and continguity, less control, instantaneous, prior beliefs, experienced-based, experiential knowledge
Impulsive	low cognitive capacity, fast, requires no or little effort, low threshold for processing incoming information, experiential, affective, low flexibility, little to no attention
Affective	low-attention, effortless, automatic
Experience-based	fast, automatic, subjective feelings, implicit, unconscious, intuition, heuristics

Search Process	Concepts
System 2	slow, analytic, deliberate, effortful, orderly, attentive, conscious, control, demanding of cognitive capacity
Central	high involvement, high effort, extensive consideration, diligent, careful
Systematic	high cogntive effort, high cognitve capacity, comprehend and evaluate information
Explicit	directed, controlled, conscious, elaborate, effortful
Cogntive	analytical, high attention, effortful, deliberative, systematic, constrained by low capacity
Strategic	conscious, serial, subject to capacity limitations of working memory, flexible, requires attention
Conscious	processing capcity limited, elaborate, voluntary, slow, thorough, cognitive and affective, attention on thinking about problem, schematic, follow strict rules, focused, covergent
Analytic	effortful, slow, controlled, rule-based
Rule Based	effortlful, sequential, slow, time-consuming, analytic, explicit, conscious, controlled
Higher order	conscious, flexible, exclusive, explicit, declarative memory, voluntary, intentional, controllable, beyond current sensory, flexible, slow, costly
Controlled	demanding attention, serial, controlled search
Reflective	high cognitive capacity, slow, require effort, high threshold for processing incoming information, controlled, requirse attention, flexible, awareness
Rational	slow, analytical, verbal, affect free, cogntiive oriented, conscious thought, controlled
Deliberate	conscious, slow, sequential, efforful, rule-based, limited cognitive capacity
Technocratic	systematic, analytical, scientific, reliance on quantitative tools, long, effortful
Information-based	slow, deliberate, explicit, dedicated

With the terms organized into two groups, this review examines both the Default process and the Search process for concepts that explain the series of activities that occur in the two cognitive processes.

1. Default Process:

Research typically characterizes the Default process as fast, automatic, unconscious, effortless, involuntary, and affective (all descriptive concepts). When

explaining the activities of the Default process, many researchers refer to the explanatory concepts of (a) stimulus-response and (b) heuristics.

a. Stimulus-Response

One stream of research suggests that the activities of the Default process operate via some form of stimulus-response mechanism. In general, the stimulus-response theory argues that through learning over time, specific stimuli in one's environment become associated with specific responses; and, when encountering a stimulus, individuals automatically respond. For example, Toates (2006) states that some behavior depends upon the fundamental design principle that organisms are constructed to react to stimuli. Schneider and Shriffin (1977) propose that the Default process operates through the activation of a learned sequence of elements in long-term memory that is initiated by stimulus in the environment. Sloman (1996) states that the Default process encodes statistical regularities in an environment and computes responses on the basis of similarity and temporal structure.

Other researchers in the stimulus-response stream argue that stimuli in the environment lead to a spreading activation of nodes in one's memory (Grunert, 1996; Strack & Deutsch, 2004), which simply means that environmental stimuli trigger thoughts, or ideas, in memory. Smith and DeCoster (2000) propose that associative activation, or the associative processing mode as they termed it, is based on the properties of a slow-learning system of memory and pattern-completion mechanism. In other words, they suggest that after knowledge has been accumulated from a large number of experiences, the associative processing mode uses the knowledge from the slow-learning

memory system to "fill-in" information about current situations based on the previous situations that resemble the current one.

b. Heuristics

Another research stream suggests that the Default process occurs through heuristics. Heuristics are general "rules of thumb" that are developed by individuals through past experiences and observations. For instance, Evans (2006, p. 382) suggests that the Default process acts as an auto-pilot (people are always thinking with the default process), which continuously generates default responses in the form of selective representations of problem content and pragmatic rules of thumb. In other words, when using the Default process to think, the individual uses relatively general or simple rules that have been developed through past experiences and observations (Chaiken, 1980). However, the authors do not explain the sequential structure or process for *how* this works. As a result, the heuristics stream of research appears a subset of the stimulus-response stream. Thus, the model of problem solving proposed in Chapter 3 will use the stimulus-response stream as its theoretical foundation for how the Default process of problem-solving operates.

2. Search Process:

The Search process (the second group of dual-processing terms) is typically characterized as effortful, conscious, controlled, time-consuming and requiring a high cognitive capacity. When describing *how* the Search process operates, research generally follows three streams: (a) a controlled flow of information in memory, (b) analytical thinking, and (c) hypothetical thought.

a. Controlled Flow of Information in Memory

One stream of research related to how the Search process operates refers to the controlled flow of information through memory. For instance, Schneider and Shiffrin (1977) suggest that the Search process operates based on the controlled flow of information from one's long-term memory to their short-term memory. Their research argues that memory can be conceived as a large collection of nodes that become interrelated over time through learning. They argue that when the nodes are inactive, they are stored in one's long-term memory; and, when the nodes are active, they are temporarily moved to and stored in one's short-term memory. Thus, they argue that the Search process operates by controlling or manipulating the flow of information (or activation of nodes) from one's long-term memory to their short-term memory.

Similar to Schneider and Shiffrin (1977), Evans (2011) proposes that the Search process operates through working memory (also known as controlled attention), which is assumed to be a temporary storage system for information relevant to the thinking at hand. Evans (2011) research argues that the Search process operates by searching for and retrieving relevant information from one's long-term memory and placing it in working memory, where the information is then analyzed to make a choice.

Smith & DeCoster (2000) suggest that the Search process works based on what the authors term a rule-based processing mode, which draws on symbolically represented rules that are structured by language and logic. The authors state that these "rules" are stored in two different memory systems, a slow learning memory system or a fast learning memory system, depending on the frequency of encounters and the length of

time encountered. When faced with a "thinking" situation, the individual draws on both memory systems in search of relevant information to the situation at hand.

Grunert (1996) argues that the Search process operates as a result of associative activation in the Default process surpassing a threshold of where "remembering" becomes a conscious and controlled activity. In other words, associative activation spreads rapidly throughout ones cognitive structure placing information into one's short-term memory. The Search process then analyzes the relevance of the information in short-term memory, and if needed, provides direction for a further search for information through one's memory (creates a new associative activation start pattern through one's long-term memory).

b. Analytical Thinking

Another stream of research related to how the Search process operates refers to analytical thinking or decision-making processes. For instance, Strack and Deutsch (2004) propose that the Search process is a consequence of a decision process. Specifically, knowledge about the value and the probability of potential consequences is weighed and integrated to reach a preference ordering for one's behavioral options. Although no further description as to how the knowledge is stored, retrieved, or analyzed is provided, this stream of research does emphasize the use of knowledge (information) in evaluating alternatives and determining an appropriate response.

c. Hypothetical Thought

Still another stream of research explaining how the Search process operates refers to the concept of hypothetical thought (the imagination of possibilities that go beyond the representation of factual knowledge about the world, such as hypothesis testing,

forecasting, consequential decision-making, and deductive reasoning). Based on the three principles of hypothetical thinking (singularity, relevance, and satisficing principles) proposed by Evans, Over, and Handley (2003), Evans (2006) suggest that the Search process evaluates, modifies, and replaces (if needed) mental models that are cued as the most relevant to the current context. In other words, the research states that individuals engage in consequential decision-making by imagining the ramifications of potential behavior; and, typically behave according to the cued mental model offered by the Default process unless the Search process finds a reason to "give it up."

Although all three steams (controlled flow of information in memory, analytical thinking, and hypothetical thought) offer different perspectives on how the Search process operates, each appears to rely heavily on or is strongly related to some form of control (not responding automatically) and/or information search (the search for and reliance on information and knowledge). Instead of behaving automatically or impulsively when encountering environmental stimuli as in the Default process (stimulus-response), individuals are thought to "control" themselves, which gives them time to search for and exploit information and knowledge (Toates, 2006). As a result, the proposed model of problem solving in Chapter 3 combines the controlled flow of information in memory, analytical thinking, and hypothetical thought streams into what is termed the Controlled Information Search to explain how the Search process operates.

By examining both the Default process and Search process for explanatory concepts, this research was able to clarify the two sets of activities that constitute the dual-processing model of cognition. In summary, this research found that the Default process operates via a stimulus-response mechanism and that the Search process operates

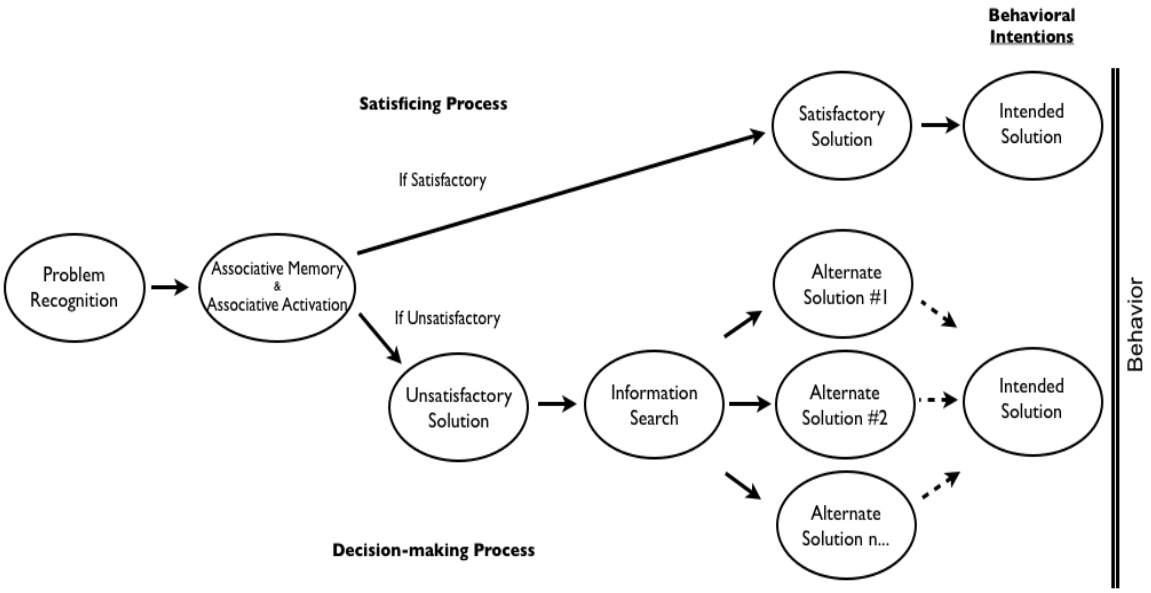
via a controlled information search. These two operating mechanisms, stimulus-response and controlled information search, will serve as the theoretical foundation in Chapter 3 of how the two processes of problem-solving operate.

Chapter 3

Theorectical framework

Chapter 3 proposes a theoretical model of problem-solving. Problem-solving is defined as any cognitive process that begins with problem-recognition and ends with the goal of finding and accepting an intended solution. In the dual-processing literature, we discussed the Default and Search processes. In the distinct cognitive domain of problem-solving, the Default process is now termed (1) Satisficing, which operates via stimulus-response. The Search process is now termed (2) Decision-making, which operates via a controlled information search. Figure 3 illustrates the proposed model and is discussed step by step.

Figure 3: Theoretical Model of Problem-Solving



Problem Recognition

Problem recognition is defined as one's acknowledgement of a significant difference between an actual state (e.g. I'm hungry) and a desired state (e.g. not hungry) requiring action (e.g. I want to eat). If an individual does not acknowledge a problem exists (e.g. I'm hungry and I want to eat), then the individual does not engage in mental activity consistent with the problem solving processes (e.g. thinking about what to eat). As a result, problem recognition is the first stage of both processes in the proposed model.

Associative Memory and Associative Activation

Problem recognition triggers the second stage of problem-solving, termed associative memory and associative activation. Associative memory is defined as ideas that are linked to other ideas in memory, like nodes in a network, based on experiences and learning. The brain links ideas together in many different ways. For instance, causes can be linked to effects (cold → runny nose), things to their properties (lime → green), and things to categories (kiwi → fruit) (Kahneman, 2011).

Associative activation is defined as evoking one idea that brings to mind another idea (James, 1950). Take the word "book." When thinking about the word "book", other ideas such as class, education, reading, paper, library, and school may come to mind. The order in which ideas come to mind is determined by the "strength" of the links between the ideas (e.g. class, education, reading, etc.) and the idea (e.g. book) (Anderson and Bower, 1973). Put another way, if "class" has the strongest link to the idea "book", then when encountering the word "book", "class" will be the first of the ideas (e.g. class,

education, reading, etc.) to come to mind. Associative activation provides information about ideas quickly, automatically, effortlessly, and at times unconsciously.

The same associative memory and associative activation process occurs between problems and solutions. Based on past experiences and learning, problems (ideas) and solutions (ideas) become linked together in associative memory. When encountering a problem, the characteristics of the problem (e.g. the resemblance or similarity to previously encountered problems, the contiguity --place and time -- of the problem, and the causality of the problem) serve as associative activation cues. These cues evoke solutions stored in memory from past occasions when similar cues were encountered (Smith and DeCoster, 2000). For example, when encountering the problem of being hungry, linked solutions may include a grocery store (Piggly Wiggly), one's favorite restaurant (McDonald's), or a favorite dish (fish).

Based on stimulus-response (Stanovich and Toplak, 2012; Schneider and Shriffin, 1977; Grunert, 1996; Strack and Deutsch, 2004; Smith and DeCoster, 2000), associative memory and associative activation (AMAA) "automatically" occurs when encountering a problem and instantly provide the individual with either a satisfactory solution or unsatisfactory solution.

Hypothesis #1: If problem recognition occurs, then associative memory and associative activation provide a potential solution.

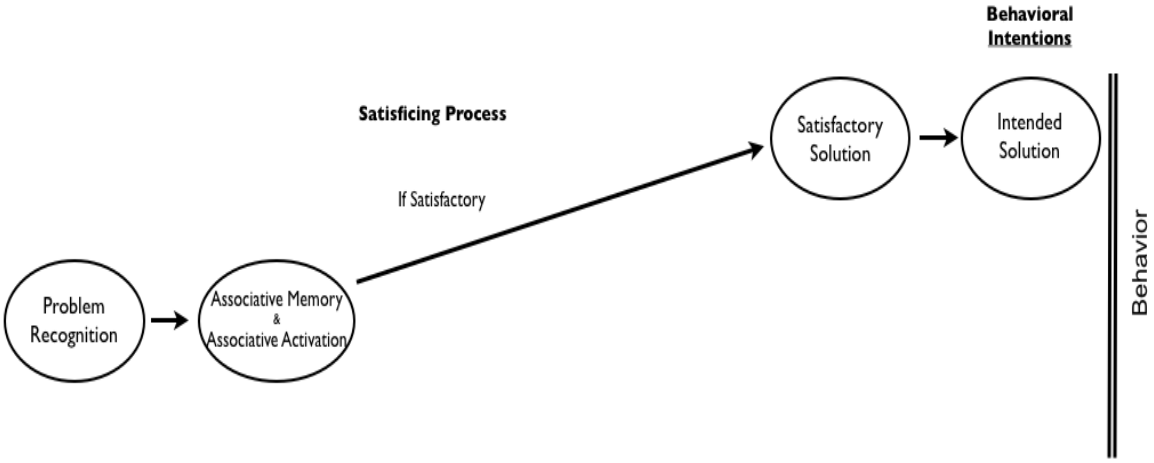
If AMAA provide a satisfactory solution, then the individual engages in what is here termed satisficing, using Simon's (1957, 1960) term for choosing the first satisfactory solution to a problem. Alternatively, if AMAA do not provide a satisfactory solution, then the individual engages in what is here termed decision-making, or a

controlled information search to find a satisfactory solution. Thus, this research argues that problem-solving consists of two cognitive processes: Satisficing and Decision-making[1]. These processes are discussed in more detail below.

Satisficing

The Default cognitive process of problem-solving is termed satisficing. Satisficing is defined as accepting the first solution provided by one's associative memory and associative activation (AMAA). See Figure 4.

Figure 4: Satisficing Process



[1] **When does Satisficing or Decision-making occur:**

Although it is beyond the scope of this paper, there is extensive research examining when individuals are more likely to engage in Satisficing or Decision-Making. Factors include but are not limited to levels of involvement, uncertainty/risk, and urgency/time-pressure. Involvement is defined as a person's perceived relevance of the object based on inherent needs, values, and interests (Zaichkowsky, 1985). Under low levels of involvement, individuals are found to search for less information and spend less time searching for the right solution (Clarke and Belk, 1978). Thus, under conditions of low involvement, individuals are more likely to engage in satisficing. Risk is defined as the perceived degree of uncertainty related to the outcome and consequences of a solution (Taylor, 1974). Under high levels of risk, individuals are found to search for more information as a way to reduce uncertainty (Sheth and Venkatesan, 1968). Thus, under conditions of low risk, individuals are more likely to engage in satisficing. Time pressure is defined as the psychological stress resulting from having to get things done in less time than is required or desired (Taber's Cyclopedic Medical dictionary, 2005, p. 2191). Research shows that time pressure leads to a decrease in information-processing (Van Kleef, De Dreu, and Manstead, 2004) and an increase in use of belief-based reasoning (Evans & Curtis-Holmes 2005). Thus, under time pressure (conditions of limited time), individuals are more likely to engage in satisficing.

In satisficing, the individual recognizes a problem, and AMAA provides the individual with a satisfactory solution (Kahneman, 2011). A satisfactory solution is defined as a behavioral intent perceived as effectively moving one from their actual state (where I am) closer to their desired state (where I want to be). As discussed by Simon (1957, 1960), individuals seldom seek to maximize their benefit from a particular course of action, but generally seek a solution that is "good enough", "adequate", or "satisfactory". In satisficing, AMAA instantly provide such a solution via stimulus-response. This is consistent with the straight rebuy in organizational buyer behavior (Robinson, Faris, and Wind, 1967; Webster and Wind, 1972) and the routinized response behavior (RRB) (Howard and Sheth, 1969) in consumer behavior.

Hypothesis #2: If associative memory and associative activation provide a satisfactory solution, then an individual will accept the solution and engage in the satisficing process.

Why Satisficing Occurs

Why satisficing occurs is best explained by the concepts of cognitive misery (Fiske, S. T., 1981; Taylor, S.E. 1981; Fiske and Taylor (1991) and the Law of Least Effort (Zipf, 1949). Cognitive misery states that whenever possible individuals attempt to preserve mental resources by adopting mental shortcuts (e.g. heuristics). In a similar vein, the Law of Least Effort states that if there are multiple processes that achieve the same goal, then individuals will engage in the process that expends the least amount of effort. Thus, if associative memory and associative activation provide a satisfactory solution to a problem, then an individual is more likely to accept that satisfactory solution

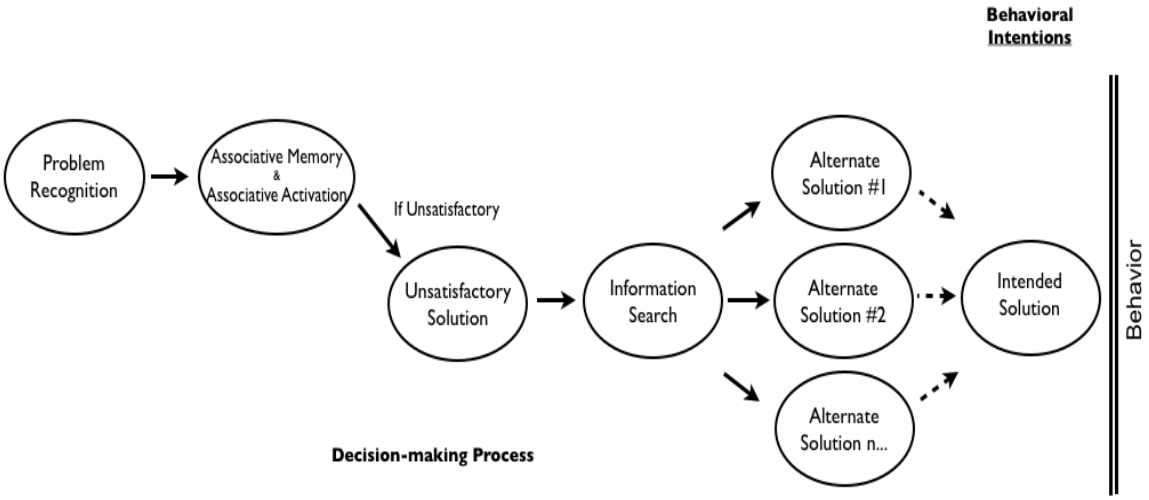
rather than expend the effort and mental resources needed to discover an alternative satisfactory solution.

However, associative memory and associative activation (AMAA) do not always provide a satisfactory solution. For example, when individuals encounter problems in which they have limited experience solving. When associative memory and associative activation (AMAA) do not provide a satisfactory solution, the individual engages in the Search process of problem-solving termed decision-making.

Decision-Making

Decision-making is defined as engaging in a controlled information search to discover a solution. See Figure 5.

Figure 5: Decision-Making Process



As previously discussed, when problem recognition occurs, associative memory and associative activation "automatically" provide a solution. However, in decision-making, the solution provided by AMAA is unsatisfactory. An unsatisfactory solution is

defined as a behavioral intent perceived as not effectively moving one from their actual state (where I am) to their desired state (where I want to be). Consequently, to solve the problem, an individual must consult their "rules of reasoning" (one's normative understanding of how to solve problems; Pacini and Epstein, 1994) and therefore engage in an information search to find a satisfactory solution.

Hypothesis #3: If associative memory and associative activation do not provide a satisfactory solution, then an individual will search for information related to alternative solutions and engage in the Decision-making process.

Information Search

In decision-making, an information search is defined as seeking evidence related to a satisfactory solution. The search for information occurs either internally, such as effortfully probing one's memory; or externally, such as probing one's environment (e.g. asking a friend, advertisements, internet search), or as a combination of both. There are three types of information a person may search for, information related to: (a) alternative solutions, (b) evaluation, and (c) criteria. Alternative solutions and evaluation are required in the decision-making process, criteria depends on the problem (discussed later).

The first type of information is related to alternative solutions. Since AMAA failed to provide a satisfactory solution, the individual must search for information related to *at least* one alternative solution, which is different than the unsatisfactory solution provided by AMAA (Bazerman and Moore, 2013). From a set of *at least* these two alternative solutions, the individual chooses the solution perceived as most

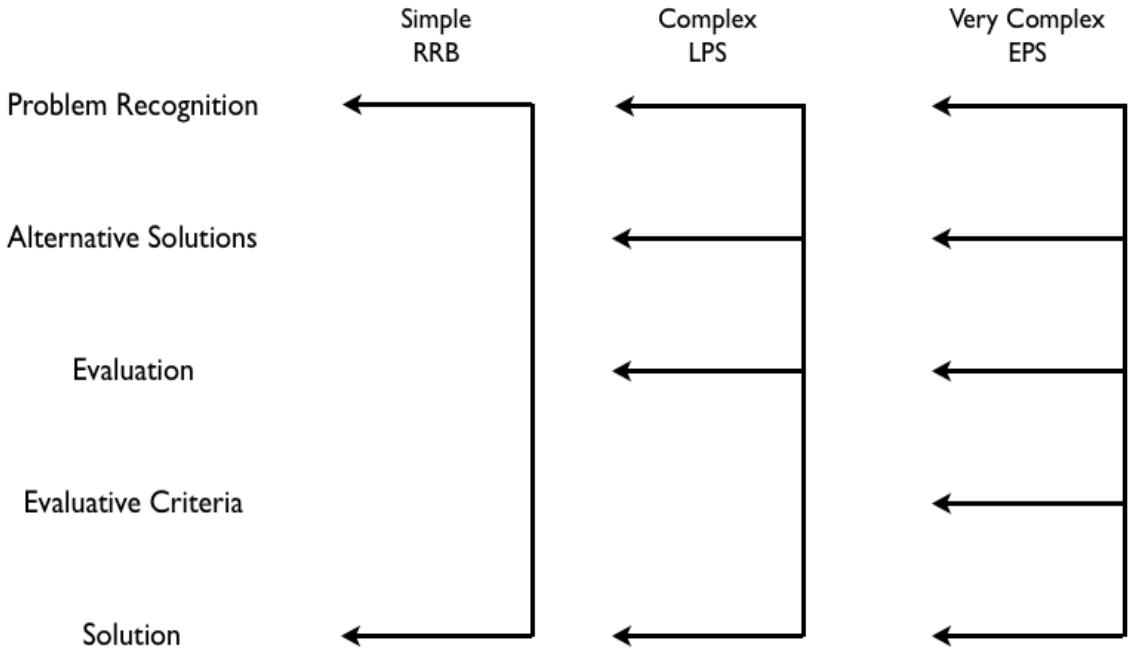
satisfactory, or least unsatisfactory. In Marketing, a set of alternative solutions is generally described as one's evoked set.

The second type of information is related to evaluation. From a set of *at least* two alternative solutions, the individual searches for information related to the advantages (pro's) and disadvantages (con's) of each alternative. This information is necessary to determine which solution is most satisfactory.

The information search in the decision-making process includes *at minimum* the search for alternative solutions and evaluation information. This is consistent with the modified rebuy in organizational buyer behavior (Robinson, Faris, and Wind, 1967; Webster and Wind, 1972) and limited problem-solving (LPS) in consumer behavior (Howard and Sheth, 1969).

The third type of information is related to criteria. Although not always required, criteria information helps to establish a basis or guideline for evaluating and comparing alternative solutions. The search for criteria information is more likely to occur when faced with a new complex problem. This is consistent with the new task purchase in organizational buyer behavior (Robinson, Faris, and Wind, 1967; Webster and Wind, 1972) and extended problem-solving (EPS) in consumer behavior (Howard and Sheth, 1969). An example of a very complex problem is whether to buy a yacht or a helicopter. In a very complex problem such as this, the buyer is highly unlikely to currently possess criteria needed for evaluating a yacht or helicopter. See Figure 6.

Figure 6: Degree of Complexity in Information Search



Source: Modified from Howard and Sheth (1969)

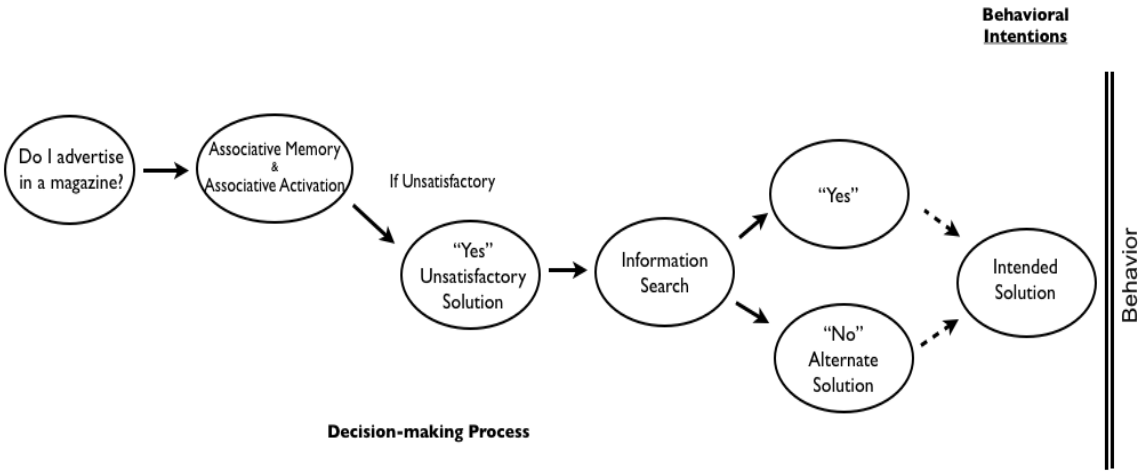
Hypothesis #4: The difference between the Satisficing process and Decision-Making process is the search for information.

The "Go, No-Go" Problem

Other complex problems take the form: "Go, No-Go". "Go, No-Go" problems are those involving whether or not to accept a specific solution. In other words, should an individual (or group) proceed with a solution or abandon it. For example, when solving the problem of low-sales, an organization may find a solution that includes advertising in a magazine. However, the organization is unsure about whether they should solve the low-sales problem with this specific solution (advertising in a magazine). As a result, a new problem arises, termed "Go, No-Go" that requires the organization to determine behavioral intent about whether or not to advertise in a

magazine. This new problem is solved via the decision-making process of problem-solving. Figure 7 provides a model of the "Go, No-Go" problem.

Figure 7: "Go, No-Go" Problem



In a "Go, No-Go" problem, the problem is first recognized (e.g. do I advertise in a magazine?) and, through stimulus-response, associative memory and associative activation provide a solution (e.g. either go (yes) advertise or no-go (no) don't advertise. According to the Human Associative Memory Theory (Anderson and Bower, 1973), the solution (yes or no) that is most strongly linked to the problem will come to mind first. However, in the "Go, No-Go" problem, the initial solution (e.g. yes) is immediately deemed unsatisfactory, thus the individual engages in an internal controlled information search (be it a very short and quick search) to find the alternative solution (e.g. no). The individual must now compare or evaluate these two alternative solutions (yes and no) to choose the solution most satisfactory.

Summary

In sum, the proposed theoretical model of problem-solving argues that the process begins with problem recognition. Recognizing a problem triggers associative memory and associative activation, which provides a default solution. This solution is either satisfactory or unsatisfactory. If the solution is satisfactory, then the individual will accept this default solution, therefore engaging in the satisficing process. If the default solution provided by AMAA is unsatisfactory, then the individual will search for information related to alternative solutions, evaluation, and possibly criteria (depending on the complexity of the problem), therefore engaging in the decision-making process. Thus, the proposed model of problem-solving argues that problem-solving is a distinct cognitive domain consisting of two processes termed (1) Satisficing and (2) Decision-making.

Chapter 3 also offers four hypotheses related to satisficing and decision-making.

- *Hypothesis #1: If problem recognition occurs, then associative memory and associative activation provide a potential solution.*
- *Hypothesis #2: If associative memory and associative activation provide a satisfactory solution, then an individual will accept the solution and engage in the satisficing process.*
- *Hypothesis #3: If associative memory and associative activation do not provide a satisfactory solution, then an individual will search for information related to alternative solutions and engage in the Decision-making process.*
- *Hypothesis #4: The difference between the Satisficing process and Decision-Making process is the search for information.*

Next, Chapter 4 describes the methodology used to test the four hypotheses.

Chapter 4

Methodology

Chapter 4 describes the methodology used to empirically test the proposed model of problem-solving. The proposed model argues that individuals solve problems via two cognitive processes termed Satisficing and Decision-Making (see Figure 3, p. 20). Specifically, the model argues that when recognizing a problem, associative memory and associative activation provide either a satisfactory or unsatisfactory solution. If the solution is satisfactory, the individual will accept the solution, therefore engaging in the Satisficing process (see Figure 4, p. 23). If the solution is unsatisfactory, then the individual will search for information in order to find a satisfactory solution, therefore engaging in the Decision-making process (see Figure 5, p. 25). To test the proposed model of problem-solving and the four hypotheses presented in Chapter 3, this research conducts one pretest and two studies.

Problem Recognition Pretest

According to the proposed model of problem-solving, problem-recognition must occur for an individual to engage in mental activity consistent with solving a problem (satisficing or decision-making). Thus, in order to test the proposed model of problem-solving, this research must first discover "situations" that elicit problem-recognition.

At least one hundred undergraduate students at Florida Atlantic University will be asked to complete a Problem Recognition Pretest Survey. Four characteristics of a problem situation are pretested: recognition, size, complexity, and frequency. Problem

Recognition refers to whether or not the situation is a problem. Problem size refers to how small or large a problem. Problem complexity refers to whether the problem situations are single (simple) or multifaceted (complex). Problem frequency refers to whether the problem situations are considered to occur occasionally (low frequency) or often (high frequency). Some situations from the Pretest that elicit problem recognition will be used in later studies. For an example of the Problem Recognition Pretest Survey, see Exhibit 1.

Exhibit 1: Problem Recognition Pretest Survey

1. On a scale from 1-6, to what extent do you see the following situations as problems that need to be solved? (1-small problem and 6-big problem; higher numbers mean bigger problems)

	1	2	3	4	5	6	Not a Problem
You use the last of the milk	○	○	○	○	○	○	○
Your television breaks	○	○	○	○	○	○	○
You run out of paper towels	○	○	○	○	○	○	○
Your car breaks down	○	○	○	○	○	○	○
Your computer crashes	○	○	○	○	○	○	○
You use the last of the tootpaste	○	○	○	○	○	○	○
Your cell phone breaks	○	○	○	○	○	○	○
Your shoelace breaks	○	○	○	○	○	○	○
A light bulb burns out (stops working)	○	○	○	○	○	○	○
You lose your sunglasses	○	○	○	○	○	○	○
You are hungry	○	○	○	○	○	○	○
You damage your favorite shirt	○	○	○	○	○	○	○
You must find a new place to live	○	○	○	○	○	○	○
You use the last of your deodorant	○	○	○	○	○	○	○
You need a new textbook for class	○	○	○	○	○	○	○
You just lost your job	○	○	○	○	○	○	○

2. On a scale from 1 to 6, to what extent do you view the following situations as simple versus complex problems? (1-simple problem and 6-complex problem; higher numbers mean more complex problems)

	1	2	3	4	5	6
You use the last of the milk	○	○	○	○	○	○
Your television breaks	○	○	○	○	○	○
You run out of paper towels	○	○	○	○	○	○
Your car breaks down	○	○	○	○	○	○
Your computer crashes	○	○	○	○	○	○
You use the last of the toothpaste	○	○	○	○	○	○
Your cell phone breaks	○	○	○	○	○	○
Your shoelace breaks	○	○	○	○	○	○
A light bulb burns out (stops working)	○	○	○	○	○	○
You lose your sunglasses	○	○	○	○	○	○
You are hungry	○	○	○	○	○	○
You damage your favorite shirt	○	○	○	○	○	○
You must find a new place to live	○	○	○	○	○	○
You use the last of your deodorant	○	○	○	○	○	○
You need a new textbook for class	○	○	○	○	○	○
You just lost your job	○	○	○	○	○	○

3. On a scale from 1-6, how often do you encounter the following situations? (1-never and 6-all the time; higher numbers mean you encounter the problem more frequently)

	1	2	3	4	5	6
You use the last of the milk	○	○	○	○	○	○
Your television breaks	○	○	○	○	○	○
You run out of paper towels	○	○	○	○	○	○
Your car breaks down	○	○	○	○	○	○
Your computer crashes	○	○	○	○	○	○
You use the last of the toothpaste	○	○	○	○	○	○
Your cell phone breaks	○	○	○	○	○	○
Your shoelace breaks	○	○	○	○	○	○
A light bulb burns out (stops working)	○	○	○	○	○	○
You lose your sunglasses	○	○	○	○	○	○
You are hungry	○	○	○	○	○	○
You damage your favorite shirt	○	○	○	○	○	○
You must find a new place to live	○	○	○	○	○	○
You use the last of the deodorant	○	○	○	○	○	○
You need a new textbook for class	○	○	○	○	○	○
You just lost your job	○	○	○	○	○	○

Study 1 Problem Recognition and AMAA

The purpose of Study 1 is to test Hypothesis #1. Hypothesis #1 states that if problem recognition occurs, then associative memory and associative activation provide a solution. To test Hypothesis #1, at least 300 participants from Florida Atlantic University

will be presented various problems and asked to provide the first solution that comes to mind.

To elicit problem recognition (independent variable), each participant will receive six different problems. These problems include a mix of problems that vary in size, complexity, and frequency (based on the results of the Problem Recognition Pretest). To measure if associative memory and associative activation provide a solution (dependent variable), participants will be asked to provide the first solution that comes to mind. According to the Human Associative Memory Theory (Anderson and Bower, 1973), the first solution that comes to mind should adequately measure one's associative memory and associative activation solution. An example of the survey format is provided in Exhibit 2.

Exhibit 2: Problem Recognition and Associative Memory and Associative Activation

Survey Format

Instructions: You will be presented with various problems. Please read each problem and provide the name of the first place that comes to mind that offers a solution. If no place comes to mind, select "Nothing comes to Mind". Please answer as quickly as possible.

(1a) Problem – Your Computer Crashes
__ Name of place that offers solution _____
__ Nothing comes to mind

(1b) How many other places that offer a solution easily come to mind?
0 1 2 3 4 5 6 or more

(1c) On a scale from 1 to 6, to what extent to you see "your computer crashing" as a complex problem? (1-simple, 6-complex, the higher the number the more complex)
1 2 3 4 5 6

(2a) Problem – You use the last of the milk
__ Name of place that offers solution _____
__ Nothing comes to mind

(2b) How many other places that offer a solution easily come to mind?
0 1 2 3 4 5 6 or more

(2c) On a scale from 1 to 6, to what extent to you see "using the last of the milk" as a complex problem? (1-simple, 6-complex, the higher the number the more complex)
1 2 3 4 5 6

(3a) Problem – You are hungry
__ Name of place that offers solution _____
__ Nothing comes to mind

(3b) How many other places that offer a solution easily come to mind?
0 1 2 3 4 5 6 or more

(3c) On a scale from 1 to 6, to what extent to you see "you are hungry" as a complex problem? (1-simple, 6-complex, the higher the number the more complex)
1 2 3 4 5 6

(4a) Problem – Your car breaks down
__ Name of place that offers solution _____
__ Nothing comes to mind

(4b) How many other places that offer a solution easily come to mind?
0 1 2 3 4 5 6 or more

(4c) On a scale from 1 to 6, to what extent to you see "your car breaks down" as a complex problem? (1-simple, 6-complex, the higher the number the more complex)
1 2 3 4 5 6

(5a) Problem – You run out of paper towels
__ Name of place that offers solution _____
__ Nothing comes to mind

(5b) How many other places that offer a solution easily come to mind?
0 1 2 3 4 5 6 or more

(5c) On a scale from 1 to 6, to what extent to you see "running out of paper towels" as a complex problem? (1-simple, 6-complex, the higher the number the more complex)
1 2 3 4 5 6

(6a) Problem – Your television breaks
__ Name of place that offers solution _____
__ Nothing comes to mind

(6b) How many other places that offer a solution easily come to mind?

0 1 2 3 4 5 6 or more

(6c) On a scale from 1 to 6, to what extent to you see "your television breaking" as a complex problem? (1-simple, 6-complex, the higher the number the more complex)

1 2 3 4 5 6

Study 2 Satisficing or Decision-Making

The purpose of Study 2 is to test Hypotheses #2, #3, and #4. Hypothesis #2 states that if the solution provided by associative memory and associative activation is satisfactory, then an individual will accept the solution, therefore engaging in the satisficing process. Hypothesis #3 states that if associative memory and associative activation do not provide a satisfactory solution, then an individual will search for information related to alternative solutions, therefore engaging in the Decision-making process. Hypothesis #4 states that the difference between the Satisficing and Decision-Making processes is the search for information related to alternative solutions.

To test these three hypotheses, this study uses an Experiential Vignette Methodology (EVM). EVM studies present participants with carefully constructed and realistic scenarios that enhance experimental realism and allow the manipulation and control of independent variables. EVM studies are found to be particularly useful for enhancing both internal and external validity (Atzmuller and Steiner, 2010; Hox, Kreft, and Hermkens, 1991), in assessing dependent variables such as intentions and behaviors (Aguinis and Bradley, 2014), and in understanding causal relationships (Grant & Wall, 2009; Cavanaugh and Fritzsche, 1985; Aguinis and Bradley, 2014).

Study 2 Participants and Procedures

Study 2 will recruit at least 500 undergraduates from Florida Atlantic University to participate. Each participant is required to first read a scenario in which they are presented a problem and asked to provide their associative memory and associative activation solution (AMAA) (similar to Study 1). After providing their AMAA solution, participants will then be presented another scenario describing an experience with this solution. Then, participants will be presented a final scenario in which they encounter the same problem encountered in the first scenario and asked to either accept their associative memory and associative activation solution or search for an alternative solution. Lastly, participants will receive a modified survey designed to measure the likelihood to search for information related to alternative solutions.

Study 2 Design and Manipulations

A 2 x 2 EVM design was used, totaling 4 versions. Each version manipulated two independent variables: problem recognition and the experience with the associative memory and associative activation solution.

Problem Recognition Manipulation

Problem recognition is manipulated in each version by altering the problem presented (two groups receive a simple problem and two groups receive a complex problem). The complexity of the problem is determined by the Problem Recognition Pretest.

Experience with the AMAA Solution Manipulation

The associative memory and associative activation solution is manipulated in each version by altering the experience with solving the problem via the AMAA solution (two

groups will be presented a scenario that describes a satisfactory experience and two groups will be presented a scenario that describes an unsatisfactory experience). For example, in the satisfactory AMAA solution experience, the store was not crowded, sales representatives were helpful, the store offered a variety of brands, qualities, and sizes to choose from, prices were fair, the individual was able to find a product they liked, and the individual purchased a product to solve the problem. This scenario should result in a satisfactory associative memory and associative activation solution.

In the unsatisfactory AMAA solution experience, the store was crowded, sales representatives were inattentive and unknowledgeable, the store didn't offer a variety of brands, qualities, and sizes to choose from, prices were high, but the individual still purchased a product from the store to solve the problem. This scenario should result in an unsatisfactory AMAA solution.

In sum, a total of four versions consisting of different scenarios that manipulate the two independent variables (problem recognition and the experience with the AMAA solution) were created specifically for this study. For details on the four versions, scenarios, and the manipulations, see the Appendix 2: Study 2 EVM Versions and Manipulations.

Manipulation Checks

To evaluate the effectiveness of the manipulations of the independent variables (problem recognition and the experience with the AMAA solution), each participant will be asked the following two questions: (1) On a scale from 1-6, to what extent do you see the current situation (using the last of the milk or your computer crashing) as a complex problem? And (2) On a scale from 1 to 6, how satisfied or unsatisfied are you with

_____ (the store that first came to mind) as a solution to the problem (using the last of the milk or your computer crashing)?

Dependent Measure

The dependent variable in Study 2 is whether the participant accepts the AMAA solution or searches for information related to an alternative solution. To measure the dependent variable, participants will be presented with a problem and asked to: __Click here to visit _____ (first store that comes to mind) or __Click here to search for another store. In addition to this item, each participant will also receive a modified version of Turner et al. (2012) 12-item alternative search scale, which measures one's likelihood to search for information for alternative solutions. The 12-items are based on a 6-point Lickert-like scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (6). For a complete list of the modified information search items, see Appendix 3: Modified Information Search Scale. An example of Study 2's overall experimental design is provided in Exhibit 3.

Exhibit 3: Example of Study 2 Experimental Design

Screen 1

A couple of weeks ago, you used the last of the milk. After double checking the refrigerator and failing to find any, you decided to visit _____ (fill in the blank with the first store that comes to mind) to purchase milk.

On a scale from 1-6, to what extent do you see using the last of the milk as a complex problem? (1-simple, 6-complex; the higher the number the more complex)

1 2 3 4 5 6

Screen 2

When you arrived at _____, the store wasn't crowed and the staff was able to quickly show you to the milk aisle. _____ offered a variety of brands, qualities, and sizes to choose from, the prices were fair, the lines were short, and you found the milk you liked. So you decided to purchase the milk from _____.

On a scale from 1 to 6, how satisfied or unsatisfied are you with _____ (the store that first came to mind) as a solution to the problem of using the last of the milk?

Screen 3

A few weeks later, while preparing something to eat you use the last of the milk again. You double check the refrigerator and fail to find any milk, so you decide to purchase more.

__ Click here to visit _____

__ Click here to search for another store

Screen 4

(1) I can't come to shop at _____ (name of store) for milk unless I have carefully considered all other stores.

(2) I'll take time to search at other stores before I visit _____ (name of store) to purchase milk.

(3) I will continue to visit different stores for milk until I find a store that reaches all of my criteria.

(4) I usually shop at different stores for milk until a store reaches all of my expectations.

(5) When shopping for milk, I plan on spending a lot of time looking at different stores other than _____ (name of store).

(6) When shopping for milk, if I can't find exactly what I'm looking for at _____ (name of store), I will continue to search for milk at different stores.

(7) I see myself going to many different stores before finding the milk I want.

(8) When shopping for milk, I don't mind visiting several other stores looking for one.

(9) I'll take time to consider all alternative stores before making a decision of where to buy.

(10) When I see the milk I want in _____ (name of store), I will always try to find the best deal elsewhere before purchasing it.

(11) If _____ (name of store) doesn't have exactly what I'm shopping for, then I will go somewhere else.

(12) I just won't make a decision about purchasing milk at _____ (name of store) until I am comfortable with the process.

Chapter 5

Results

Chapter 5 provides the results of the Pretest and the two studies conducted to test the proposed model of problem-solving.

Pretest Results

The purpose of the pretest was to discover situations that elicit problem recognition. The pretest survey was distributed to 108 Florida Atlantic University students. Of these 108 participants, 59 were female and 49 were male. Their ages ranged from 18 – 44 (75 were 18-24, 28 were 25-34, 5 were 35-44). The majority of participants were undergraduates (104) from the College of Business (majors include: Marketing, Management, Information Systems, Accounting, and Finance). See Appendix 4 and Appendix 5 for more detailed Pretest Demographic Information.

To determine situations that elicit problem recognition, pretest participants were presented various problem situations and asked to rate each situation in terms of its problem size, problem complexity, and problem frequency.

Problem: Recognition and Size

It will be recalled (Chapter 4, p. 32) that Problem Recognition refers to whether situations are considered problems and that Problem Size refers to how small or large a problem. The pretest used the Problem Size scale to test both characteristics. Participants were asked to rate each problem situation on a scale from 0-6 (0 indicated not a problem, 1 indicated a small problem, and 6 indicated a big problem).

Problem Recognition

A comparison of the percentage of respondents that did not consider a situation a problem (rated a 0) and those that did consider a situation a problem (rated from 1-6) is provided in Table 3.

Table 3: Not a Problem vs. Problem

"Situation"	% viewed as not a problem	% viewed as a problem
Use the last of the milk	35%	65%
Shoelace breaks	17%	83%
A light bulb burns out	12%	88%
Lose your sunglasses	8%	92%
Damage your favorite shirt	7%	93%
TV Breaks	8%	92%
Use last of Deordorant	10%	90%
Need to buy a new Textbook	7%	93%
Use last of the Paper Towels	6%	94%
Use last of the Toothpaste	7%	93%
Hungry	3%	97%
CPU Breaks	3%	97%
Need a new Place to Live	2%	98%
Cell Phone Breaks	1%	99%
Lost Job	2%	98%
Car Breaks Down	2%	98%

According to Table 3, the situations most frequently viewed as not a problem were using the last of the milk, your shoelace breaking, a light bulb burning out, and using the last of the deodorant (35%, 17%, 12%, and 10% respectively). On the other hand, the situations most frequently viewed as problems were your cell phone breaking, your car breaking down, losing your job, and needing to find a new place to live (99%, 98%, 98%, and 98% respectively).

To statistically test whether the situations elicit problem recognition, this research conducted a one-sample t-test. A one-sample t-test determines whether a sample mean is statistically different from a population mean (or test value). In this study, the test value for problem recognition is 1 (responses were on a scale from 0-6; less than 1 indicated not a problem, greater than 1 indicated a problem). In other words, the situations are considered to elicit problem recognition if their problem size means are significantly greater than the test value 1. For Problem Recognition results, see Table 4.

Table 4: Problem Recognition

"Situation"	Mean*	Std. Deviation	P-value	Problem or Not
Use the last of the milk	1.37	1.41	0.007	Problem
Shoelace breaks	1.99	1.45	0.000	Problem
A light bulb burns out	2.22	1.41	0.000	Problem
Lose your sunglasses	2.57	1.58	0.000	Problem
Damage your favorite shirt	2.94	1.54	0.000	Problem
TV Breaks	3.12	1.83	0.000	Problem
Use last of Deordorant	3.16	1.85	0.000	Problem
Need to buy a new Textbook	3.19	1.67	0.000	Problem
Use last of the Paper Towels	3.39	1.61	0.000	Problem
Use last of the Toothpaste	3.53	1.87	0.000	Problem
Hungry	4.09	1.58	0.000	Problem
Computer Breaks	4.94	1.62	0.000	Problem
Need a new Place to Live	5.02	1.53	0.000	Problem
Cell Phone Breaks	5.03	1.40	0.000	Problem
Lost Job	5.12	1.56	0.000	Problem
Car Breaks Down	5.22	1.52	0.000	Problem

* All means are significantly greater than 1 at the .05 level.

Results in Table 4 show that all of the situations above are considered problems (means are significantly greater than 1); therefore, any of the problems above can be used to elicit problem recognition in later studies.

Problem Size

To test the size of the problems (whether a problem is small or large), this research conducted another one-sample t-test using a test value of 3.56, which represents the overall mean of all problem size means. Problems are considered small if the means are less than 3.56 and are considered large problems if the means are greater than 3.56. Results can be found in Table 5.

Table 5: Problem Size

Problem	Mean*	Std. Deviation	P-value	Small or Large
Use the last of the milk	1.37*	1.41	0.000	Small
Shoelace breaks	1.99*	1.45	0.000	Small
A light bulb burns out	2.22*	1.41	0.000	Small
Lose your sunglasses	2.57*	1.58	0.000	Small
Damage your favorite shirt	2.94*	1.54	0.000	Small
TV Breaks	3.12*	1.83	0.014	Small
Use last of Deordorant	3.16*	1.85	0.026	Small
Need to buy a new Textbook	3.19*	1.67	0.022	Small
Use last of the Paper Towels	3.39	1.61	0.272	Small
Use last of the Toothpaste	3.53	1.87	0.858	Small
Hungry	4.09*	1.58	0.001	Large
Computer Breaks	4.94*	1.62	0.000	Large
Need a new Place to Live	5.02*	1.53	0.000	Large
Cell Phone Breaks	5.03*	1.40	0.000	Large
Lost Job	5.12*	1.56	0.000	Large
Car Breaks Down	5.22*	1.52	0.000	Large
Problem Size Mean	3.56			

* Indicates mean is significantly different from 3.56 at the .05 level.

Results in Table 5 indicate that of the sixteen problems presented, ten are considered small problems and six are considered large problems. All but two of the small problems (using the last of the paper towels and using the last of the toothpaste) had means significantly less than 3.56; and, all six of the large problems had means significantly greater than 3.56.

Problem Complexity

Problem complexity refers to whether the situations are single (simple) or multifaceted (complex) problems. To test the complexity of the problems, this research conducted a one-sample t-test. Problem complexity was measured on a scale of 1 to 6 (1 indicating a simple problem and 6 indicating a complex problem). For the Problem Complexity test value, this research used 2.78, which represents the overall mean of all problem complexity means. Thus, problems are considered simple problems if the problem complexity means are less than 2.78 and considered complex problems if the problem complexity means are greater than 2.78. See Table 6 for complexity results.

Table 6: Problem Complexity

Problem	Mean	Std. Deviation	P-value	Simple or Complex
Use the last of the milk	1.19*	0.53	0.000	Simple
Shoelace breaks	1.40*	0.77	0.000	Simple
Use last of the Paper Towels	1.50*	1.00	0.000	Simple
Use last of the Toothpaste	1.55*	0.97	0.000	Simple
Use last of Deordorant	1.58*	1.06	0.000	Simple
A light bulb burns out	1.67*	1.00	0.000	Simple
Lose your sunglasses	1.88*	1.05	0.000	Simple
Damage your favorite shirt	1.92*	1.24	0.000	Simple
Need to buy a new Textbook	2.41*	1.28	0.003	Simple
Hungry	2.80	1.60	0.916	Complex
TV Breaks	3.02	1.50	0.102	Complex
Cell Phone Breaks	4.07*	1.46	0.000	Complex
Computer Breaks	4.53*	1.39	0.000	Complex
Car Breaks Down	4.94*	1.32	0.000	Complex
Need a new Place to Live	5.02*	1.21	0.000	Complex
Lost Job	5.10*	1.23	0.000	Complex
Problem Complexity Mean	2.78			

* Indicates mean is significantly different from 2.78 at the .05 level.

Results in Table 6 indicate that of the sixteen problems presented, nine are considered simple problems and seven are considered complex problems. All nine of the simple problems have means statistically less than 2.78 (ex. using the last of the milk and using the last of the paper towels); and, five of the seven complex problems have means statistically greater than 2.78 (ex. your computer breaks and your car breaks down).

This research uses Problem Complexity as opposed to Problem Size in later studies because the former more accurately describes multiple aspects of a problem as opposed to a single aspect of a problem. In addition, this research also conducted a Pearson Correlation between Problem Complexity and Problem Size and the two were found to have a significant positive relationship. Small problems were generally considered simple problems, and large problems were generally considered complex problems. See Appendix 6: Problem Size and Complexity Pearson Correlation for more details.

Problem Frequency

Problem frequency refers to whether the problem situations are considered to occur occasionally (low frequency) or often (high frequency). This research conducted a one-sample t-test to determine the Problem Frequency of each problem. Problem Frequency was measured on a scale from 1 to 6 (1 indicated a low frequency problem and 6 indicated a high frequency problem). For the Problem Frequency test value, this research used 2.38, which represents the overall mean of all problem frequency means. Problems are considered low frequency problems if the frequency means are less than 2.38 and are considered high frequency problems if the frequency means are greater than 2.38. See Table 7 for frequency results.

Table 7: Problem Frequency

Problem	Mean	Std. Deviation	P-value	High or Low
Shoelace breaks	1.44*	0.80	0.000	Low
TV Breaks	1.56*	0.82	0.000	Low
Lost Job	1.57*	1.01	0.000	Low
Need a new Place to Live	1.81*	1.05	0.000	Low
Car Breaks Down	2.00*	1.04	0.000	Low
Computer Breaks	2.06*	1.04	0.002	Low
Damage your favorite shirt	2.16*	1.10	0.038	Low
Cell Phone Breaks	2.21	1.13	0.127	low
Lose your sunglasses	2.29	1.39	0.490	low
Use the last of the milk	2.31	1.34	0.566	low
A light bulb burns out	2.63*	1.12	0.023	High
Use last of Deordorant	2.74*	1.44	0.010	High
Use last of the Toothpaste	2.80*	1.45	0.004	High
Need to buy a new Textbook	3.03*	1.54	0.000	High
Use last of the Paper Towels	3.04*	1.36	0.000	High
Hungry	4.45*	1.31	0.000	High
Problem Frequency Mean	2.38			

*Indicates the mean is significantly different from 2.38 at the .05 level.

The results in Table 7 indicate that ten of the sixteen problems were considered low frequency problems and six of the sixteen problems were considered high frequency problems. Seven of the ten low frequency problems (cell phone breaking, losing your sunglasses, and using the last of the milk) had means significantly less than 2.38; and, all six of the complex problems had means significantly greater than 2.38.

A summary of problem size, complexity, and frequency is located in Table 8[2].

[2] This research also compared the overall mean of small problems versus the overall mean of large problems, the overall mean of simple problems versus the overall mean of complex problems, and the overall mean of low frequency problems with the overall mean of high frequency problems. Results indicate that the overall mean is statistically different at the 99% confidence level for small vs. large problems, simple vs. complex problems, and infrequent vs. frequent problems.

Table 8: Problem Size, Complexity, and Frequency Summary

Problem	Size (Small or Large)	Complexity (Simple or Complex)	Frequency (Low or High)
Use the last of the milk	Small	Simple	Low
Shoelace breaks	Small	Simple	Low
A light bulb burns out	Small	Simple	High
Lose your sunglasses	Small	Simple	Low
Damage your favorite shirt	Small	Simple	Low
Use last of Deordorant	Small	Simple	High
Need to buy a new Textbook	Small	Simple	High
Use last of the Paper Towels	Small	Simple	High
Use last of the Toothpaste	Small	Simple	High
TV Breaks	Small	Complex	Low
Hungry	Large	Complex	High
Computer Breaks	Large	Complex	Low
Need a new Place to Live	Large	Complex	Low
Cell Phone Breaks	Large	Complex	Low
Lost Job	Large	Complex	Low
Car Breaks Down	Large	Complex	Low

In sum, all of the situations presented in the pretest are considered problems and consequently will elicit problem recognition. Problems can be categorized into eight categories based on their size, complexity, and frequency. Of the sixteen problems tested, four problems were considered Small-Simple-Low frequency problems (e.g. using the last of the milk), five were considered Small-Simple-High frequency problems (e.g. using the last of the paper towels), one problem was considered a Small-Complex-Low frequency problem (e.g. your television breaks), five were considered Large-Complex-Low frequency problems (e.g. your computer breaks and car stops working), and one problem was considered a Large-Complex-High frequency problem (i.e.. being hungry).

Study 1 Results

The purpose of Study 1 (see table 6, Chapter 4, p. 50) was to test Hypothesis #1. Hypothesis #1 states that if problem recognition occurs, then associative memory and associative activation provide a potential solution.

Study 1 used a different sample than the Pretest and was distributed to 383 Florida Atlantic University students. Of the 383 surveys distributed, 331 were used in the analysis (19 surveys were deleted due to incomplete/missing responses and 33 responses were deleted because the participant first indicated that "no solution comes to mind" and then later indicated that other solutions easily came to mind – a clear contradiction). An overview of the demographic information of Study 1 participants can be found in Table 9.

Table 9: Study 1 Overview of Demographic Information

Gender	Frequency	Percent		College	Frequency	Percent
Female	215	65		College of Business	123	37.2
Male	116	35		College of Science	93	28.1
Total	331	100		College of Arts and Letters	33	10
				College of Design and Social Inquiry	32	9.7
Age	**Frequency**	**Percent**		Education	50	15.1
Under 18	9	2.7		Total	331	100
18-24	281	84.9				
25-34	29	8.8		**Education**	**Frequency**	**Percent**
35-44	10	3		1st yr undergraduate	115	34.7
45-54	2	0.6		2nd yr undergraduate	96	29
Total	331	100		3rd yr undergraduate	64	19.3
				4th yr undergraduate	33	10
Ethnicity	**Frequency**	**Percent**		5th or more yr undergraduate	7	2.1
White	196	59.2		1st yr graduate	4	1.2
Black	58	17.5		2nd yr graduate	3	0.9
Indian	1	0.3		3rd or more yr graduate	1	0.3
Asain	15	4.5		Ph.D.	8	2.4
Other	61	18.4		Total	331	100
Total	331	100				
				GPA	**Frequency**	**Percent**
HH Income	**Frequency**	**Percent**		4-3.5	98	29.6
less than $10,000	89	26.9		3.5-3	125	37.8
$10,000-$20,000	27	8.2		3-2.5	69	20.8
$20,000-$30,000	28	8.5		2.5-2	34	10.3
$30,000-$40,000	26	7.9		1.99 - 1.5	4	1.2
$40,000-$50,000	20	6		1.49 - 1.0	1	0.3
$50,000-$60,000	14	4.2		Total	331	100
$60,000-$70,000	14	4.2				
$70,000-$80,000	17	5.1		**Marital Status**	**Frequency**	**Percent**
$80,000-$90,000	19	5.7		Married	16	4.8
$90,000-$100,000	15	4.5		Divorced	4	1.2
$100,000-$150,000	38	11.5		Seperated	2	0.6
more than $150,000	24	7.3		Never Married	309	93.4
Total	331	100		Total	331	100

Of the 331 respondents used, 65% were female, 35% were male, and 94% were between the ages of 18-34. 95% of the respondents were undergraduates and approximately 65% were either from the College of Business (37.2%), College Science (28.1%), and the College of Education (15.1%).

To test Hypothesis #1, participants were presented six problems from the pretest that vary in problem size, complexity, and frequency. Participants received one Small-Simple-Low frequency problem (i.e. using the last of the milk), one Small-Simple-High frequency problem (i.e. using the last of the paper towels), one Small-Complex-Low frequency problem (i.e. television breaks), one Large-Complex-High frequency problem (i.e. being hungry), and two Large-Complex-Low frequency problems (i.e. computer breaks and car breaks down). After reading each problem, participants were then asked to provide the name of the first place that comes to mind that offers a solution. If no place came to mind, participants were asked to select "nothing comes to mind". The results are shown in Table 10.

Table 10: Percentage of Respondents who provided a Solution

Problem	% of Respondents that AMAA provided a solution	% of Respondents that "nothing came to mind"
Use the last of the milk	96.7%	3.3%
Use the last of the paper towels	98.8%	1.2%
Hungry	99.7%	0.3%
TV breaks	75.2%	24.8%
Computer breaks	86.1%	13.9%
Car breaks down	93.1%	6.9%

The results support Hypothesis #1: when problem recognition occurs, associative memory and associative activation provide a solution more than 75 percent of the time. The results in Table 10 also show that the percentage of respondents who provided a

solution to a problem never totaled 100 percent. Perhaps for some participants, a link between the problem and a solution had not yet formed due to insufficient learning. As discussed in Chapter 3, learning helps to form the links between problems and solutions in one's associative memory. For a complete list of associative memory and associative activation solutions for each problem, see Appendix 7.

Study 2 Results

The purpose of Study 2 (see Chapter 4, Table 7, p. 57) was to test Hypothesis #2, #3, and #4. Hypothesis #2 states that if associative memory and associative activation provide a satisfactory solution, then the individual will accept the solution and engage in Satisficing. Hypothesis #3 states that if associative memory and associative activation do not provide a satisfactory solution, then the individual will search for information related to alternative solutions and engage in Decision-making. Hypothesis #4 states that the difference between the satisficing and decision-making process is the search for information for alternative solutions.

Study 2 used a sample different from Study 1 and was distributed to 536 Florida Atlantic University students. Of the 536 distributed surveys, 11 were deleted because of missing responses and 8 surveys were deleted because of unwarranted responses (i.e. improperly answering the first question causes errors in the remaining survey questions). An overview of Study 2 participants' demographic information is provided in Table 11.

Table 11: Study 2 Overview of Demographic Information

Age	Frequency	Percent	GPA	Frequency	Percent
under 18	15	2.9	4-3.5	142	27.5
18-24	449	86.8	3.5-3	201	38.9
25-34	43	8.3	3-2.5	123	23.8
35-44	7	1.4	2.5-2	40	7.6
45-54	2	0.4	1.99-1.5	4	0.8
55-64	1	0.2	1.5-1.0	3	0.6
Total	517	100	Below 1.0	4	0.8
			Total	517	100
Gender	**Frequency**	**Percent**			
Female	395	76.4	**Education**	**Frequency**	**Percent**
Male	122	23.6	1st yr undergraduate	198	38.3
Total	517	100	2nd yr undergraduate	108	20.9
			3rd yr undergraduate	120	23.2
Ethnicity	**Frequency**	**Percent**	4th yr undergraduate	62	12
White	301	58.2	5th or more yr undergraduate	19	3.7
Black	109	21.1	1st yr graduate	6	1.15
Indian	2	0.4	2nd yr graduate	1	0.2
Asain	29	5.6	3rd or more yr graduate	2	0.4
Other	76	14.7	Ph.D.	1	0.15
Total	517	100	Total	517	100
Marital Status	**Frequency**	**Percent**			
Married	18	3.5	**Household income**	**Frequency**	**Percent**
Divorced	6	1.15	Less than $10,000	123	23.8
Seperated	6	1.15	$10,000 - $19,999	53	10.3
Never Married	487	94.2	$20,000 - $29,999	45	8.7
Total	517	100	$30,000 - $39,999	48	9.3
			$40,000 - $49,999	42	8.1
College	**Frequency**	**Percent**	$50,000 - $59,999	25	4.8
Engineering and Computer Science	1	0.2	$60,000 - $69,999	32	6.2
College of Business	121	23.4	$70,000 - $79,999	32	6.2
College of Science	290	56.1	$80,000 - $89,999	29	5.6
College of Arts and Letters	12	2.3	$90,000 - $99,999	17	3.3
College of Design and Social Inquiry	5	1	$100,000 - $149,999	44	8.5
Education	88	17	More than $150,000	27	5.2
Total	517	100	Total	517	100

Of the 517 respondents used, 76% were female, 24% were male, and 95% were between the ages of 18-34. 98% of the respondents were undergraduates and approximately 96% were from the College of Business (23%), College Science (56%), or the College of Education (17%).

Three tests were used to support hypothesis #2 and #3, which were tested together: two-way ANOVA, Chi Square Test of Association, and a Point Biserial Correlation. Two tests were conducted to test hypothesis #4: Independent Samples T-Test and a Point Biserial Correlation. To test Hypothesis #2 (if AMAA provides a

satisfactory solution, individuals accept the solution) and Hypothesis #3 (if AMAA provides an unsatisfactory solution, individual searches for an alternative solution), a two-way ANOVA was conducted. A two-way ANOVA compares the mean differences between groups that have been categorized based on two independent variables. The independent variables of this two-way ANOVA were (1) satisfactory level (a satisfactory or unsatisfactory AMAA solution) and (2) problem complexity (a simple or complex problem). The dependent variable was the mean of the means of the modified Turner et al. (2010) 12-item scale measuring one's likelihood to search for information related to alternative solutions (see Appendix Table 3, p. 90). Before running the two-way ANOVA, the six assumptions of a two-way ANOVA were tested and the manipulations of the independent variables were checked (results are provided in Appendix 8: Two-Way ANOVA Assumption Testing and Appendix 9: Two-Way ANOVA Manipulation Checks)

Test of Hypotheses #2 and #3 Two–Way ANOVA

After checking the assumptions and manipulations, this research conducted a two-way ANOVA. A summary of the results of the two-way ANOVA is provided in Table 12.

Table 12: Two-Way ANOVA Results

Tests of Between-Subjects Effects						
Dependent Variable: Information Search Average of Averages						
Source	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**	**Observed Power**
Corrected Model	3	116.099	143.465	0.000	0.456	1
Intercept	1	5818.942	7190.569	0.000	0.933	1
Satisfactory or Unsatisfatory AMAA Solution	1	13.62	16.831	0.000	0.032	0.984
Simple or Complex Problem	1	331.795	410.005	0.000	0.444	1
Interaction of Satisfactory/Unsatisfactory & Simple/Complex	1	1.51	1.865	0.173	0.004	0.276
Error	513	0.809				
Total	517					
Corrected Total	516					

The results of the two-way ANOVA support Hypothesis #2 and Hypothesis #3. The results indicate a statistically significant difference between the mean of the group with a satisfactory AMAA solution and the mean of the group with an unsatisfactory AMAA solution on the likelihood to search for information related to alternative solutions (p-value .000). Results indicate that 3.2 percent of the variance in one's likelihood to search for information related to alternative solutions can be attributed to whether the individual had a satisfactory or unsatisfactory AMAA solution come to mind (Partial Eta Squared .032).

In addition to supporting Hypotheses #2 and #3, the results of the two-way ANOVA also indicate a statistically significant difference between the simple problem group mean and the complex problem group mean on the likelihood to search for information related to alternative solutions (p-value .000). Results indicate that 44.4% of the variance in searching for information related to alternative solutions can be attributed to whether the individual had a simple or complex problem (Partial Eta Squared .444). Lastly, the results of the Two-Way ANOVA show no significant interaction effects between problem complexity and satisfactory level (satisfactory or unsatisfactory AMAA solution) on one's likelihood to search for information related to alternative solutions.

Test of Hypotheses #2 and #3 Chi-Square Test of Association

To provide additional support for Hypothesis #2 and #3 (if AMAA provides an unsatisfactory solution, individual searches for an alternative solution), this research also conducted a 2 x 2 chi-square test of association. A chi-square test of association is used to discover if there is a relationship between two categorical variables. This research used a 2 x 2 chi-square test of association to determine if there is a relationship between

satisfactory level (satisfactory AMAA solution or an unsatisfactory AMAA solution) and whether the participant engaged Satisficing (accepts the AMAA solution) or Decision-Making (searches for information related to an alternative solution). See Table 13 for results.

Table 13: Chi-Square Test of Association Results

Actual Count			
	Satisficing (Accept AMAA)	Decision-Making (search for alternative)	Total
Satisfactory AMAA Solution	220	38	258
Unsatisfactory AMAA Solution	132	127	259
Total	352	165	517
Actual Percentage in each Group			
	Satisficing (Accept AMAA)	Decision-Making (search for alternative)	
Satisfactory AMAA Solution	85%	14.70%	
Unstaisfactory AMAA Solution	51%	49%	
Expected Count			
	Satisficing (Accept AMAA)	Decision-Making (search for alternative)	Total
Group Satisfactory	175.7	82.3	258
Group Unstaisfactory	176.3	82.7	259
Total	352	165	
	Value	Significance*	
Pearson Chi-Sqaure	70.004	0.000	
Phi correaltion	0.368	0.000	

Results support Hypothesis #2 and #3 and indicate that a respondent is more likely to engage in satisficing (accepting the AMAA solution) given a satisfactory solution (85%), and that a respondent is less likely to engage in satisficing (accept the AMAA solution) given an unsatisfactory solution (51%). This relationship is statistically significant based on the phi correlation of .368 (p-value < than .001), which according to Pallant, J. (2010) indicates a strong to very strong association. In other words, whether an individual engages in Satisficing or Decision-making is strongly dependent on

whether the AMAA solution was satisfactory or unsatisfactory (unsatisfactory positively correlated to the search for information).

Test of Hypotheses #2 and #3 Point-Biserial Correlation

In addition to the two-way ANOVA and chi-square test of association, this research computed a Point-Biserial Correlation to further support Hypothesis #2 and #3. A point-biserial correlation is used to measure the strength and direction of the association that exists between one dichotomous variable (satisfactory level) and one continuous variable (modified Turner et al. 2010 information search scale). This research computed a point-biserial correlation between satisfactory level (satisfactory or unsatisfactory AMAA solution) and the likelihood to search for alternative solutions (the modified Turner et. al. 12 point likelihood to search for alternatives scale).

The results of this correlation support Hypothesis #2 and #3 and indicate a significant positive relationship between an unsatisfactory AMAA solution and the likelihood to search for information related to alternative solutions (p-value .001; Point Biserial Correlation .141, significant at the .01 level). In other words, respondents with an unsatisfactory AMAA solution are more likely to search for information related to an alternative solution.

Test of Hypothesis #4 Independent-Samples T-Test

To test Hypothesis #4 (the difference between satisficing and decision-making is the search for information), this research conducted an independent-samples t-test between the mean information search average of those who engaged in satisficing versus the mean information search average of those who engaged in decision-making. The results are provided in Table 14.

Table 14: Independent-Samples T-Test Results

Group Statistics				
	Satisficing_or_DecisionMaking	N	Mean	Std. Deviation
InfoSearchAvg	0	352	2.92	1.09
	1	165	4.24	0.96
Independent Samples Test				
T-test for Equality of Means				
		t-statistic	Degrees of Fredom	Sig. (2-tailed)
InfoSearchAvg	Equal variances assumed	-13.354	515	0.000

The results in Table 14 support Hypothesis #4 and indicate a statistically significant difference between the means of the two groups (p-value - .000). This provides evidence that those who engage in satisficing are much less likely to search for information, while those who engage in decision-making are much more likely to search for information. Although we would expect a near zero mean for information search, the mean was 2.92. This can be explained by the influence of problem complexity on one's likelihood to search for information related to alternative solutions (see two-way ANOVA results above).

Test of Hypothesis #4 Point-Biserial Correlation

In addition to the independent-samples t-test, this research also computed a Point-Biserial Correlation to further support Hypothesis #4 (the difference between satisficing and decision-making is the search for information). This research uses this point-biserial correlation to determine the association between engaging in the Satisficing or Decision-making process and the search for information related to alternative solutions (used the modified Turner et. al. 12 point likelihood to search for alternatives scale).

The results of this correlation support Hypothesis #4 and indicate a statistically significant positive correlation between whether someone engages in satisficing versus

decision-making and the likelihood to search for information (Point Biserial Correlation .507; significant at the .01 level, p-value .000). These results show that the individuals who engage in the satisficing process are significantly less likely to search for information and those that engage in the decision-making process are significantly more likely to search for information.

In sum, Hypothesis #2 and Hypothesis #3 were supported by a two-way ANOVA, a Chi-Square Test of Association, and a Point Biserial Correlation. Hypothesis #4 was supported by an Independent Sample T-test and a Point Biserial Correlation.

Chapter 6

Conclusion

This chapter offers conclusions, managerial implications, limitations, and potential areas of future research. This research sought to better understand how marketers and consumers solve problems by first clarifying areas of confusion within the problem-solving literature, and then developing and empirically testing a theoretical model of problem-solving.

There were three areas of confusion related to the problem-solving literature: (1) the unclear relationship between problem-solving and decision-making, (2) the meaning of problem-solving, and (3) the blurred distinction between the use of normative and positive explanations of problem-solving. The first area of confusion was related to the conflation of problem-solving and decision-making. It was resolved by providing a logical argument that decision-making is an element of problem-solving. It was shown that problem-solving involves two cognitive processes and decision-making is one of them (satisficing the other). The model argues that individuals can engage in problem-solving without engaging in decision-making (through satisficing), but cannot engage in decision-making without engaging in problem-solving.

The second area of confusion was the lack of consensus about the meaning of problem-solving. This research provides a clear definition of problem-solving as any cognitive process that begins with problem recognition and ends with the goal of finding and accepting an intended solution.

The third area of confusion was the blurred distinction between the use of normative descriptions and positive explanations of problem-solving. Simply, earlier models of problem-solving provided normative descriptions (how one *should* solve problems). However, normative descriptions alone are insufficient for theory development (see Chapter 2, p. 9). Consequently, this research provides a positive explanation of problem-solving based on the dual-processing model of cognition (how one *actually* solve problems).

With these three areas of confusion clarified, this research developed and empirically tested a theoretical model of problem-solving. The model states that the distinct cognitive domain of problem-solving begins with problem recognition. Problem recognition triggers associative memory and associative activation (hypothesis #1), which provide a default solution that is either satisfactory or unsatisfactory. If the default solution is satisfactory, then the marketer or consumer will accept this default solution, therefore satisficing (hypothesis #2). The satisficing process operates based largely on stimulus-response. If the default solution is unsatisfactory, then the marketer or consumer will search for an alternative solution, therefore engaging in the decision-making (hypothesis #3). The decision-making process operates based on a controlled search for information. Thus, the difference between satisficing and decision-making is the search for information (hypothesis #4).

To empirically test the four hypotheses, a pretest and two studies were conducted. The results of the pretest provided problem situations that elicit problem recognition (the first step of the proposed model), which were then used in two studies to test the four hypotheses. The results of the two studies support the four hypotheses. Thus, this

research concludes that problem-solving begins with problem recognition, triggering associative memory and associative activation, which provide either a satisfactory or unsatisfactory solution. If satisfactory, the individual accepts the solution and engages in satisficing, and if unsatisfactory the individual searches for information related to an alternative solution and engages in decision-making. Problem-solving ends when an intended solution is chosen.

Managerial Implications

The most significant implication for management when solving complex problems is to resist behaving according to the default solution (which is provided by associative memory and associative activation). It is important to resist the natural inclination to accept the default solution and instead engage in the decision-making process by using the subscribed normative processes of problem-solving (see Chapter 2, p. 9). This is because solutions can be categorized as either effective or efficient (Drucker, 1974). Effective solutions are those that solve a problem, and efficient solutions are those that solve a problem in the best way (cost less, provides a greater return, easiest to implement, etc.). Depending on the problem, the default solution may be effective, but not efficient.

Another managerial implication is that firms should occasionally engage in decision-making with reoccurring simple problems. When faced with a problem for the first time, firms typically engage in the decision-making process to find the most efficient solution (e.g. the firm engages in a new task purchase). Over time and with experience, this solution becomes the default solution to the reoccurring problem (e.g. the firm engages in a straight rebuy). However, as time passes, the firm's situation and

circumstance may change and the default solution may no longer provide the most efficient solution. Thus, firms should occasionally engage in the decision-making process (as opposed to the satisficing process) when solving reoccurring simple problems to ensure that they are solving the problem with an efficient solution.

Limitations

Like all research, this study is not without limitations. These are either conceptual or empirical. Conceptual limitations involve the comprehensiveness of the proposed model of problem-solving, and empirical limitations relate to testing the model.

A conceptual limitation of this research involves which activities the brain engages-in during the associative memory and associative activation stage of problem-solving. It will be recalled that the dual-processing model of cognition offered two streams of research describing the mental activities that could possibly occur during this stage: Stimulus-response and Heuristics. Although stimulus response provides a clear description of the activities that could possibly occur, there is no research that explains the specific mental activities that could possibly occur in the heuristics stream. Future research should explore these mental activities, as well as test each stream (heuristics and stimulus-response) to determine when or under what conditions stimulus-response or heuristics actually occur.

Another conceptual limitation of this research involves which activities the brain engages-in during the controlled information search stage of decision-making. It will be recalled (Chapter 2, p. 15) that the dual-processing model of cognition offered three alternative streams of research describing the mental activities that could possibly occur when searching for information: (1) controlled flow of information in memory, (2)

analytical thinking, and (3) hypothetical thought. All three streams appear viable possibilities. Different situations or circumstances could elicit different activities or a combination of these activities. However, there is no research that tests when or under what conditions these three streams actually occurs. Future research should address this issue.

One empirical limitation of this research is the use of student samples, which may limit the generalizability of the results. However, this is a general theory of problem-solving, so there is no reason to suspect the results would change if the studies were conducted on a more heterogeneous non-student sample.

Another empirical limitation is that Study 2 only tested the search for information related to alternative solutions. According to the proposed model, this is only one of three types of information that could be searched during the decision-making process (the other two types are evaluative and criteria information, see Chapter 3, Figure 6, p. 28). Future research should test the search related to all three types of information.

A third empirical limitation is that the studies conducted only tested one's likelihood to search for information for alternative solutions in general, as opposed to searching for information internally (memory) or externally (environment). Future research should distinguish between these two searches and test for both.

Future Research

In addition to the future research generated by the limitations, there are many other areas of future research. Three are discussed next. One involves expanding the model to include behavior and learning. The current model of problem-solving ends when one accepts a solution that results in behavioral intent. The intent is expected to

result in behavior. One's behavior impacts whether the solution was satisfactory or unsatisfactory, which is expected to impact subsequent associative memory and associative activation solutions through learning. Future research could examine how learning (represented by an information feedback loop) affects one's associative memory and associative activation, which influences satisficing and decision-making.

Another area of future research might examine how solutions are categorized in one's associative memory. How one categorizes solutions could affect whether one engages in satisficing or decision-making. The results of Study 1 showed that some associative memory and associative activation solutions were general (e.g. grocery store, mechanic, electronic repair store, and restaurant), which may lead to decision-making, and others were specific (e.g. Publix, AAA, Best Buy, and Chipotle), which may lead to satisficing. Future research should study how, when, and why solutions are categorized, and even more importantly, what factors influence this categorization.

A final area of future research involves developing a more efficient method of measuring the problem-solving model. Although the current method of testing the model was effective, it is a laborious and time-consuming approach. As a result, future research should examine a more user-friendly method of measuring the model of problem-solving. One potential method is the Cognitive Reflection Test (Federick, 2005). The Cognitive Reflection Test was originally developed to measure one's disposition to engage in either the Default or Search process (see Chapter 2, p. 12), and may prove a more efficient measuring instrument.

Appendices

Appendix 1: Frequency of Cognitive Process Description

Group 1 Common Discritpive words/phrases	Heuristic	System 1	Peripheral	Implicit	Experiential	Automatic	Unconscious	Inuitive	Associative	Stimulus-bound	Holistic	Impulsive	Affective	Experience-Based	Totals	Percent
Low cogntive effort/low cogntive capapcity	1	1	1			1		1		0		1	1		7	50%
automatic	1	1			1	1	1	1	1	1			1	1	10	71%
involuntary/nocontrol	1	1			1	1	1			1	1				7	50%
fast	1	1		1	1			1	1	1	1	1		1	10	71%
holistic		1			1			1							3	21%
unconscious		1		1	1	1	1	1	1	1				1	9	64%
Low involvement			1												1	7%
Heuristic			1											1	2	14%
unintentional				1											1	7%
unaware				1					1						2	14%
affective, feeling, experiential				1	1		1	1	1	0		1		1	7	50%
nonverbal					1										1	7%
parrellel						1		1							2	14%
learned						1									1	7%
low attention						1	1		1			1	1		5	36%
intuitive							1		1		1			1	4	29%
infinite processing capacity							1								1	7%
aschematic							1								1	7%
Not-rule based							1								1	7%
divergent							1								1	7%
reproductive									1						1	7%
reflexive									1	1					2	14%
nonanlytical									1						1	7%
implicit										1				1	2	14%
inflexible										1		1			2	14%
associative											1				1	7%

Group 2 Common Discriptive words/phrases	Systematic	Cogntive	System 2	Central	Explicit	Rational	Strategic	Conscious	Analytic	Rule-based	Higher-Order	Controlled	Deliberate	Reflective	Information-based	Technocratic	Totals	Percent
High cogntive capacity/constrained by low capacity	1	1	1				1	1			1		1	1			8	50%
high cognitive effort	1	1	1	1	1	1			1	1	1		1	1		1	12	75%
analytical		1															1	6%
High attention		1	1				1	1				1		1			6	38%
deliberative/Intentional		1	1								1				1		4	25%
analytical			1			1				1						1	4	25%
Slow/long			1			1		1	1	1	1		1	1	1	1	10	63%
Controlled/directed			1		1	1			1	1	1	1		1			8	50%
Conscious/awareness			1		1	1	1			1	1		1	1			8	50%
rule-based								1	1				1				3	19%
sequential/orderly/serial/systematic	1	1	1				1			1		1	1			1	8	50%
invovlement				1													1	6%
extensive consideration				1													1	6%
diligent/careful				1													1	6%
elaborate					1			1									2	13%
verbal						1											1	6%
affect-free						1											1	6%
flexible							1				1						2	13%
voluntary								1			1						2	13%
schematic								1									1	6%
focused/dedicated								1							1		2	13%
Convergent								1									1	6%
Explicit										1	1				1		3	19%
exclusive											1						1	6%
Scientific																1	1	6%
Relies of Quant tools																1	1	6%

Appendix 2: Study 2 EVM Versions and Manipulations

Simple Problem & Satisfactory AMAA Solution

A couple of weeks ago, you used the last of the milk. After double checking the refrigerator and failing to find any, you decided to visit _____ (fill in the blank with the first store that comes to mind) to purchase milk.

When you arrived at _____, the store wasn't crowed and the staff was able to quickly show you to the milk aisle. _____ offered a variety of brands, qualities, and sizes to choose from, the prices were fair, the lines were short, and you found the milk you liked. So you decided to purchase the milk from _____.

A few weeks later, while preparing something to ear you use the last of the milk again. You double check the refrigerator and fail to find any milk, so you decide to purchase more.

Simple Problem & Unsatisfactory AMAA Solution

A couple of weeks ago, you used the last of the milk. After double checking the refrigerator and failing to find any, you decided to visit _____ (fill in the blank with the first store that comes to mind) to purchase milk.

When you arrived at _____, the store was crowded, the staff was busy, and you had an extremely difficult time finding the milk aisle. After finding the milk aisle, _____ did not have many brands, qualities, and sizes to choose from, the prices were high, and the check out lines were long. Although unsatisfied with _____, you purchased a carton of milk.

A few weeks later, while preparing something to ear you use the last of the milk again. You double check the refrigerator and fail to find any milk, so you decide to purchase more.

Complex Problem & Satisfactory AMAA Solution

A few months ago, while browsing the Internet your computer crashed. After asking friends, browsing tech magazines, and searching the web, you decided to go to _____(fill in the blank with the first store that comes to mind) to purchase a new computer.

When you arrived at _____, the store wasn't crowded and the technical sales representatives were extremely knowledgeable and attentive. _____ offered a variety of brands, qualities, and sizes to choose from, the prices were fair, and you were able to find a computer you liked. So you decided to purchase the computer from _____.

A few years later, while browsing the Internet your computer crashes again. Although you tried your best to fix it, you decide to purchase a new computer.

Complex Problem & Unsatisfactory AMAA Solution

A few months ago, while browsing the Internet your computer crashed. After asking friends, browsing tech magazines, and searching the web, you decided to go to _____(fill in the blank with the first store that comes to mind) to purchase a new computer.

When you arrived at _____, the store was crowded and the technical sales representatives were inattentive and unable to answer your questions. In addition, _____ didn't offer many brands, qualities, and sizes to choose from and the prices were high. Although unsatisfied with _____, you purchased a computer form the store.

A few years later, while browsing the Internet your computer crashes again. Although you tried your best to fix it, you decide to purchase a new computer.

Appendix 3: Modified Information Search Scale

(1) I can't come to shop at _____ (name of store) for (milk or a computer) unless I have carefully considered all other stores.

(2) I'll take time to search at other stores before I visit _____ (name of store) to purchase (milk or a computer).

(3) I will continue to visit different stores for (milk or a computer) until I find a store that reaches all of my criteria.

(4) I usually shop at different stores for (milk or a computer) until a store reaches all of my expectations.

(5) When shopping for (milk or a computer), I plan on spending a lot of time looking at different stores other than _____ (name of store).

(6) When shopping for (milk or a computer), if I can't find exactly what I'm looking for at _____ (name of store), I will continue to search for (milk or a computer) at different stores.

(7) I see myself going to many different stores before finding (the milk or a computer) I want.

(8) When shopping for (milk or a computer), I don't mind visiting several other stores looking for one.

(9) I'll take time to consider all alternative stores before making a decision of where to buy.

(10) When I see the (milk or computer) I want in _____ (name of store), I will always try to find the best deal elsewhere before purchasing it.

(11) If _____ (name of store) doesn't have exactly what I'm shopping for, then I will go somewhere else.

(12) I just won't make a decision about purchasing (milk or a computer) at _____ (name of store) until I am comfortable with the process.

Appendix 4: Pretest Demographic Information

Gender	Frequency	Percent		Education	Frequency	Percent
Female	59	54.6		1st yr undergraduate	2	1.9
Male	49	45.4		2nd yr undergraduate	15	13.9
Total	108	100		3rd yr undergraduate	25	23.1
				4th yr undergraduate	46	42.6
Age	**Frequency**	**Percent**		5th or more yr undergraduate	16	14.8
18-24	75	69.4		2nd yr graduate	1	0.9
25-34	28	25.9		Ph.D.	3	2.8
35-44	5	4.6		Total	108	100
Total	108	100				
				GPA	**Frequency**	**Percent**
Ethnicity	**Frequency**	**Percent**		4.0 - 3.5	23	21.3
White	56	51.9		3.49 - 3.0	51	47.2
Black	20	18.5		2.99 - 2.5	30	27.8
Asain	4	3.7		2.49 - 2.0	4	3.7
Other	28	25.9		Total	108	100
Total	108	100				
				MaritalStatus	**Frequency**	**Percent**
CollegeFAU	**Frequency**	**Percent**		Married	13	12
Engineering & CPU Science	1	0.9		Divorced	1	0.9
College of Business	104	96.3		Seperated	2	1.9
College of Science	3	2.8		Never Married	92	85.2
Total	108	100		Total	108	100

Appendix 5: Pretest Demographic and Problems Correlations

		Gender				Age
Milkp	Pearson Correlation	.223*		**FavShirtp**	Pearson Correlation	-.208*
	Sig. (2-tailed)	0.02			Sig. (2-tailed)	0.031
TVp	Pearson Correlation	.195*		**Hungryf**	Pearson Correlation	-.204*
	Sig. (2-tailed)	0.043			Sig. (2-tailed)	0.034
Milkf	Pearson Correlation	.223*		**FavShirtf**	Pearson Correlation	-.193*
	Sig. (2-tailed)	0.02			Sig. (2-tailed)	0.045
CellPhonec	Pearson Correlation	-.212*		**FavShirtc**	Pearson Correlation	-.263**
	Sig. (2-tailed)	0.027			Sig. (2-tailed)	0.006
Hungryc	Pearson Correlation	-.256**				
	Sig. (2-tailed)	0.007				**GPA**
				PaperTowelsp	Pearson Correlation	.221*
		HH Income			Sig. (2-tailed)	0.021
Place2Livec	Pearson Correlation	-.195*		**PaperTowelsf**	Pearson Correlation	.230*
	Sig. (2-tailed)	0.044			Sig. (2-tailed)	0.017
CellPhonec	Pearson Correlation	-.209*				
	Sig. (2-tailed)	0.03				
CPUc	Pearson Correlation	-.214*				**Education**
	Sig. (2-tailed)	0.026		**Carf**	Pearson Correlation	-.205*
Place2Livef	Pearson Correlation	-.202*			Sig. (2-tailed)	0.033
	Sig. (2-tailed)	0.036				
Shoelacef	Pearson Correlation	-.225*				
	Sig. (2-tailed)	0.019				**Marital Status**
CPUf	Pearson Correlation	-.247*		**TVp**	Pearson Correlation	-.195*
	Sig. (2-tailed)	0.01			Sig. (2-tailed)	0.043
Hungryp	Pearson Correlation	-.195*		**PaperTowelsf**	Pearson Correlation	.215*
	Sig. (2-tailed)	0.044			Sig. (2-tailed)	0.026
FavShirtp	Pearson Correlation	-.300**		**Sunglassesf**	Pearson Correlation	-.265**
	Sig. (2-tailed)	0.002			Sig. (2-tailed)	0.006

Appendix 6: Problem Size and Complexity Correlation

Problem	Size & Complexity
Use the last of the milk	.343**
Shoelace breaks	.320**
A light bulb burns out	.313**
Lose your sunglasses	.472**
Damage your favorite shirt	.428**
TV Breaks	.474**
Use last of Deordorant	.291**
Need to buy a new Textbook	.447**
Use last of the Paper Towels	.365**
Use last of the Toothpaste	.190*
Hungry	.218*
Computer Breaks	.367**
Need a new Place to Live	.248**
Cell Phone Breaks	.364**
Lost Job	.286**
Car Breaks Down	.216*

*. Significant at the .05 confidence level
**. Significant at the .01 confidence level

Appendix 7: Study 1 Associative Memory and Associative Activation Solutions

Problem: Computer Breaks

Marketing Solutions	Frequency	Percentage
Apple	78	27.4%
Best Buy	63	22.1%
Geek Squad	19	6.7%
FAU Tech Store	16	5.6%
Call Customer Service	6	2.1%
Office Depot	5	1.8%
iFixUbreak	4	1.4%
Technical support	3	1.1%
Computer Store	3	1.1%
CPU Repair Store	2	0.7%
Microsoft	2	0.7%
Costco	1	0.4%
Staples	1	0.4%
Total	**203**	**71.2%**

Non-Marketing Solutions	Frequency	Percentage
Family (dad, boyfriend, Uncle, Professor) or Friend	20	7.0%
Google	12	4.2%
Library	12	4.2%
FAU Help desk	10	3.5%
Internet	9	3.2%
Computer Center	6	2.1%
Myself	3	1.1%
restart it	3	1.1%
Use another CPU	2	0.7%
Other (bank, hospital)	1	0.4%
Computer Science Building	1	0.4%
FAU All Night Study	1	0.4%
Sam Lab	1	0.4%
software	1	0.4%
Total	**82**	**28.8%**

Problem: Use last of the milk

Marketing Solutions	Frequency	Percentage
Publix	184	57.7%
The Grocery Store	39	12.2%
Wal-Mart	32	10.0%
The Store	15	4.7%
Supermarket	9	2.8%
Outtakes	6	1.9%
Walgreens	6	1.9%
Gas station	4	1.3%
CVS	3	0.9%
Buy another one	2	0.6%
Cafeteria	2	0.6%
Corner/Convenient Store	2	0.6%
Trader Joe's	2	0.6%
Whole Foods	2	0.6%
Costco	1	0.3%
Target	1	0.3%
Winn Dixie	1	0.3%
Geek Squad	1	0.3%
Total	**312**	**97.8%**

Non-Marketing Solutions	Frequency	Percentage
Friend (roomate) and Family	3	0.9%
Look in the refridgorator	2	0.6%
Home	1	0.3%
Make a list	1	0.3%
Total	**7**	**2.2%**

Problem: You are hungry

Marketing Solutions	Frequency	Percentage
Chipotle	39	11.9%
Caferteria	28	8.5%
Publix	27	8.2%
Resteraunt	23	7.0%
McDonald's	23	7.0%
Taco Bell	13	4.0%
Chick-Fil-A	12	3.6%
Wendy's	9	2.7%
Dining Hall	8	2.4%
Fast Food	7	2.1%
Whole Foods	4	1.2%
Subway	4	1.2%
Grocery Store	4	1.2%
Food Court	4	1.2%
Burger King	3	0.9%
Trader Joe's	2	0.6%
Store	2	0.6%
Shake Shack	2	0.6%
Pizza Hut	2	0.6%
Panera Bread	2	0.6%
Domino's	2	0.6%
Chili's	2	0.6%
Wingstop	1	0.3%
Wal-mart	1	0.3%
TGI Fridays	1	0.3%
Sushi Resteraunt	1	0.3%
Popeyes	1	0.3%
Pollo Tropical	1	0.3%
PF Changs	1	0.3%
La Bamba	1	0.3%
Hooters	1	0.3%
Go out to eat	1	0.3%
Five Guys	1	0.3%
Firehouse Subs	1	0.3%
Duffy's	1	0.3%
CR Chicks	1	0.3%
Burrow	1	0.3%
Boca's Best	1	0.3%
Blaze Pizza	1	0.3%
BJ's	1	0.3%
Benihana's	1	0.3%
Applebee's	1	0.3%
Ale House	1	0.3%
Total	**243**	**73.9%**

Non-Marketing Solutions	Frequency	Percentage
Kitchen	33	10.0%
Fridge	25	7.6%
Home	10	3.0%
Eat Something	7	2.1%
Cook	4	1.2%
Mom	2	0.6%
Depends on what type of food	1	0.3%
Everywhere	1	0.3%
Google	1	0.3%
Pantry	1	0.3%
The Sea	1	0.3%
Total	**86**	**26.1%**

Problem: Car breaks down

Marketing Solutions	Frequency	Percentage
AAA	73	23.9%
Mechanic	35	11.4%
Auto Zone	16	5.2%
Call Dealership	14	4.6%
Jiffy Lube	10	3.3%
PepBoys	9	2.9%
Call a Tow Truck	8	2.6%
Firestone	8	2.6%
Tire Kingdom	7	2.3%
Repair Shop	6	2.0%
Tires Plus	6	2.0%
Toyota	6	2.0%
Auto Shop	5	1.6%
Gas Station	5	1.6%
Honda	5	1.6%
Car Repair Shop	4	1.3%
Goodyear	4	1.3%
Mechanic Shop	4	1.3%
Sears	4	1.3%
Advanced AutoParts	3	1.0%
Audi	3	1.0%
Auto Parts	3	1.0%
Jeep	3	1.0%
Volkswagen	3	1.0%
Acura	2	0.7%
Car Garage	2	0.7%
E.F. Tires	2	0.7%
Geico	2	0.7%
Infiniti	2	0.7%
Insurance	2	0.7%
Kia	2	0.7%
Lexus	2	0.7%
Nissan	2	0.7%
Al Hendrickson	1	0.3%
Arrigo Service Center	1	0.3%
Auto Body Shop	1	0.3%
Auto Place	1	0.3%
Boca Auto	1	0.3%
Boca Coastal Tires	1	0.3%
Chevy	1	0.3%
Delray Auto Repair	1	0.3%
FAU Transportation Service:	1	0.3%
Ford	1	0.3%
General Automotive	1	0.3%
John Mechanic	1	0.3%

Marketing Solutions Continued	Frequency	Percentage
Kia	1	0.3%
Mazda	1	0.3%
Meineke	1	0.3%
Mercedes Benz	1	0.3%
Midas	1	0.3%
NAPA Autocare	1	0.3%
Ollie	1	0.3%
Onstar	1	0.3%
Roadside Service	1	0.3%
State Farm	1	0.3%
Subaru	1	0.3%
Walmart	1	0.3%
Workshop	1	0.3%
Total	**287**	**93.8%**

Non-Marketing Solutions	Frequency	Percentage
Call Dad	5	1.6%
Boyfriends Shop	2	0.7%
Call a Friend	2	0.7%
Call Mom	2	0.7%
Parents House	2	0.7%
Call for Help	1	0.3%
Cell Phone	1	0.3%
Family friend's car garage	1	0.3%
Fix myself	1	0.3%
My garage	1	0.3%
My House	1	0.3%
Total	**19**	**6.2%**

Problem: Use last of the paper towels

Marketing Solutions	Frequency	Percentage
Publix	107	32.8%
Wal Mart	72	22.1%
Target	23	7.1%
Store	21	6.4%
Grocery Store	17	5.2%
CVS	11	3.4%
Costco	10	3.1%
Outtakes	8	2.5%
Walgreens	7	2.1%
Supermarket	6	1.8%
Buy more	4	1.2%
Dollar Store	4	1.2%
Dollar Tree	3	0.9%
Any Local Shopping Store	1	0.3%
Convenience Store	1	0.3%
Corner Store	1	0.3%
Food Store	1	0.3%
Gas Station	1	0.3%
Staples	1	0.3%
Superstore	1	0.3%
Whole Foods	1	0.3%
Total	**301**	**92.3%**

Non-Marketing Solutions	Frequency	Percentage
Beach/Bath Towel	3	0.9%
Cabinet	3	0.9%
Bathroom	2	0.6%
Call Mom	2	0.6%
Closet	2	0.6%
Napkins	2	0.6%
Use a Rag	2	0.6%
Laundry Room	1	0.3%
Look for more	1	0.3%
Next Door Neighbor	1	0.3%
Pantry	1	0.3%
Roomate	1	0.3%
Steal from Cafeteria	1	0.3%
Under the sink	1	0.3%
Total	**23**	**7.1%**

Problem: TV breaks

Marketing Solutions	Frequency	Percentage
Best Buy	132	53.7%
Comcast	17	6.9%
Wal Mart	17	6.9%
Brandsmart	6	2.4%
Geek Squad	6	2.4%
Costco	5	2.0%
Cable Company	4	1.6%
Electronic Repair Store	4	1.6%
Tech U	4	1.6%
Sears	3	1.2%
Target	3	1.2%
Get it repaired	2	0.8%
My Uncle	2	0.8%
Repair man	2	0.8%
Store	2	0.8%
Tech Support	2	0.8%
Xfinity	2	0.8%
Television Company	2	0.8%
Amazon	1	0.4%
Appliance Store	1	0.4%
Bright House	1	0.4%
Buy a new one	1	0.4%
Call for Repair	1	0.4%
DirectTV	1	0.4%
HGTV	1	0.4%
PC Richards and Sons	1	0.4%
Store I bought it	1	0.4%
Samsung	1	0.4%
Sony	1	0.4%
Sound Advice	1	0.4%
Tech Place	1	0.4%
The Technology Fix Store	1	0.4%
TV Store	1	0.4%
Verizon	1	0.4%
Try to get it fixed	1	0.4%
U Break-I Fix	1	0.4%
Total	**233**	**94.7%**

Non-Marketing Solutions	Frequency	Percentage
Boyfriend	2	0.8%
Family	1	0.4%
Fix it	1	0.4%
Friend	1	0.4%
Google	1	0.4%
Internet	1	0.4%
My Phone	1	0.4%
NetFlix	1	0.4%
Go study	1	0.4%
Parents Room	1	0.4%
Stream through computer	1	0.4%
Trash	1	0.4%
Total	**13**	**5.3%**

Appendix 8: Two-Way ANOVA Assumption Testing

Assumption #1: Dependent variable is measured at the continuous level (interval or ratio). The dependent variable is the mean of the means of the 12-item information search scale questions across all subjects within each of the four groups. This 12-item scale was measured on a Likert scale from 1 strongly disagree to 6 strongly agree.

Assumption #2: Independent variables consist of two or more categorical, independent groups. The independent variables are Complexity (2 groups - high/low) and Satisfaction (2 groups - satisfactory/unsatisfactory).

Assumption #3: Independence of observations (no relationship between the observations in each group or between groups. Different participants in each group with no participant being in more than one group. No respondents were in multiple groups and there is no reason to suspect that any individual response was influenced by any other respondent.

Assumption #4: No significant outliers. Although the box plots reveal some outliers in 3 of the 4 groups {low complex/low satisfaction (4), high complex/low satisfaction (1), and high satisfaction/high complexity (2)}, the large sample size for each group should compensate for the effects of these outliers with respect to giving us fairly accurate estimates of the means.

Assumption #5: Dependent Variable should be approximately normally distributed for each combination of the 2 independent variables. After using the Shapiro-Wilk test for Normality, the results indicate non-normality in the data. However, since the ANOVA procedure is robust with respects to this assumption, and the sample size for

each group is large (all over 120), the Central Limit Theorem ensures us that each sampling distribution is approximately Normal.

Assumption #6: Needs to be homogeneity of variances for each combination of the groups of the two independent variables. The Levene's test of equality of error variances was not statistically significant, therefore this assumption is met.

Appendix 9: Two-Way ANOVA Manipulation Checks

To check the satisfactory level manipulation (whether a respondent had a satisfactory or unsatisfactory AMAA solution), a one-sample t-test was conducted to determine if the satisfactory AMAA solution mean was significantly greater than 3.5 and if the unsatisfactory AMAA solution mean was significantly less than 3.5. In addition, an independent-samples t-test was also conducted. An independent-samples t-test compares the means between two unrelated groups on the same continuous, dependent variable. An independent-samples t-test was used in this study to determine if the satisfactory AMAA solution mean and the unsatisfactory AMAA solution mean were statistically different based on the modified Turner et al. (2010) alternative solution information search scale. See Table 19 for results.

Table 15: Control for Satisfactory/Unsatisfactory Results

One Sample T-Test Results:			
Scenario	Mean*	Std. Deviation	P-value
Satisfactory	1.7016	1.16702	0.000
Unsatisfactory	4.2124	4.2124	0.000
*Both means are significantly different from 3.5 at the .05 level			
Independent Two Sample T-test			
Satisfaction Level	t-statistic	Degrees of Freedom	P-value
Satisfactory-Unsatisfactory	-22.975	508.386	0.000
*The two means are significantly different fom each other			

According to the results in Table 19, the one-sample t-test indicates that the mean of the satisfactory AMAA solution was statistically less than 3.5 (p-value - .000) and that using this manipulation resulted in a satisfactory AMAA solution; and, the mean of the

unsatisfactory AMAA solution was statically greater than 3.5 (p-value - .000) and that using this manipulation resulted in an unsatisfactory AMAA solution. In addition, the results of the independent-samples t-test indicate that the means of the satisfactory and unsatisfactory AMAA solutions are statistically different.

To check the problem complexity manipulation (whether a respondent received a simple or complex problem), a one-sample t-test was conducted to determine if the mean of the simple problem was significantly less than 3.5 and if the mean of the complex problem was significantly greater than 3.5; and, an independent-samples t-test was conducted to determine if the simple problem mean and the complex problem mean were statistically different based on the modified Turner et al. (2010) alternative solution information search scale. See Table 20 for results.

Table 16: Control for Problem Complexity Results

One Sample T-Test Results:			
Problem	**Mean***	**Std. Deviation**	**P-value**
Use the last of the milk	1.6794	1.09522	0.000
CPU Crashes	3.9059	1.50294	0.000
*Both means are significantly different from 3.5 at the .05 level			
Independent Two Sample T-test			
Problem	**t-statistic**	**Degrees of Freedom**	**P-value**
Complex-Simple	-19.208	463.828	0.000
*The two means are significantly different fom each other			

According to the results in Table 20, the one-sample t-test indicates that the mean of using the last of the milk was statistically less than 3.5 (p-value - .000) and that using this manipulation resulted in a simple problem; and, that the mean of one's computer crashing was statistically greater than 3.5 (p-value - .000) and that using this

manipulation resulted in a complex problem. In addition, the results of the independent-samples t-test indicate that the simple problem mean (using the last of the milk) and the complex problem mean (computer crashes) are statically different.

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