

## Models of Decision-Making

If politics involves the “authoritative allocation of values” (Easton, 1953), as one classic definition holds, then the *study* of politics must certainly involve, as a central organizing theme, how those authoritative allocation decisions are made. This question can be addressed from a number of different perspectives. One concerns how *individual* political actors, be they kings or dictators, politicians or ordinary citizens, make political decisions. Few decisions are made in total isolation from others, but for the most part this first perspective views decision-making as a question of individual psychology: individual preferences, information search, memory, and choice. A second perspective considers how the *institutions* of government—the legislative, executive, and judicial branches, and the various organizations in the larger governmental bureaucracy—make decisions. All institutions are made up of individuals, of course, but all institutions also have their own particular ways—laws, traditions, “standard operating procedures”—for gathering information, aggregating preferences, and taking actions. In many instances, institutional norms and procedures can overwhelm individual decision-making processes. March (1994) tries to capture this difference in perspectives by asking whether decision-makers are generally seen as autonomous actors or as being primarily guided by the “systematic properties of an interacting ecology” (p. ix).

Without meaning to minimize the importance of institutional factors in understanding political decisions, this chapter will focus on how individual political actors make decisions. Individual decision-making has been the primary concern of psychologists, while economists, sociologists, and organizational theorists have more frequently studied larger aggregates like institutions and firms. The literatures are largely distinct; both are voluminous. I will narrow my focus and concentrate on the individual perspective. For good overviews of research aimed more at the institutional level, the reader is referred to the many works of March (e.g., 1988, 1994; March & Olsen, 1989; March & Simon, 1958) and the earliest research of Simon (1947). Allison (1971; Allison & Zelikow, 1999) does an excellent job of contrasting the two perspectives in the context of the Cuban missile crisis.

Even limiting our attention to individual political decision-makers, democratic systems provide two important categories of decision-makers: politicians and other government elites, and ordinary citizens. If democracy is to work the way it is supposed to work, both types of individuals must be making reasonably frequent political decisions. One obvious dimension

along which these two categories of decision-makers differ is their level of expertise or knowledge about politics. Almost by definition, political elites are political experts: they generally have far more relevant knowledge and experience than ordinary people. Everyday citizens, on the other hand, vary greatly in how much they know and care about the topics that they are regularly asked to make decisions about as part of their role as citizens.

In this chapter I will try to provide a general framework for studying decision-making that applies to both everyday citizens (i.e., the “mass”) and to political elites. Political elites and common citizens differ not only in the amount of expertise they typically bring to the decision-making task, however, but also in the type of decisions they are generally asked to make. I will try to point out some of the more obvious differences. In my examples and extensions of the basic decision-making framework, I will concentrate on the decision-making of everyday citizens. (One very important topic of elite decision-making, foreign policy, is the specific focus of chapter 8.)

It is useful at the outset to distinguish between “judgment” and “decision-making.” The two have often been linked (e.g., Slovic & Lichtenstein, 1971), and normatively they are equivalent in the sense that a decision-maker should choose an alternative if and only if it is liked more than any other. Still, judgment and decision-making are not the same thing. A judgment involves an evaluation of a single entity along some dimension: how heavy or light, or bright or dark, an object is (psychophysical judgment); how attractive/funny/likable/smart a person is (person judgment); how likely some event is to occur (probabilistic judgment). Judgment involves the mapping of some ambiguous stimuli onto a perceptual system. The tendency to make judgments is particularly true of entities—that is, people—in the social world. Kathleen McGraw reviews this literature as it applies to political actors in chapter 12. (See also Druckman & Lupia, 2000.) A decision, in contrast, involves a *choice* between two or more alternatives: *whether* to take drugs, *who* to marry, *when* to retire, *which* candidate to support in the election. Making a choice implies more *commitment* to the chosen alternative than making a judgment suggests about the judged entity, and may well also involve searching for reasons to *justify* the choice (Slovic, Fischhoff, & Lichtenstein, 1982). People make judgments all the time without necessarily “putting those judgments into action.”

Decisions are often treated as if they are nothing more than choosing the most highly evaluated alternative. This is a mistake, for at least two reasons. First, people (and institutions) make all sorts of decisions without first evaluating the alternatives on some global dimension. “Spur of the moment” decisions are certainly of this type, as are habitual or “standing” decisions (Quadrel, Fischhoff, & Davis, 1993), but the problem is much broader than this. If I knew I was going to die tomorrow I might very well think about what is my favorite restaurant and decide to eat my last meal there; but most of the time I decide whether I want to eat Chinese or Italian or Mexican food not because of any judgment about the quality or

tastiness or healthiness of these different cuisines and not because of any judgment about the quality of the service or the skill of the chef in any of the nearby restaurants that serve these different types of food, but rather because I “feel” like having Chinese tonight.

I suspect, however, that the vote decision in particular—or any choice between different *people*—is rarely made without first forming some global evaluation of the different candidates for the position. Hence candidate evaluation is intimately involved in the vote choice. But a second reason that it is wrong to equate judgment and decision-making is that global evaluations, even when they are made, do not necessarily dictate choice. People may vote “strategically”—that is, choose a less preferred alternative because their most preferred candidate has no chance of winning (Abramson, Aldrich, Paolino, & Rohde, 1992). People may vote for a candidate they do not particularly like for some reason largely external to the decision itself (acting “against my better judgment”), for example to please a parent or girlfriend. In any case, I will leave the literature on person (candidate) impression to chapter 12, and focus almost exclusively here on clear choices or decisions.

This chapter begins by laying out more fully a general framework for what constitutes a “decision,” a discussion that segues nicely into the classic economic rational choice approach to decision-making associated with von Neuman and Morgenstern (1947). This approach provides a standard against which particular decisions can be judged. No one who has actually observed decision-making believes that the classic approach provides an accurate description of how decision-makers actually behave, however, and this chapter will spend more time discussing an approach that takes accurate description as its primary goal: behavioral decision theory. As I will show, behavioral decision theory takes as its starting point a very different (and more limited) view of human cognitive abilities than the classic approach. Ironically, this more limited starting point provides many more dimensions along which to study decision-making. Consequently I will spend some time discussing the methods for studying decision-making that have been developed with this approach, particularly process tracing methods. Finally I will consider briefly one very common political decision made by everyday citizens many times during their adult lives: whether, and how, to vote in an election.

### ▲ A General Framework for Studying Decision-Making

As already noted, any decision involves a *choice*, and a choice requires at least two *alternatives* that could be chosen. Each alternative is associated with a set of beliefs about the *outcomes* that are potentially associated with each alternative—beliefs that can be idiosyncratic to every decision-maker. Every outcome must be associated with a *value* or preference, which again

can be unique to every decision-maker. But these three characteristics—alternatives (plural), beliefs about outcomes, and values associated with those outcomes—provide the general framework of any decision (Hastie, 2001).

Within this general framework, decisions can be categorized along a whole slew of dimensions. Two of the most important involve

- Whether the alternatives are fixed and presented as such to the decision-maker, in which case the decision is “well defined” or “well structured” (Langley, Simon, Bradshaw, & Zytkow, 1987) or whether the alternative courses of action must be *sought out* or *constructed* by the decision-maker (which is more often the case in organizational contexts and with fairly complicated policy problems), in which case the decision is “ill defined” or “ill structured.”
- Whether the outcomes associated with each alternative will occur with certainty (if I pay \$50 for a U.S. savings bond today, I will be able to cash it in for \$100 in 15 years), in which case the decision is *riskless*, or will occur only with some probability (if George W. Bush is elected president, he will cut taxes, increase defense spending, and be compassionate toward people outside of the Republican coalition), in which case the decision is *risky*.

The theories and techniques for studying decision-making that have been developed in psychology have typically focused on well-defined decisions, and I will limit my discussion to those types of decisions. A largely independent set of theories and methods must be invoked to study the generation or discovery of alternatives, and they are beyond the scope of this chapter (but see Gettys, Pliske, Manning, & Casey, 1987; Keller & Ho, 1988). Even ill-defined decisions can usually be studied as if they occur in stages, however, with the data gathering and alternative generation stage logically occurring first. The theories and methods discussed here could then be applied to the alternatives “on the table” at the time the choice must be made.

Psychologists have studied both risky and riskless decisions, and uncertainty can easily be incorporated into most common models of decision-making. For example, beliefs about the outcomes or consequences associated with some alternative involve not only what those consequences are but how likely they are to occur. Thus the uncertainty dimension falls easily within the purview of this chapter. At some level all decisions involve risk (the U.S. government could go belly-up before it is time to cash in my savings bond), but the probabilities of such outcomes are usually so minuscule that it is reasonable to consider them riskless. Many decisions involve alternatives that truly do involve a great deal of uncertainty, however, and that uncertainty must be taken into consideration when considering those decisions.

**Table 2.1**  
**A General Structural Framework for Analyzing Decision-Making**

Multiple alternatives	Each associated with one or more outcomes	That have fixed values to the decision-maker	Which may have differential importance	And/or occur probabilistically
A <sub>1</sub>	O <sub>1</sub> O <sub>2</sub> O <sub>3</sub>	+	W <sub>1</sub> W <sub>2</sub> W <sub>3</sub>	P <sub>1,1</sub> P <sub>1,2</sub> P <sub>1,3</sub>
A <sub>2</sub>	O <sub>1</sub> O <sub>2</sub> O <sub>3</sub>	+	W <sub>1</sub> W <sub>2</sub> W <sub>3</sub>	P <sub>2,1</sub> P <sub>2,2</sub> P <sub>2,3</sub>
A <sub>3</sub>	O <sub>1</sub> O <sub>2</sub> O <sub>3</sub>	+	W <sub>1</sub> W <sub>2</sub> W <sub>3</sub>	P <sub>3,1</sub> P <sub>3,2</sub> P <sub>3,3</sub>
A <sub>4</sub>	O <sub>1</sub> O <sub>2</sub> O <sub>3</sub>	+	W <sub>1</sub> W <sub>2</sub> W <sub>3</sub>	P <sub>4,1</sub> P <sub>4,2</sub> P <sub>4,3</sub>

Table 2.1 provides a general framework for analyzing decisions that contains the major structural features of decisions just laid out: multiple alternatives, outcomes, and values. The table also incorporates the possibility of risky decisions and, as one further complication, the possibility that different outcomes may be of varying importance to the decision-maker. If all outcomes are equally important, the weights in this column would all be set to 1.0 (or just ignored). Likewise, with riskless decisions the probabilities would all be set to 1.0. For simplicity, the table assumes that every outcome associated with any alternative is associated with every alternative. In practice this very well might not be the case, but then the probability could be set to zero for any such outcome. For the well-defined decision problems I am focusing on here, alternatives and outcomes are “provided to” the decision-maker by the problem itself. The values, importance weights, and probabilities associated with each outcome are subjective in nature and must be determined by the decision-maker herself.

▲ **Rational Choice/Economic Theories of Decision-Making**

The first major social science theories of decision-making, developed within the field of economics, were explicitly normative in orientation, describing how decision-makers *should* behave. If the theory considers uncertainty, it has an “expected value” framework. This general approach holds that decision-makers should gather sufficient information about every plausible

course of action to evaluate it. Every consequence or outcome associated with each alternative is assumed to have a certain fixed value for the decision-maker. The value of the outcomes associated with each alternative, weighted by their expected probability of occurring, are combined in a simple additive fashion to determine the overall value associated with each alternative. After going through this process of information gathering and alternative evaluating, decision-makers are assumed to choose among alternatives by some value-maximizing process (e.g., choose the alternative with the greatest expected value; choose the alternative that minimizes the worst thing that would be associated with every alternative—that is, minimizes maximum regret).<sup>1</sup> This standard economic perspective on rationality views humans (*homo economicus*) as “omniscient calculators” (Lupia, McCubbins, & Popkin, 2000) or demons (Gigerenzer & Todd, 1999) who can easily perform all of the cognitive manipulations required to reach a decision.

The term “rational” has become fairly loaded and has many different meanings (see Converse, 1975; March, 1978; Rubenstein, 1998). In this chapter I will restrict my meaning to *procedural rationality*, that is, to the process by which the choice is made. A “rational choice” is one that is based on relatively fixed preferences and follows a *logic of consequence*, by which current actions are dictated by anticipation of the value associated with future outcomes (March, 1994). Rational decision-makers are motivated to maximize their “interests,” although the theory is silent about what those interests ought to be. This restriction on the meaning of rationality also draws attention to the fact that rational choice does not guarantee that the value-maximizing outcome *will* be obtained, only that it is the most likely to be obtained.

Consider as an example the decision of whether I should play the Pick-3 game in my state's lottery. It costs \$1 to play, where playing, in essence, means picking a three-digit number between 0 and 999. If I pick the right number, I win \$499 (\$500 minus the \$1 it cost to play); if I pick any other number, I win nothing but am still out the \$1 price of a ticket. Let's assume lottery tickets are sold in the convenience store where I buy my coffee on the way to work every morning, and I have the computer automatically select a random number for me, so I accrue no tangible costs in either time (agonizing over which numbers to choose) or effort (getting to a place lottery tickets are sold) to buy a ticket in the first place, nor do I receive any noticeable psychic benefits from fantasizing about what I would do with the money if I won. If I choose to play, I either win \$499 with some small probability  $p$ , or lose \$1 with probability  $1 - p$ . If I choose not to play, on the other hand, I have the status quo in my wallet with 100 percent certainty. There is little room for idiosyncratic beliefs in this choice, as the outcomes associated with each alternative are few and easy to determine, and the probabilities associated with each outcome are also simple to compute. My decision algorithm—and that of anyone else making the same decision—can be faithfully represented by table 2.2.

**Table 2.2**  
**Expected Value Analysis of Whether it is “Rational” to Play the Pick-3 Lottery**

Multiple alternatives	Each associated outcomes		That have fixed Values to the decision-maker		Which may occur probabilistically		Expected value
	O <sub>1</sub> : Win	O <sub>2</sub> : Lose	\$499	-\$1	$P_{11} = .001$	$P_{12} = .999$	
A <sub>1</sub> : Play	O <sub>1</sub> : Win	O <sub>2</sub> : Lose	\$499	-\$1	$P_{11} = .001$	$P_{12} = .999$	$EV_1 = .001*(\$499) + .999*(-\$1) = -50¢$
A <sub>2</sub> : Don't Play	O <sub>1</sub> : Win	O <sub>2</sub> : Lose	\$499	-\$1	$P_{21} = 0$	$P_{22} = 0$	$EV_2 = \$0$
	O <sub>3</sub> : Status Quo		\$0		$P_{13} = 0$	$P_{23} = 1.0$	

*Notz.* This example assumes that any nonmonetary values associated with the decision are so small they can be ignored.

This decision perfectly fits the general framework just laid out. For simplicity, table 2.2 ignores the differential importance column. There are multiple alternatives to choose from (Play, Don't Play), outcomes associated with each alternative (only one outcome, with certainty, for the second alternative; and two possible outcomes for the first, each associated with some uncertainty), and a value associated with each outcome (the amount of money I will win or lose). The expected value associated with 100 percent certainty with the second outcome is the status quo, or \$0. There is uncertainty associated with the first alternative of playing the lottery, and the expected value of that alternative is the sum of the value of the first outcome (win \$499), multiplied by its probability (.001), plus the expected value of the second outcome (lose \$1) multiplied by its probability (.999). When you do the simple math, the expected value associated with playing this game is minus 50¢.<sup>2</sup> Rationally, then, no one should ever play the Pick-3 lottery, because it is a losing bet. If my choice about playing the lottery were to be described as (procedurally) “rational,” I must follow the steps outlined here to reach my decision.

The most general expectancy-value theory is *subjective expected utility* (SEU) theory (von Neuman and Morgenstern, 1947; see also Luce & Raiffa, 1957; Raiffa, 1968; Savage, 1954). The concept of “utility” is a clever solution to a very tricky analytic problem, and it deserves some discussion.<sup>3</sup> The preceding decision of whether one should play the Pick-3 lottery was fairly simple because it was assumed the only values associated with any outcome were monetary. But consider just about any proposal a candidate might make during political campaign. Say Roger Republican is running against Debra Democrat for governor of my state, and he proposes a one-time, across-the-board \$100 cut in state income taxes for all taxpayers in the state as a spur to the sluggish economy. If Roger's proposal becomes law, what would be its consequences for me?

- First, I would receive a reduction in taxes of \$100. That is nice, that is a plus, I like it; all else equal, I would rather have \$100 than not. Money is very tangible and easy to comprehend.
- At the same time, the state's revenue will be significantly less, at least in the short run, even if this proposal did stimulate the state's economy and thus generate additional revenue in the long term. This reduction probably would have some negative impact on my life, in terms of reduced state services from which I benefit. For example, the potholes in my streets may take longer to repair; there may be fewer police on the streets, and the science labs in my state's older schools might have to make due with outdated equipment for a little longer. This could then result in my having to have my car realigned more frequently, or a burglar alarm installed in my home, or even put my children in private schools. Although more long-term and harder to "see" precisely, I can still understand these costs in dollar terms, and they can figure into my decision.
- But what else will result from this tax cut? There certainly will be less money in the public till to help preserve open space in my state, a local issue that is very important to me. More development means more jobs but also more traffic, more pollution, and less "wilderness" around me. I could translate some of these results into consequences for my economic well-being, but that activity simply misses the point. My opposition is largely *symbolic* in nature and not translatable to some consequence for my pocketbook.
- And how about the poor in my state, who do not pay taxes and thus receive no immediate benefit, but who are undoubtedly much more dependent on state services than I am? I am not among them, but the problem has nothing to do with my material self-interest. I simply do not like the fact that I live in a state which tries to solve its economic hard times on the backs of the poor. Similarly, while the schools in my neighborhood have nice new science labs, those in the poorer areas of the state do not, and this bothers me because I think it is not fair, and wrong. Again, my opposition is largely symbolic in nature.

I could go on, but the point is, how can these various costs and benefits that I believe will occur if this proposed tax cut becomes law be combined in any rational manner into a decision? That is, dollars are easy to compare, but how can I weigh a \$100 gain to my pocketbook against the various symbolic costs I will accrue if this tax cut becomes law? The problem is one of *incommensurability*—the inability to compare the various outcomes associated with this program. And the clever solution of subjective expected utility theory is to invent the hypothetical concept of subjective "utility" into which all costs and benefits can be translated. With this assumption,

all values (i.e., utilities) become commensurable, and an expected value analysis can proceed. I can associate some positive utility with the \$100, some negative utility with living in a state with deteriorating schools, real suffering by its poor, and less open space, and perform my calculations.

But would anyone actually do this? I know a lot about politics, and it was easy for me to generate the preceding list of potential costs and benefits of the Roger Republican's proposed tax cut. I could have easily come up with several more. But how much information about this policy should I try to learn? Rationally, I must seek out all relevant information.<sup>4</sup> Even assuming I have a "utility register" in my brain that can easily assign utilities to different outcomes, once there are more than a few outcomes or considerations to keep in mind, each weighed by some subjective probability of occurring, keeping track of the different calculations becomes quite challenging. And so far we are talking about only one alternative. If I were making a decision between Roger's proposal and some alternative plan(s), I would rationally have to seek out exactly the same relevant information about every other proposal under consideration. The calculation difficulties multiply rapidly. Worse yet, suppose I were deciding whether to vote for Roger or Debra in an upcoming election, and this tax cut proposal was one of a dozen different policies the candidates were debating during the campaign. Now the level of calculations required to make a "rational" decision becomes exponentially more difficult, particularly when we acknowledge that policy differences are only one dimension across which candidates can be compared. If people actually made decisions in this manner, they could be truly characterized as demonic in their cognitive abilities.

There are two issues here, one concerning ability, the second concerning motivation. Is it *possible* for the unaided decision-maker (i.e., one without a computer, or even a pencil and paper and a calculator) to make anything but the simplest decisions in the manner directed by the rational choice approach? Given the number of computations involved, and the limitations of working memory (see hereafter), the answer must be No. Okay, fine, but how about the "aided" decision-maker? The human race has, after all, had paper and writing implements (if not computers) available to it for several thousands of years. The answer now is probably yes—for the most part the computational demands are within reason, and the memory problem can be overcome by simply making lists of pluses and minuses associated with any alternative (e.g., Kelley & Miret, 1974).<sup>5</sup>

But *would* I go to all this effort to make a decision? Here the issue of motivation arises, and it is a serious challenge to the rational choice approach. I *could*, probably, follow most of the dictates of subjective expected utility theory for arriving at a good decision about which candidate to support in an election, say—but why would I bother? It is a lot of work to learn everything I want to know about the competing candidates. And according to the theory, it is only rational for me to expend all of this effort

if the expected value of making the correct vote choice is greater than the costs of all of this information gathering and computation. It is important to realize that we are not just trading off the greater expected utility to me of, say, Roger Republican winning rather than Debra Democrat against the information gathering and computation costs it takes for me to figure out which candidate to support. That utility could be substantial. But it must be weighed against the probability that my vote would determine the outcome of the election—and that probability is, for all practical purposes, nil. In other words, even if the difference in utilities associated with a Roger victory or a Debra victory is quite large, I am still going to receive one or the other of those utilities irrespective of what I do. Just as playing the Pick-3 lottery is always a losing bet, figuring out which candidate to vote for—indeed, going to the polls at all—is, according to the rational choice approach, an irrational activity. This argument can be pushed further (see for example Meehl, 1977), but the only way “rationality” can be saved is by adopting the economist’s notion of “revealed preferences”: because people *do* vote, we know the utility of voting must be greater than the costs. Thus notions like fulfilling one’s “civic duty” are given great utility (Riker & Ordeshook, 1968). Unfortunately, this “solution” quickly makes the entire approach tautological.<sup>6</sup>

That so many people nonetheless do play the lottery every week, and do bother to vote, suggests either that many people are irrational or that the rational choice perspective is somehow flawed.<sup>7</sup> The flaw, I think, is not in assuming that people want to be rational, but in pretending that people actually make decisions in the way that they must if they are to ensure that they will make a value-maximizing decision. March (1994) captures this issue perfectly when he asks whether “decision makers pursue a logic of consequence, making choices among alternatives by evaluating their consequences in terms of prior preferences” (p. viii). A “logic of consequence” simply does not describe how people make the vast majority of the decisions they make in all aspects of their lives, including (but certainly not restricted to) the political realm.

The rational choice subjective expected utility approach need not—and should not—be applied as a behavioral description of how people (or organizations) actually make decisions. Nor should this limitation eliminate the most attractive aspects of the perspective, its strong normative component. If a decision-maker were to follow the dictates of the rational choice approach, he can rest assured that he will make what is, for him, the “best” decision. Given certain reasonable (but not indisputable) assumptions, such as maximizing the interests of the most people, the rationality of individual decision-making can also be “aggregated up” to make normative judgments about institutional arrangements for decision-making (see Jones, 1994).

## ▲ Behavioral Decision Theory

In contrast to the normative focus of classical decision theory, behavioral decision theory has always taken as its primary goal a description and understanding of how people actually make decisions. And every study of decision-making in the real world has shown that rarely are all alternatives known, all outcomes considered, or all values evoked at the same time. People generally settle for alternatives that are “good enough” rather than seeking out the value-maximizing alternative.

The behavioral decision theory approach begins with the view of humans as *limited information processors*, with neither the inclination nor the ability to make the sort of “consequential” calculations described by a rational choice perspective (Anderson, 1983; Hastie, 1986; Simon, 1979). The term “cognitive miser” was once popular to represent this view (Taylor, 1981), but that term is somewhat misleading in that it suggests a conscious hoarding of cognitive resources, which is simply inaccurate. “Bounded rationality,” first coined by Simon (1947, 1957) is probably a better term to characterize human cognition.

### Cognitive Limits on Rationality

But what, exactly, are the bounds or limits on information processing? Lupia, McCubbins, and Popkin (2000) complain that “Simon’s bounded rationality offers little systematic guidance as to where the bounds of rationality are” (p. 10). I cannot imagine what Lupia and colleagues were thinking of when they wrote this, but the statement could not be more wrong. Charles Taber more thoroughly discusses bounded rationality in chapter 13, but let me highlight where some of the bounds on omniscient rationality occur. They can be categorized as limitations on processing and limitations on retrieval. Processing limitations begin with the physical orientations of our sense organs. Unlike Madeye-Moody, one of the succession of dark arts teachers at Harry Potter’s wizarding school Hogwarts, human beings (a.k.a. muggles) do not have eyes that can see in all directions or ears that can distinguish more than one or two simultaneous sounds. Even limiting consideration to sights that are somehow before our eyes and sounds that are nearby, there is almost always more in our visual and auditory fields than can be processed because all incoming stimuli must pass through “short-term” or “working” memory, and short-term memory has a very limited capacity (of approximately  $7 \pm 2$ , bits of information; Miller, 1956). This bottleneck of short-term memory is in practice the most important “bound” on classic rationality. Its consequence is that *attention*, and factors that influence it, become crucially important to information processing. The limited nature of working memory also dictates that most information processing will occur serially, that is, one goal at a time.

### ▲ Process Tracing Methodologies for Studying Decision-Making

Behavioral decision theorists have utilized two primary strategies for studying decisions "while they happen," verbal protocols and information boards. With verbal protocols, the decision-maker is asked to "think aloud" while she is making some decision, to vocalize "every passing thought" (Ericsson & Simon, 1984). The decision-maker is thus assumed to be able to report on the contents of working memory as a decision is being made.<sup>10</sup> Verbal protocols are an excellent technique for exploratory research, for developing models of how people go about making a particular type of decision. Because verbal reports are less easily quantifiable, however, verbal protocols are generally a less powerful technique for testing hypotheses.

The second major process tracing technique for studying decision-making is the information board (Carroll & Johnson, 1990). If studying verbal protocols resembles eavesdropping on a decision as it is being made, information boards are more like voyeurism. Information boards present subjects with some sort of matrix on a computer screen, where the alternatives under consideration are typically the columns of the matrix, and the different attributes of choice (i.e., the outcomes associated with every alternative) are the rows. The actual information is hidden from view (i.e., the cells of the matrix are blank), and decision-makers must *actively* decide to learn any specific bit of information by clicking on a particular cell of the matrix with a mouse. Every action the decision-maker takes is recorded by the computer, so that at the end there is a complete record of what the decision-maker accessed, how long every bit of information was considered, and the order in which every bit of information was examined.

### Decision Strategies

A decision strategy is a set of mental and physical operations that an individual uses to reach a decision. In the most general sense, it includes identifying alternatives, searching for information about the possible outcomes associated with the different alternatives, making probabilistic judgments about the likelihood of those different outcomes, searching through memory to determine how much each of those outcomes is valued, and how important it is in this particular context, and so on. A decision strategy also includes a method for choosing among the alternatives. With process tracing methodologies it is possible to observe decision strategies in action.

Behavioral decision theory researchers have identified a number of different decision strategies or "rules" that can be used by decision-makers to reach a decision. These strategies differ in terms of how cognitively difficult they are to use, how much of the available information they consider, and their likelihood of reaching a "best" decision. I will refer to strategies that

at least "good enough" most of the time to encourage their reproduction—and rarely bad enough to lead to extinction. Nonetheless, it is important to recognize that all three of these simplification mechanisms can at times lead to poor decisions. Decomposition, for example, can lead to very embarrassing decisions when the components of a decision are treated as independent when in fact they are not. A candidate who stresses one set of policies in her personal appearances and another set of policies in her political advertisements at best puts forth a very diffuse and unfocused message and at worst can be caught espousing contradictory policies. Editing can lead to poor decisions when the ignored aspects of the decision would result, cumulatively, in a new preference order across alternatives if those ignored aspects had been considered. And heuristics can lead to systematic biases when the reason the heuristic is generally effective (e.g., more frequent occurrences really are easier to recall; numerical anchors provided by the decision context usually are reasonable) is not true in some particular instance.

Thus decision-makers face a real dilemma in coping with cognitive limitations. On the one hand, because we are not demonic omniscient calculators we simply *need* to develop some cognitive shortcuts, some means of simplifying decisions so that a choice can be made. Both information acquisition and information processing can be very costly in terms of time and cognitive effort. On the other hand, whatever shortcuts and simplifications we adopt also come with a potential cost: inaccurate judgments and something short of value-maximizing decisions. Thus I can make sense of many of the diverse findings in behavioral decision theory by suggesting that decision-makers are generally guided by two competing goals: (1) the desire to make a good decision; and (2) the desire to reach a decision with the minimal cognitive effort (see for example Hogarth, 1975; Payne, Bettman, & Johnson, 1993; Shugan, 1980; Wright, 1975).

This view leads to another important distinction between the rational choice and behavioral decision theory approaches. Rational choice focuses attention on the *structure* or *elements* of a decision—the multiple alternatives, and the value of the different outcomes that are associated, with some probability, with each alternative. Behavioral decision theories, in contrast, are much more likely to be concerned with the dynamic processes of *how decisions are made*, with information search and with strategies for making choices. Not surprisingly, behavioral decision theory researchers have developed methodologies that are particularly suited to observing decision-making, with the underlying assumption that the best way to study decision-making is to observe it while the decision is being made (Svenson, 1979). These *process tracing* methodologies keep track of what information was obtained and the order in which it was obtained to make inferences about the strategies employed in making the choice.

employ all available information as decision *rules* and those that ignore some information as decision *heuristics*.

The major way decision strategies are categorized in the behavioral decision theory literature is by the extent to which they confront or avoid conflict (Billings & Marcus, 1983; Ford, Schmitt, Schechtman, Hulks, & Doherty, 1989). When one alternative is preferred on one dimension of judgment but a different alternative is preferred on another dimension of judgment, the potential for value conflict or tradeoffs exists.<sup>11</sup>

- *Compensatory* strategies are cognitively complex information integration rules where decision-makers are assumed to assign a value to every attribute associated with each alternative. Some of those values can be positive and others negative, but when they are combined into an overall evaluation or decision, a positive value on one dimension can *compensate for* or trade off against a negative value on another dimension. Conflict is confronted and resolved in the process of integrating the positive and negative information or values associated with a choice. Compensatory strategies require commensurable outcomes or values. To avoid confusion, we should employ the term "utility."
- *Noncompensatory* strategies, on the other hand, rely on incomplete information search to avoid conflicts. Negative values on one attribute or possible outcome cannot trade off against positive values on another attribute or outcome; instead, alternatives are usually eliminated once negative information about them is obtained. Incommensurability typically is not a problem.

A great deal of research has shown that most decision-makers, most of the time, try to avoid value tradeoffs (Hogarth, 1987; Jervis, 1976). But again this avoidance has a cost: potentially less accurate decisions. I review some of the major decision strategies here.

### Compensatory Decision Strategies

The *weighted additive rule* (WAdd) and the *expected utility rule* (EU) are both formal variants of rational choice and are thus often considered normative standards. They both suggest that decision-makers evaluate each alternative according to the utilities of all relevant attributes or outcomes associated with it, form an overall evaluation of each alternative, and then choose the most highly evaluated one. A linear regression model would be a perfect example of such a strategy. The WAdd rule assumes that decision-makers further consider the relative importance of each attribute, whereas EU assumes that decision-makers consider the probability that each outcome will occur. Hence they both involve great cognitive complexity. Both of these rules assume that conflicts are explicitly confronted and resolved via the different weights or probabilities.

The *equal weights heuristic* (EqW) is a simplified version of WAdd and

EU where all the weights and/or probabilities are assumed to equal 1.0. It is considerably less complex than either WAdd or EU, although the rule still assumes that all relevant attributes are considered about every alternative and that conflicts are confronted and reconciled. Because of the information that is ignored (i.e., importance weights and probabilities), the EqW rule should not be quite as likely as either WAdd or EU to reach the value-maximizing decision, although several researchers have argued that in practice, EqW is nearly as accurate as WAdd and EU (Dawes, 1979; Einhorn & Hogarth, 1975).

The *frequency of good and bad features heuristic* (FreqGB) is an even simpler strategy that ignores not only importance weights and probabilities but also fine discriminations of utility (Alba & Marmorstein, 1987). Every attribute of judgment is assumed to have only two levels, good and bad, and decision-makers are assumed to simply count up the number of good and bad features associated with each alternative. Any problems with incommensurability disappear.

The *additive difference rule* (AddDif) is logically equivalent to the Add model. Here decision-makers are assumed to compare alternatives one attribute at a time and to calculate and retain the differences between alternatives. As with WAdd, all information is assumed to be considered, and the differences are weighed in terms of their relative importance to the decision-maker. If more than two alternatives are available this decision rule is exceedingly complex, but Aschenbrenner, Bockenholt, Albert, and Schmalhofer (1986) have suggested a more plausible variant of this rule where alternatives are considered two at a time, with the losing alternative eliminated and the winning alternative compared in a pairwise manner to a third alternative, and so one, until the best alternative is determined.

The *majority of confirming dimensions heuristic* (MCD) is a simplified version of the AddDif procedure, where alternatives are compared in a pairwise fashion on every dimension of judgment, but those comparisons only result in a judgment of which alternative is preferred. The alternative with a majority of winning or "confirming" judgments is retained and compared to another alternative. This procedure continues until all alternatives have been considered.

### Noncompensatory Decision Strategies

The *satisficing heuristic* (SAT) is one of the first and most famous decision heuristics identified in the behavioral decision theory literature (Simon, 1957). It assumes that decision-makers set aspiration levels for every attribute of judgment they care about, and considering alternatives one at a time in random order, keep searching until an alternative is discovered that meets or exceeds the aspiration level for every criteria. Search then stops and this alternative is chosen. If no such alternative is found, aspiration levels must be lowered and the process repeated until an alternative that "satisfies" all

criteria is found. Because a chosen alternative must satisfy the criterion on the first attribute *and* the second attribute *and* the third attribute, and so on, strategies such as SAT are sometimes called conjunctive strategies. Satisficing involves relatively simple cognitive processes. Conflict and incommensurability are avoided by seeking an alternative that is satisfactory on every criterion of judgment, and by *not* comparing the alternatives to each other. Indeed, some alternatives may be totally ignored, and there is no guarantee that anything approaching the "best" alternative will be selected. Obviously the order in which alternatives are considered can completely determine which alternative is selected.

The *lexicographic heuristic* (LEX) considers the value of every alternative on the most important attribute of judgment, and selects the alternative with the highest value (Tversky, 1969). If two or more alternatives are tied for the highest value, the remaining alternatives are compared on the second most important attribute, and so on until only one remains.<sup>12</sup> The LEX rule can involve fairly complex cognitive processes if there are many alternatives in the choice set, but it produces cognitive savings by restricting the number of attributes under consideration to a relative few. Conflict is avoided by considering attributes one at a time and eliminating alternatives that are not the best on the attribute under consideration. Any incommensurability across attributes is not a problem. Again there is no guarantee that the "best" decision will be reached, as an alternative that is not quite as good as another alternative on the most important criterion might be far superior to it on every other criterion. In practice, however, if a decision-maker's preferences are structured in a conventional manner (a voter has consistently liberal or conservative positions on a set of policy issues, say) and the alternatives are similarly structured in a stereotypic manner (the Democratic candidates takes mostly liberal positions, the Republican mostly conservative ones), the LEX rule will usually select the "correct" alternative. (See Lau & Redlawsk, 2001a, for an instance where this is not the case.)

The *elimination-by-aspects heuristic* (EBA) is a combination of satisficing and the lexicographic strategies and generally simpler than both of them (Tversky, 1972). As with LEX, decision-makers are assumed to rank the attributes of judgment in terms of importance, and consider the most important attribute first. As with SAT, decision-makers are assumed to have something like an aspiration level of every attribute, and alternatives are eliminated if they do not meet or exceed the aspiration level. The procedure continues with additional attributes of judgment in decreasing order of importance until only one alternative remains. Like SAT and LEX, EBA avoids conflicts by eliminating alternatives before conflicts occur.

The preceding descriptions of different decision strategies are idealized accounts, of course, and would rarely be observed in such pure states.<sup>13</sup> One may well ask, then, How can you tell which strategy a decision-maker is using? A very important finding of much behavioral decision theory research is that different patterns of information acquisition clearly reflect distin-

guishable choice strategies. Thus a key to understanding any decision is observing how people acquire information, because this in turn sheds light on the decision rules or heuristics that people follow in making their choices.

### Measures of Information Search

Information boards provide a large amount of detailed information about the process of decision-making, particularly information search. If decision-makers are omniscient calculators who seek out and process all relevant information, the order in which information is acquired is irrelevant. But if decision makers are limited information processors who almost certainly will make a decision before all possible information has been obtained, then the order of information acquisition can be crucially important. It should be obvious that how much information is obtained can influence choice. Somewhat less obviously, even controlling on amount of information, *how* information comes to a decision-maker can also influence choice. As summarized in table 2.3, each of the decision strategies just discussed specifies a particular depth and order of information search. Thus if we can develop standard measures of information search, they can be used to infer which decision strategy is being employed.

Consider first the depth of information search. Rationally, all relevant information about every alternative should be obtained. In practice it rarely is, but with information boards it is easy to calculate the proportion of all alternatives that are considered, the proportion of all attributes that are considered, the proportion of all possible information about every alternative that is considered, and so on—all reasonable measures of the depth of information search. All of the compensatory decision strategies just considered assume that all relevant information about every alternative will be considered, and thus that search will be relatively deep. Each of the non-compensatory strategies allow for much shallower search, although the choice set and aspiration levels could be such that all information must be considered before a satisfactory alternative is found, or all but one alternative eliminated.

We can also consider the sequence of information acquisition. Irrespective of how much information is gathered, the search sequence can be relatively ordered, or largely haphazard. With information boards it can be studied formally with a "transition analysis" (Jacoby, Chestnut, Weigl, & Fischer, 1976). *Ordered search* is of two types, as follows.

- With *alternative-based* search (more formally, intraalternative, interattribute), sometimes also called holistic search, decision-makers consider the different alternatives sequentially. A voter following this search strategy would learn about the issue stands, political experience, personal values, and whatever else he considered important

**Table 2.3**  
**Characteristics of Different Decision Strategies**

Decision rule	Type	Depth of search	Variance of search	Sequence of search	Cognitive effort
Weighted additive rule (WAdd) or expected utility rule (EU)	Compensatory	Very deep	Equal	Alternative-based	Very high
Equal weights heuristic (EqW)	Compensatory	Deep	Equal	Alternative-based	Moderately high
Frequency of good and bad features heuristic (FreqGB)	Compensatory	Deep	Equal	Alternative-based	Moderate
Additive difference rule (AddDif)	Compensatory	Very deep	Equal	Attribute-based	Very high
Majority confirming dimensions heuristic (MCD)	Compensatory	Deep	Equal	Attribute-based	Moderately high
Satisficing heuristic (SAT)	Noncompensatory	Depends: shallow to deep	Generally unequal	Alternative-based	Moderately low
Lexicographic heuristic (LEX)	Noncompensatory	Generally shallow	Generally unequal	Attribute-based	Moderately low
Elimination-by-aspects heuristic (EBA)	Noncompensatory	Generally shallow	Generally unequal	Attribute-based	Low

about one candidate in an election, before trying to learn the same information about a second candidate, and so on, until all of the competing candidates were explored. WAdd, EU, EqW, FreqGB, and SAT all assume alternative-based searching.

• With *attribute-based* search (intraattribute, interattribute), sometimes also called dimensional search, a decision-maker chooses one attribute for consideration and compares the values of all competing candidates on that issue, before turning to another attribute and comparing all of the competing alternatives on it. AddDif, MCA, LEX, and EBA all assume attribute-based searching.

*Haphazard search* then is everything else—interattribute, interalternative transitions.<sup>14</sup>

Most research with decision boards considers the relative proportion of alternative-based to attribute-based search, with the latter usually being considered cognitively easier (Russo & Doshier, 1983; Kahn, 1993). This focus obscures the larger point that either type of ordered search must be much simpler, cognitively, than haphazard search. When information acquisition is completely under the decision-maker's control, as it is with decision boards, the great majority of all transitions are ordered, as I have defined them (Jacoby, Jaccard, Kuss, Troutman, & Mazursky, 1987; Payne & Braunstein, 1978), reflecting the decision-maker's overriding goal of minimizing cognitive effort. Ordered information can be processed and stored more efficiently, and it should be a big aid to decision-making. When information acquisition is not entirely controllable, however, the sequence in which information becomes available, the structure of that information in the environment, and the decision-maker's ability to at least partially restructure that sequence in some coherent manner can have important effects on decision-making, even changing preferences among alternatives (Tversky & Sattath, 1979).

The various decision strategies make specific statements not only about the depth and order of information search but also about the variance of information search across alternatives. The various compensatory strategies all assume that the same information should be considered about every alternative, whereas the three noncompensatory strategies all allow for unequal search across alternatives. Thus the within-subject *variance* in the amount of information considered about each alternative is another way to distinguish between choice strategies. Compensatory strategies dictate equal variance, while noncompensatory strategies allow for unequal search. Variance measures are particularly useful in distinguishing between decision strategies when task constraints (e.g., time) make it impossible for all information to be considered.

*Comparable alternatives* are those about which the same attribute information is known, as is always possible with a standard information board. *Noncomparable alternatives*, on the other hand, are those with at least some attributes that are unique to each alternative (Johnson, 1984, 1986). Alternatives can be *inherently* noncomparable—guns versus butter, say—or de facto noncomparable because of information about some alternatives that exists but is unknown to the decision-maker. Rationally, information that is available about some but not all alternatives should be ignored in making a choice—but I suspect it rarely is. Instead, people use what information they have and whenever possible make category-based inferences about the missing information. More generally, however, the possibility (probability, in most instances) of incomplete search of available information means that virtually any decision could involve noncomparable alternatives.

### ▲ *Determinants of Choice Strategies— Deciding How to Decide*

Having described a number of different decision strategies, and various means of determining when a particular strategy is being employed, it is worth asking whether these strategies are available to and used by almost everyone, or if instead different people tend to specialize in the use of one or another strategy, employing it for many different types of decisions. Asked differently, are there some people who tend to be very rational and methodical in their decision-making, while others typically employ more intuitive and heuristic-based decision strategies? The broad answer to this question is that there is little evidence for systematic individual differences in use of these different strategies. Instead, almost all people seem to have available a wide variety of different decision strategies that they can and do employ in making decisions. Choice of decision strategy seems to be highly contingent on the nature of the decision task (Payne, Bettman, & Johnson, 1993). Hence research in behavioral decision theory, rather than searching for individual differences in decision-making, has instead focused on situational or contextual factors that make it more likely that one or another strategy will be employed.<sup>15</sup> I will highlight several of these factors here.

One very important set of factors involve the complexity or size of the decision task. Task complexity is usually defined in terms of the number of alternatives under consideration and the number of different attributes across which they vary, with the general finding being that people rely more heavily on simplifying decision heuristics the more complex the task. This is true for both variation in the number of alternatives (Biggs, Bedard, Gaber, & Linsmeier, 1985; Billings & Marcus, 1983; Klayman, 1985; Lau & Redlawsk, 2001b; Olishavsky, 1979; Payne, 1976) and the number of attributes under consideration (Jacoby, Speller, & Kohn, 1974; Keller & Staelin, 1987; Malhotra, 1982), although the former seems to have much more consistent effects than the latter. Generally speaking, decision-makers rely on noncompensatory decision strategies when there are more than two alternatives, but they may use more compensatory strategies if there are only two alternatives (Einhorn, 1970; Tversky, 1972).

There are additional factors that can affect the difficulty of the choice facing decision-makers, holding task size constant. One such factor that can characterize many political decisions is time pressure, which could shift a decision-maker's goals from accuracy to efficiency. Thus decision-makers faced with time pressure may accelerate processing (that is, work faster); reduce the total amount of information considered, focusing on the most important factors; or change decision strategies, shifting from a compensatory to a noncompensatory strategy (Ben Zur & Breznitz, 1981; Holsti, 1989; Holsti & George, 1975; Payne, Bettman, & Johnson, 1988). Another factor that affects task complexity is the similarity of the alternatives to each other. When alternatives are very dissimilar, it is relatively easy to distinguish

between them and choose the best one. A noncompensatory choice strategy might very well lead to a different choice than a compensatory strategy, however. When alternatives are relatively similar to each other, it is much more difficult to find the best alternative (Lau & Redlawsk, 2001). Depth of search should increase (Brockenholt, Albert, Aschenbrenner, & Schmalhofer, 1991), and decision-makers may be more likely to employ a compensatory decision strategy (Biggs et al., 1985). On the other hand, it usually doesn't matter very much if one picks the second- or third-best alternative if they are all very similar to each other.

It is reasonable to hypothesize that the more important the decision is to the decision-maker, the more she will be motivated by decision accuracy rather than decision ease, and the greater will be the effort expended in making the decision (Payne et al., 1993). Thus information search should be deeper, and compensatory decision strategies are more likely to be employed (Lindberg, Garling, & Montgomery, 1989). This reasoning assumes that deeper information search leads to better decisions, a conclusion that is easy to reach granted omniscient rationality and demonic abilities but may not actually hold for limited information processors. Indeed, Gigerenzer & Goldstein (1999; Czerlinski, Gigerenzer, and Goldstein, 1999) have demonstrated at least some instances when additional information actually results in lower-quality judgments.

Variations in how information is displayed or becomes available have also been shown to affect decision-making. The alternatives-by-attributes matrix of a standard information board provides an ideal world where all information is organized and easily available to decision-makers. But information about real decisions rarely becomes available in such an orderly, controllable manner. Obviously, if information is displayed about alternatives sequentially, the decision-maker has little choice but to engage in alternative-based decision strategies, while simultaneous presentation of information about several alternatives makes attribute-based search possible (Tversky, 1969). More subtle variations of information display can also make alternative-based or attribute-based processing more likely (e.g., Herstein, 1981) and even determine whether particular information is utilized at all (Russo, 1977). During an election campaign, watching a rally or speech or party convention for a single candidate provides primarily alternative-based information; a political debate, on the other hand, provides largely attribute-based information (Rahn, Aldrich, & Borgida, 1994). The *completeness* of the information display—that is, whether the same information is available about every alternative—determines whether inferences about the missing data are necessary (Ford & Smith, 1987) but can also influence whether information “outside of the box” is even considered in making the decision (Fischhoff, Slovic, & Lichtenstein, 1978).

Finally, there is a great deal of research in behavioral decision theory on *response mode* effects, that is, whether a choice among, a ranking of, or an evaluation of different alternatives is required. This topic has received so

much research because different response modes can lead to preference reversals, which violates one of the fundamental propositions of rational choice, that of *procedure invariance*—that strategically equivalent ways of eliciting a preference should reveal the same preference (Tversky, Sattath, & Slovic, 1988). The leading explanations for the observed preference reversals have to do with processing differences associated with the different response modes. The need to evaluate alternatives leads to alternative-based searching and more quantitative thinking, while choosing among alternatives leads to more attribute-based searching and more qualitative thinking (Fischer & Hawkins, 1993; Lichtenstein & Slovic, 1971; Tversky, 1969; Tversky et al., 1988).

This research is yet another reason to distinguish between decision-making and judgment, but it is one that has largely been ignored in political science. Could the processes by which citizens form evaluations of their leaders—for example, judging how good a job the president has been doing—be fundamentally different from how they choose among candidates in an election? Virtually all political science models of the vote decision involve overall liking of the candidates and/or performance evaluations as crucial components, yet such judgments might have little to do with how most people decide how to vote.<sup>16</sup> I will conclude this chapter by turning attention explicitly to the most fundamental decision that citizens in a democracy make on a regular basis—the vote choice.

### ▲ Studying the Vote Decision

When political scientists have attempted to understand individual vote decisions, they have almost universally turned to the sample survey as their methodology of choice (e.g., Campbell, Converse, Miller, & Stokes, 1960; Fiorina, 1981; Kelley & Mirer, 1974; Lazarsfeld, Berelson, & Gaudet, 1948; Markus & Converse, 1979; Miller & Shanks, 1998; Nie, Verba, & Petrocik, 1976). Surveys do an excellent job of recording what decision was made (e.g., Are you going to vote in the upcoming election? Which candidate do you support?), but they are a poor vehicle for studying *how* that decision was reached. For most respondents, surveys ask about opinions or decisions that were reached some time in the past, and thus the information provided is based on respondents' memories. Moreover, the reasons people provide on surveys for why they might vote for or against one or another candidate have been shown to be justifications of a decision already reached rather than a veridical representation of the information that went into that decision (Lau, 1982; Rahn, Krosnick, & Breuning, 1994). A very popular model of candidate impression suggests that people keep an "on-line running tally" or summary evaluation of familiar candidates in their heads, which they update whenever new information is encountered, but forgetting the details of that new information (Lodge, McGraw, & Stroh, 1989;

Lodge, Streenbergen, & Broh, 1995). Indeed, people are notoriously poor at providing the reasons for their own actions, even those in the recent past (Nisbett & Wilson, 1977). Memory, then, usually provides a poor trace of how a decision was reached.

The shortcomings of the sample survey for studying how decisions are made suggests that researchers must look elsewhere, and the process tracing methodologies described earlier seem an obvious starting point. A few researchers have already provide some evidence on the vote decision from experiments based on information boards (Herstein, 1981; Huang, 2000; Riggle & Johnson, 1996). Yet in many ways, a standard information board provides a poor analog to a political campaign. With a decision board the decision-maker can access any information any time he wants, while campaigns have a dynamic quality about them such that information easily available today might be harder to find tomorrow and almost completely gone by the following day. All information on a standard information board is equally easy to access, while in a political campaign certain types of information (e.g., hoopla and horse race) are much easier to find than others (e.g., detailed issue stands). Decision-makers must actively choose to learn everything they find out about the alternatives with a standard information board, but much information during political campaigns (e.g., political commercials) comes to us without any active effort by the decision-maker to learn that information. And, most important, decision-making with an information board is far too "manageable," too controllable, too easy; while during a typical high-level political campaign (e.g., presidential elections and many statewide races), voters are overwhelmed by far more information than they can possibly process. In many ways the static information board represents an "ideal world" for decision-making that can be contrasted to voting in an actual political campaign.

There is an epistemological argument for studying any phenomenon in a simplified, ideal state (Henshel, 1980), and the tradeoffs between internal and external validity with any methodology are well known (Campbell & Stanley, 1963). David Redlawsk and I have sought a middle ground for studying the vote decision, trying to devise a more ecologically valid research technique that would better approximate the realities of modern political campaigns while still providing the experimental control and detailed evidence on information search that is available from a traditional information board (Lau, 1995; Lau & Redlawsk, 1992, 1997, 2001a, 2001b; Redlawsk, 2001). To accomplish these goals we have designed a dynamic process tracing methodology, which retains the most essential features of the standard information board while making it a better analog of an actual political campaign. This new methodology has the information boxes scroll down a computer screen rather than sitting in a fixed location. If a standard information board is artificial because it is static and therefore too "manageable," our procedure overwhelms subjects (voters) with information. If the standard information board is unrealistic by making all information available

whenever a subject wants it, we mimic the ongoing flow of information during a campaign with the scrolling, where information available today might be much harder to find tomorrow. If the standard information board is artificial because all different types of information are equally available, our procedure models in a realistic way the relative ease or difficulty of finding different types of information during a campaign. And if a standard information board only allows for information that is actively accessed by the decision-makers, we provide voters with a good deal of relevant information "free of charge" in the form of campaign advertisements that occasionally take over the computer screen without any active decision on the voter's part to learn that information. Our research program aims to discover which of the various findings of the behavioral decision theory literature apply to voting during political campaigns. A forthcoming book provides an overview of this research (Lau & Redlawsk, in preparation).

Methodology aside, elections have typically been studied by historians, journalists, and political scientists, all of whom are chiefly concerned with which candidate or which party won the most votes. Such a focus is understandable, and quite appropriate. Yet there is another way to look at the vote decision that is more compatible with a behavioral decision theory perspective: Did the voter choose *correctly*—that is, did the voter select the candidate who, in some normative sense, and from the voter's own perspective, was the best one? This is the primary focus of my and Redlawsk's (1997, 2001a) research, and I would hope this question could become the concern of many political psychologists.

I do not have the space to go into much detail in discussing how voters decide how to vote, and I will only try to sketch out the most important features. I want to briefly describe seven heuristics or cognitive shortcuts that I believe people utilize in making vote decisions. These heuristics provide great cognitive efficiency while probably still yielding reasonably accurate decisions most of the time. I say "probably" because there is in fact little empirical research addressing how people go about making a vote decision and how likely they are to choose the candidate who, for them, is best. Thus the use of these seven cognitive shortcuts should better be considered testable hypotheses rather than statements of fact.

*Affect referral* (Wright, 1975): If an election involves several candidates with whom you are already quite familiar, vote for the most highly evaluated candidate. This heuristic can only be used for candidates who have been around for multiple elections, but it could be used in a general election campaign if voters have already formed impressions of the candidates from primary elections.

*Endorsements*: Follow the recommendations of close acquaintances, trusted political elites (Carmines & Kuklinski, 1990; Mondak, 1993; Sniderman, Brody, & Tetlock, 1991), or social groups (Brady & Sni-

derman, 1985; Lau & Redlawsk, 2001a; Sniderman et al., 1991) with whom one identifies. In other words, let someone else do the hard work of figuring out how to vote.

*Familiarity* (Gigerenzer & Goldstein 1999): If you have heard of one candidate but not any of the others, and your evaluation of that one candidate is neutral or better, vote for the candidate with whom you are already familiar. This heuristic is a variant of Tversky and Kahneman's (1973) availability heuristic. It is probably the most important explanation of the powerful incumbency effects that characterize most legislative elections.

*Habit*: Vote how you voted the last time. Make a "standing decision" (e.g., always vote Republican) and stick to it (Quadrel, 1990).

Apply *partisan and ideological schemata* (Conover & Feldman, 1986, 1989; Hamill, Lodge, & Blake, 1985; Lau & Redlawsk, 2001a; Lodge & Hamill, 1986; Kahn, 1993; Sniderman, Hagen, Tetlock, & Brady, 1986): When you are relatively unfamiliar with the candidates in an election, categorize them according to widely available political schemata, assume schema-consistent detailed (default) information, and apply category-based affect (Fiske & Pavelchak, 1986). Voting one's party identification is probably the most important reason for a vote choice (in partisan elections, for the large majority of people with some partisan leanings), particularly if you include the indirect effect of partisanship on selective exposure and selective evaluation.

Likewise, apply *person stereotypes* concerning gender, race, age, appearance, and so on to "flesh out" your impression of the candidates (Fiske & Taylor, 1991; Miller, Wattenberg, & Malanchuk, 1986; Riggle, Ottati, Wyer, Kuklinski, & Schwartz, 1992; Rosenberg, Kahn, & Tran, 1991). Stereotype- and/or schema-based inferences are applications of Kahneman and Tversky's (1972) representativeness heuristic. *Viability* (Aldrich, 1980; Bartels, 1988; Lau & Redlawsk, 2001a): Only consider candidates who have a good chance of winning.

Although most citizens in almost all democracies feel it is sufficiently important to participate in politics that they get to the polls at least some of the time, still it should be obvious that the vote decision is not nearly as momentous to most people as buying a house or a car, deciding what college to attend, who to marry, where to work, and so on. Thus we must assume that the goal of efficiency rather than accuracy will dominate the decision strategies of most voters. Hence some noncompensatory decision strategy will almost certainly be applied. This tendency should be particularly strong in multiple (i.e., more than two) candidate elections. A simplified compensatory strategy is more feasible in a two-candidate election. And of course combined strategies are very possible—for example, beginning

with a noncompensatory heuristic like viability, and then switching to some simplified compensatory strategy such as the EqW heuristic or the FreqGB heuristic. Table 2.4 summarizes this reasoning.

We also should consider how the political information environment typically structures information. I know of no hard data on this point, but I will tentatively assert that the great bulk of all political information concerning elections becomes available in a candidate-centered format, thus almost requiring alternative-based searching. Citizens can actively choose to process more or less of that candidate-centered information, but attribute-based information—for example, charts in newspapers comparing the candidates' stands on selected issues—is much harder to come by (Lodge, Steenbergen, & Brau, 1995; Rahn, Aldrich, & Borgida, 1994). This is an important area for future research.

### Conclusion

This chapter began by considering the classic, rational choice perspective on decision-making and suggested that a more behaviorally oriented approach based on a view of humans as limited information processors was a more useful and accurate perspective. I have tried to shape my review of

the behavioral decision theory literature in a manner that highlights issues that should be of use to political psychologists. The focus on description in the behavioral decision theory literature can leave the casual reader of summaries of that literature (e.g., Abelson & Levi, 1985; Dawes, 1998; Einhorn & Hogarth, 1981; Hastie, 2001; Mellers, Schwartz, & Cooke, 1998; Payne, Bettman, & Johnson, 1992; Pitz & Sachs, 1984; Slovic, Fischhoff, & Lichtenstein, 1977) with a view more of the trees than the forest. I have tried to provide a map of the forest rather than describe all the trees, because the latter obscure the fact that while the process of making a decision is much more varied than the single ideal procedure suggested by the rational choice approach, it is still far from random (Jacoby et al., 1987). The regularities in human behavior are what social scientists must study, and there are more than enough in the decision-making field to go around.

One topic that is largely absent from this chapter is any discussion of the role of emotions or motivation on decision-making. My focus in this chapter has been on the rational choice and behavioral decision theory literatures, and there is very little research in either of those fields on emotions or motivations—except for the overarching motivation of self-interest that the rational choice perspective presumes universally guides behavior. I suspect this will change, and one can point to at least two areas in political science where it already has: the study of “motivational biases” in foreign policy decision-making (Janis & Mann, 1977; Jervis, 1976, 1985; again, see chapter 8); and the work of Marcus, MacKuen, & Neuman on the role of emotions on political behavior (Marcus, 1988; Marcus & MacKuen, 1993; Marcus, Neuman, & MacKuen, 2000). I do not have the space here to adequately address this topic, and motivational biases are discussed in chapter 8. The gist of Markus's argument is that the emotional system, particularly anxiety, can provide the increased motivation for more thorough (procedurally rational) information processing and decision-making. As such, it influences answers to questions in the first stage of the general model presented in table 2.4.

I will conclude this chapter by addressing whether rational choice and behavioral decision theory approaches could ever be reconciled. At some level, it is fairly easy to integrate the notion of bounded rationality into a rational choice perspective. Information costs have been recognized as an integral part of the approach (e.g., Downs, 1957; Fiorina, 1981). Bounded rationality provides a more complete understanding, not only in terms of the costs of gathering the information but also in terms of the costs of utilizing it once it has been gathered. More recent versions of rational choice view decision-makers as “intendedly rational,” as doing the best they can under the circumstances and with acknowledged cognitive limitations. Jones (1994) and Lupia et al. (2000) seem to adopt this position. I think this reconciliation misses the boat (see also Simon, 1985). Sometimes people *are* intendedly rational; but much more often they make decisions automatically or semiautomatically with no conscious consideration or how or why they

**Table 2.4**  
**A General Procedural Framework for Analyzing Political Decision-Making**

Problem determination and preliminary information search	Do I have a standard or simple way to decide?	If not, how can I simplify this decision?	Is accuracy sufficiently important that I must employ a more complicated strategy?
Is this problem familiar or new?	Affect referral	Endorsements	Compensatory strategy (EqW, FreqGB, MCD) to reach final decision
Is it relatively simple or complex?	Familiarity heuristic	Person stereotypes	
How important is it to make an accurate decision?	Habit	Political schemata	
		Viability	
		Use noncompensatory decision strategy (SAI, LEX, EBA) to eliminate alternatives and/or attributes	

are choosing as they are. The view of decision-makers as "omniscient calculators," even as an ideal, should probably be dropped: it can be misleading, when people confuse "ought" with "is," and a consequence set unrealistically high standards (Lau & Redlawsk, 1997). But the normative concerns of a rational choice approach are important, and the guidelines of procedural rationality are worthwhile standards for making good decisions. Rather than intendedly rational behavior, however, I would characterize most decision-making—and certainly most political decision-making—as *semiautomatic rule following*, with any conscious deliberation focused on determining which heuristic it is appropriate to apply rather than value-maximization.

I would echo Kahneman (1994) in arguing that rather than asking *whether* decisions are rational or not, or revising our definition of "rationality" so that it can include more actual choice behavior, a better question for future decision research to address is *under what conditions* decision-makers are at least "reasonably" rational in their decision processes;<sup>17</sup> and when they are not, what cognitive shortcuts or heuristics do they employ in lieu of thorough information search and value-maximizing choice strategies, and what consequences do those strategies hold for the quality of the decisions that are made? People can, and often do, follow a logic of consequence, if not omnisciently, at least reasonably, given their cognitive limitations. And people can, and often do, make many decisions automatically, by unconsciously following well-learned rules for making decisions. The question that political psychologists should consider is not whether people are always or ever procedurally rational in their decision processes but what they do when they are not, and what effect it has on the quality of the decision that is reached.

## ▲ Notes

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1. When people refer to a "best" or "ideal" solution, they usually mean the value-maximizing alternative. The rational choice approach also assumes that decision-makers follow a number of formal mathematical principles in making their probability judgments and value assessments, including regularity, independence from irrelevant alternatives, transitivity, procedure invariance, dominance, and all the dictates of Bayes's theorem. Although these principals can sound intimidating, for the most part they are quite logical and intuitive, and are widely accepted by decision-makers when they are explained. Dawes (1988) summarizes these principals more simply by saying that a decision can be considered "rational" if it is (1) based on the status quo of current assets such that losses or foregone gains are equivalent; (2) based on all possible/ plausible

outcomes associated with the choice; and (3) where uncertainty is involved, does not violate any of the basic rules of probability.

2. Notice that  $-50¢$  is never a value associated with any outcome that ever occurs when choosing to play the lottery. When outcomes are uncertain, expected value takes on an "in the long run" meaning: if one plays the Pick-3 lottery over and over again, on average you will lose 50¢ for every time you play.

3. Economists contrast "utility" to straightforward numeric value, because most people view the difference between \$0 and \$100 to be much greater than the difference between \$10,000 and \$10,100. Thus the "subjective utility" curve for increased wealth is concave (i.e., sloping downward). This is an important empirical refinement, but its implications are much narrower in scope than the incommensurability problem I discuss hereafter. The real advantage of von Neuman and Morgenstern's subjective expected utility theorem to economists, however, is its method for turning ordinal preferences into cardinal utility functions, which then allows much more powerful mathematics to come into play.

The implications of *this* change are huge, for it is the basis of most of modern microeconomics, and it has allowed the development of game theory. The SEU theorem begins by assuming away incommensurability.

4. "Relevance" is again typically defined subjectively, as including everything I "care" about that is affected by this policy. Many rational choice models, most notably Downs (1957), consider the cost of gathering information as a means of limiting the burdens on the decision-maker. Such models can be viewed as "optimization under constraints." New information should be gathered until the marginal costs of additional information exceed the marginal returns from that information. Although considering information costs seems at first glance a plausible way of limiting cognitive effort, in fact any stopping rule actually takes more cognitive effort to employ (Gigerenzer & Todd, 1999; Vriend, 1996). In practical terms, information search—data gathering—is probably the most effortful and influential aspect of decision-making, yet it is outside the realm of many rational choice models.

5. From an evolutionary perspective, the availability of ink and paper for several thousand years would not be anywhere near long enough for the human brain to have adapted accordingly. Thus, functionally speaking, the brains we are all using today to make decisions were developed at a time when the best our ancestors could do vis-à-vis any calculating was make a few marks in the dirt with a stick—if that activity would have occurred to anyone.

6. See Green and Shapiro (1994) for an elaborate presentation of this argument, Simon (1985, 1995) for its essence, and Aldrich (1993) or Friedman (1995) for various responses from the rational choice perspective.

7. Kahneman and Tversky's (1979; Tversky & Kahneman, 1992) prospect theory provides an alternative framework that is better suited to explain why some seemingly "irrational" behavior like playing the Pick-3 lottery occurs (see Levy, 1997, and chapter 8).

8. Cognitive efficiency results from being able to ignore the details of some particular stimulus that are present in the information environment if the stimulus has been categorized as another instance of some familiar group. Efficiency also results from being able to make category-based inferences about the particular stimulus even when the detailed information is *not* actually present in the information environment—thus avoiding additional information search.

9. The generation of possible causal scenarios is sometimes distinguished from availability as the "simulation" heuristic (Kahneman and Tversky, 1982).

10. It takes some practice to be able to do this without noticeably interfering with the decision-making itself. Ericsson and Simon distinguish between concurrent verbalizations, where decision-makers try to report on their thoughts as they are making a decision, and retrospective verbal protocols, where decision-makers try to describe cognitive processes that occurred earlier in time. The latter procedure should not be considered a process tracing methodology at all, for it must rely on long-term rather than short-term memory, and people are notoriously poor after-the-fact reporters on what has influenced their own behavior (Nisbett & Wilson, 1977). People can give plausible rationalizations for their behavior, but those explanations may have little association with why people actually did what they did.

11. If one alternative is preferred to all other alternatives on every dimension of judgment, it is said to "dominate" the other alternatives (Dawes, 1998), and there should be no conflict in making a decision.

12. The LEX heuristic is sometimes combined with the psychological notion of "just noticeable differences" (JNDs), which recognizes that human perceptual abilities cannot discriminate among very many distinct levels on most dimensions of judgment. Alternatives are then selected only if they are "greater than one JND" better than the other alternatives. This results in many more "ties" when applying the LEX heuristic, which can lead to intransitivities in preferences such that option A is preferred to option B, B is preferred to C, but C is preferred to A (see Payne et al., 1993). FreqGB, SAT, and LEX all assumed that decision-makers consider only a single JND for all attributes of judgment, and thus only two values—good or bad, satisfactory or unsatisfactory—are possible.

13. Taber and Steenbergen (1995) attempted to model several pure decision strategies with a procedure they called computational process tracing in order to predict the choices subjects made in a mock election study. No process tracing data were gathered, but Taber and Steenbergen did know the political beliefs of their subjects and which of two hypothetical congressional candidates they preferred. Thus the authors asked the question "Had subjects used this strategy, what choice should they have made?" Unfortu- nately all of the rules Taber and Steenbergen considered did a good job of predicting subjects' actual vote choices, which make it difficult to use this procedure to determine which strategies were most likely to have been employed.

14. One other type of transition is possible: intraattribute, intraalternative, that is, reaccessing the same item of information. Whenever this type of transition occurs it can usually be considered a random error.

15. The one exception to this statement is expertise, which has been a major focus of attention in the field; see for example Chase & Simon, 1973; Fiske, Kinder, & Larter, 1983; Fiske, Lau, & Smith, 1990; Lau & Erber, 1985; Reder & Anderson, 1980.

16. Most of the political science models that attempt to predict the outcome of presidential elections had Al Gore winning about 55 percent of the popular vote in 2000—about 5 percent more than he actually received (e.g., Holbrook, 1996; Lewis-Beck & Rice, 1992; Rosenstone, 1983). All of these models include evaluations of the incumbent administration's job performance as a crucial predictor. Evidently enough voters were *deciding* between Bush and Gore on some other basis to throw these models off.

17. Marcus et al. (2000) have supplied one answer to this question: people are more "rational" when they are more anxious.

## References

- Abelson, R. P., & Levi, A. (1985). Decision making and decision theory. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed., vol. 1, pp. 231–309). New York: Random House.
- Abramson, P. R., Aldrich, J. H., Paolino, P., & Rohde, D. W. (1992). "Sophisticated" voting in the 1988 presidential primaries. *American Political Science Review*, *86*, 55–69.
- Alba, J. W., & Marmorstein, H. (1987). The effects of frequency knowledge on consumer decision making. *Journal of Consumer Research*, *14*, 14–26.
- Aldrich, J. H. (1980). *Before the convention: Strategies and choices in presidential nomination campaigns*. Chicago: University of Chicago Press.
- Aldrich, J. H. (1993). Rational choice and turnout. *American Journal of Political Science*, *37*, 246–276.
- Allison, G. T. (1971). *Essence of decision: Explaining the Cuban missile crisis*. Boston: Little, Brown.
- Allison, G. T., & Zelikow, P. D. (1999). *Essence of decision: Explaining the Cuban missile crisis* (2nd ed.). New York: Longman.
- Anderson, J. R. (1983). *The architecture of cognition*. Cambridge, MA: Harvard University Press.
- Aschenbrenner, K. M., Bockenholt, U., Albert, D., & Schmalhofer, F. (1986). The selection of dimensions when choosing between multiattribute alternatives. In R. W. Scholz (Ed.), *Current issues in West German decision research* (pp. 63–78). Frankfurt: Lang.
- Bartels, L. M. (1988). *Presidential primaries and the dynamics of public choice*. Princeton: Princeton University Press.
- Ben Zur, H., & Breznitz, S. J. (1981). The effects of time pressure on risky choice behavior. *Acta Psychologica*, *47*, 89–104.
- Biggs, S. F., Bedard, J. C., Gaber, B. G., & Linsmeier, T. J. (1985). The effects of task size and similarity on the decision behavior of bank loan officers. *Management Science*, *31*, 970–987.
- Billings, R. S., & Marcus, S. A. (1983). Measures of compensatory and noncompensatory models of decision behavior: Process tracing versus policy capturing. *Organizational Behavior and Human Performance*, *31*, 331–352.
- Bockenholt, U., Albert, D., Aschenbrenner, M., & Schmalhofer, F. (1991). The effects of attractiveness, dominance and attribute differences on information acquisition in multiattribute binary choice. *Organizational Behavior and Human Decision Processes*, *49*, 258–281.
- Brady, H. E., & Sniderman, P. M. (1985). Attitude attribution: A group basis for political reasoning. *American Political Science Review*, *79*, 1061–1078.
- Campbell, A., Converse, P. E., Miller, W. E., & Stokes, D. E. (1960). *The American voter*. Chicago: University of Chicago Press.
- Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research*. Chicago: Rand McNally.
- Cantor, N., & Mischel, W. (1979). Prototypes in person perception. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (vol. 12, pp. 3–25). New York: Academic Press.
- Carmines, E. G., & Kuklinski, J. H. (1990). Incentives, opportunities, and the logic of public opinion in American political representation. In J. A. Ferejohn &

- J. H. Kuklinski (Eds.), *Information and democratic processes* (pp. 240-268). Urbana: University of Illinois Press.
- Carroll, J. S., & Johnson, E. J. (1990). *Decision research: A field guide*. Beverly Hills, CA: Sage.
- Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive Psychology*, 4, 55-81.
- Conover, P. J., & Feldman, S. (1984). How people organize their political world: A schematic model. *American Journal of Political Science*, 28, 95-126.
- Conover, P. J., & Feldman, S. (1986). The role of inference in the perception of political candidates. In R. R. Lau & D. O. Sears (Eds.), *Political cognition: The nineteenth annual Carnegie symposium on cognition* (pp. 127-158). Hillsdale, NJ: Erlbaum.
- Conover, P. J., & Feldman, S. (1989). Candidate perception in an ambiguous world: Campaigns, cues, and inference processes. *American Journal of Political Science*, 33, 912-940.
- Converse, P. E. (1975). Public opinion and voting behavior. In F. Greenstein & N. Polsby (Eds.), *Handbook of political science* (vol. 4, pp. 75-170). Reading, MA: Addison-Wesley.
- Czerlinski, J., Gigerenzer, G., & Goldstein, D. G. (1999). How good are simple heuristics? In G. Gigerenzer, P. M. Todd, & the ABS Research (Eds.), *Simple heuristics that make us smart* (pp. 97-118). New York: Oxford University Press.
- Dawes, R. M. (1979). The robust beauty of improper linear models in decision making. *American Psychologist*, 34, 571-582.
- Dawes, R. M. (1988). *Rational choice in an uncertain world*. New York: Harcourt Brace Jovanovich.
- Dawes, R. M. (1998). Behavioral decision making and judgment. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (4th ed., vol. 1, pp. 497-548). Boston: McGraw-Hill.
- Downs, A. (1957). *An economic theory of democracy*. New York: Harper and Row.
- Druckman, J. N., & Lupia, A. (2000). Preference formation. *Annual Review of Political Science*, 3, 1-24.
- Easton, D. (1953). *The political system: An inquiry into the state of political science*. New York: Knopf.
- Einhorn, H. J. (1970). The use of nonlinear, noncompensatory models in decision making. *Psychological Bulletin*, 73, 211-230.
- Einhorn, H. J., & Hogarth, R. M. (1975). Unit weighting schemes for decision making. *Organizational Behavior and Human Performance*, 13, 171-192.
- Einhorn, H. J., & Hogarth, R. M. (1981). Behavioral decision theory: Processes of judgment and choice. *Annual Review of Psychology*, 32, 53-88.
- Erticsson, K. A., & Simon, H. A. (1984). *Protocol analysis: Verbal reports as data*. Cambridge, MA: MIT Press.
- Fiorina, M. P. (1981). *Retrospective voting in American national elections*. New Haven: Yale University Press.
- Fischer, G. W., & Hawkins, S. A. (1993). Strategy compatibility, scale compatibility, and the prominence effect. *Journal of Experimental Psychology: Human Perception and Performance*, 19, 580-597.
- Fischhoff, B., Slovic, P., & Lichtenstein, S. (1978). Fault trees: Sensitivity of estimated failure probabilities to problem representation. *Journal of Experimental Psychology: Human Perception and Performance*, 4, 330-344.
- Fiske, S. T., Kinder, D. R., & Larzer, W. M. (1983). The novice and the expert: Knowledge-based strategies in political cognition. *Journal of Experimental Social Psychology*, 19, 381-400.
- Fiske, S. T., Lau, R. R., & Smith, R. A. (1990). On the variety and utility of political knowledge structures. *Social Cognition*, 8, 31-48.
- Fiske, S. T., & Pavelchak, M. A. (1986). Category-based versus piecemeal-based affective responses: Developments in schema-triggered affect. In R. M. Sorrentino & E. T. Higgins (Eds.), *The handbook of motivation and cognition: Foundations of social behavior* (pp. 167-203). New York: Guilford.
- Fiske, S. T., & Taylor, S. E. (1991). *Social cognition* (2nd ed.). New York: McGraw-Hill.
- Ford, J. K., Schmitt, N., Schechtman, S. L., Hults, B. M., & Doherty, M. L. (1989). Process tracing methods: Contributions, problems, and neglected research questions. *Organizational Behavior and Human Decision Processes*, 43, 75-117.
- Ford, J. K., & Smith, R. A. (1987). Inferential beliefs in consumer evaluations: An assessment of alternative processing strategies. *Journal of Consumer Research*, 14, 363-371.
- Friedman, J. (Ed.). (1995). *The rational choice controversy*. New Haven: Yale University Press.
- Gettys, C. F., Pliske, R. M., Manning, C., & Casey, J. T. (1987). An evaluation of human act generation performance. *Organizational Behavior and Human Decision Processes*, 39, 23-51.
- Gigerenzer, G., & Goldstein, D. G. (1999). Betting on one good reason: The take the best heuristic. In G. Gigerenzer, P. M. Todd, & the ABS Research (Eds.), *Simple heuristics that make us smart* (pp. 75-95). New York: Oxford University Press.
- Gigerenzer, G., & Todd, P. M. (1999). Fast and frugal heuristics: The adaptive toolbox. In G. Gigerenzer, P. M. Todd, & the ABS Research (Eds.), *Simple heuristics that make us smart* (pp. 3-34). New York: Oxford University Press.
- Green, D. P., & Shapiro, I. (1994). *Pathologies of rational choice theory: A critique of applications in political science*. New Haven: Yale University Press.
- Hamill, R., Lodge, M., & Blake, F. (1985). The breadth, depth, and utility of class, partisan, and ideological schemata. *American Journal of Political Science*, 29, 850-870.
- Hastie, R. (1986). A primer of information-processing theory for the political scientist. In R. R. Lau & D. O. Sears (Eds.), *Political cognition: The nineteenth annual Carnegie Symposium on Cognition* (pp. 11-39). Hillsdale, NJ: Erlbaum.
- Hastie, R. (2001). Problems for judgment and decision making. *Annual Review of Psychology*, 52, 653-683.
- Henshel, R. L. (1980). The purposes of laboratory experimentation and the virtues of deliberate artificiality. *Journal of Experimental Social Psychology*, 16, 466-478.
- Herstein, J. A. (1981). Keeping the voter's limits in mind: A cognitive process analysis of decision making in voting. *Journal of Personality and Social Psychology*, 40, 843-861.
- Hogarth, R. M. (1975). Cognitive processes and the assessment of subjective probability distributions. *Journal of the American Statistical Association*, 70, 271-289.
- Hogarth, R. M. (1987). *Judgment and choice* (2nd ed.). New York, NY: Wiley.
- Holbrook, T. M. (1996). Reading the political tea leaves: A forecasting model of contemporary presidential elections. *American Politics Quarterly*, 24, 506-519.

- Holsti, O. R. (1989). Crisis decision making. In P. E. Tetlock, National Research Council Committee on Contributions of Behavioral and Social Science to the Prevention of Nuclear War, and the Committee on International Conflict and Cooperation (Eds.), *Behavior, society, and nuclear war* (vol. 1, pp. 8-84). New York: Oxford University Press.
- Holsti, O. R., & George, A. L. (1975). The effects of stress on the performance of foreign policy-makers. In C. P. Cotter (Ed.), *Political science annual* (pp. 255-319). Indianapolis: Bobbs-Merrill.
- Huang, L.-N. (2000). Examining candidate information search processes: The impact of processing goals and sophistication. *Journal of Communication, 50*, 93-114.
- Jacoby, J., Chestnut, R. W., Weigl, K. C., & Fischer, W. (1976). Pre-purchasing information acquisition: Description of a process methodology, research paradigm, and pilot investigation. *Advances in Consumer Research, 5*, 546-554.
- Jacoby, J., Jaccard, J., Kuss, A., Troutman, T., & Mazursky, D. (1987). New directions in behavioral process research: Implications for social psychology. *Journal of Experimental Social Psychology, 23*, 146-175.
- Jacoby, J., Speller, D. E., & Kahn, C. A. (1974). Brand choice behavior as a function of information load. *Journal of Marketing Research, 11*, 63-69.
- Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Free Press.
- Jervis, R. (1976). *Perception and misperception in international politics*. Princeton: Princeton University Press.
- Jervis, R. (1985). Perceiving and coping with threat. In R. Jervis, R. N. Lebow, & J. G. Stein (Eds.), *Psychology and deterrence* (pp. 13-33). Baltimore: Johns Hopkins University Press.
- Johnson, M. D. (1984). Consumer choice strategies for comparing noncomparable alternatives. *Journal of Consumer Research, 11*, 741-753.
- Johnson, M. D. (1986). Modeling choice strategies for noncomparable alternatives. *Marketing Sciences, 5*, 37-54.
- Jones, B. D. (1994). *Reconciling decision-making in democratic politics: Attention, choice, and public policy*. Chicago: University of Chicago Press.
- Jones, B. D. (1999). Bounded rationality. *Annual Review of Political Science, 2*, 297-321.
- Kahneman, D. (1994). New challenges to the rationality assumption. *Journal of Institutional and Theoretical Economics, 150*, 18-36.
- Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology, 3*, 430-454.
- Kahneman, D., & Tversky, A. (1973). On the psychology of prediction. *Psychological Review, 80*, 237-251.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*, 263-291.
- Kahneman, D., & Tversky, A. (1982). The psychology of preferences. *Scientific American, 246*, 160-173.
- Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American Psychologist, 39*, 341-350.
- Keller, K. L., & Staelin, R. (1987). Effects of quality and quantity of information on decision effectiveness. *Journal of Consumer Research, 14*, 200-213.
- Keller, L. R., & Ho, J. L. (1988). Decision problem structuring: Generating options. *IEEE Transactions on Systems, Man, and Cybernetics, 18*, 715-728.
- Kelley, S., Jr., & Mirer, T. W. (1974). The simple act of voting. *American Political Science Review, 68*, 572-591.
- Klayman, J. (1985). Children's decision strategies and their adaptation to task characteristics. *Organizational Behavior and Human Decision Processes, 35*, 179-201.
- Langley, P., Simon, H. A., Bradshaw, G. L., & Zytkow, J. M. (1987). *Scientific Discovery*. Cambridge, MA: MIT Press.
- Lau, R. R. (1982). Negativity in political perception. *Political Behavior, 4*, 353-378.
- Lau, R. R. (1995). Information search during an election campaign: Introducing a process tracing methodology to political science. In M. Lodge & K. McGraw (Eds.), *Political judgment: Structure and process* (pp. 179-205). Ann Arbor: University of Michigan Press.
- Lau, R. R., & Erber, R. (1985). An information processing perspective on political sophistication. In S. Kraus & R. Perloff (Eds.), *Mass media and political thought* (pp. 17-39). Beverly Hills, CA: Sage.
- Lau, R. R., & Redlawsk, D. P. (1992 August). How voters decide: A process tracing study of decision making during political campaigns. Paper presented at the eighty-eighth annual meeting of the American Political Science Association, Chicago.
- Lau, R. R., & Redlawsk, D. P. (1997). Voting correctly. *American Political Science Review, 91*, 585-599.
- Lau, R. R., & Redlawsk, D. P. (2001a). Advantages and disadvantages of cognitive heuristics in political decision making. *American Journal of Political Science, 45*, 951-971.
- Lau, R. R., & Redlawsk, D. P. (2001b). An experimental study of information search, memory, and decision making during a political campaign. In J. H. Kuklinski (Ed.), *Citizens and politics: Perspectives from political psychology* (pp. 136-159). Cambridge: Cambridge University Press.
- Lau, R. R., & Redlawsk, D. P. (in preparation). *How voters decide: Information processing during an election campaign*.
- Lau, R. R., & Sears, D. O. (1986). Social cognition and political cognition. In R. R. Lau & D. O. Sears (Eds.), *Political cognition: The nineteenth annual Carnegie symposium on cognition* (pp. 347-366). Hillsdale, NJ: Erlbaum.
- Lazarsfeld, P. F., Berelson, B. R., & Gaudet, H. (1944). *The people's choice*. New York: Columbia University Press.
- Levy, J. (1997). Prospect theory, rational choice, and international relations. *International Studies Quarterly, 41*, 87-112.
- Lewis-Beck, M. S., & Rice, T. W. (1992). *Forecasting elections*. Washington, DC: CQ Press.
- Lichtenstein, S., & Slovic, P. (1971). Reversals of preference between bids and choices in gambling decisions. *Journal of Experimental Psychology, 89*, 46-55.
- Lindberg, E., Garling, T., & Montgomery, H. (1989). Differential predictability of preferences and choices. *Journal of Behavioral Decision Making, 2*, 205-219.
- Lodge, M., & Hamill, R. (1986). A partisan schema for political information processing. *American Political Science Review, 80*, 505-519.
- Lodge, M., McGraw, K. M., & Stroh, P. (1989). An impression-driven model of candidate evaluation. *American Political Science Review, 83*, 399-420.

- Lodge, M., Steenbergen, M. R., & Brau, S. (1995). The responsive voter: Campaign information and the dynamics of candidate evaluation. *American Political Science Review*, 89, 309-326.
- Luce, R. D., & Raiffa, H. (1957). *Games and decisions: Introduction and critical survey*. New York: Wiley.
- Lupia, A., McCubbins, M. D., & Popkin, S. L. (2000). Beyond rationality: Reason and the study of politics. In A. Lupia, M. D. McCubbins, & S. L. Popkin (Eds.), *Elements of reason: Cognition, choice, and the bounds of rationality* (pp. 1-20). New York: Cambridge University Press.
- Malhotra, N. K. (1982). Information load and consumer decision making. *Journal of Consumer Research*, 8, 419-430.
- March, J. G. (1978). Bounded rationality, ambiguity, and the engineering of choice. *Bell Journal of Economics*, 9, 578-608.
- March, J. G. (1988). *Decisions and organizations*. Oxford: Blackwell.
- March, J. G. (1994). *A primer on decision making*. New York: Free Press.
- March, J. G., & Olson, J. P. (1989). *Rediscovering institutions: The organizational basis of politics*. New York: Free Press.
- March, J. G., & Simon, H. A. (1958). *Organizations*. New York: Wiley.
- Marcus, G. E. (1988). The structure of emotional response: 1984 presidential candidates. *American Political Science Review*, 82, 737-761.
- Marcus, G. E., & MacKuen, M. B. (1993). Anxiety, enthusiasm, and the vote: The emotional underpinnings of learning and involvement during presidential campaigns. *American Political Science Review*, 87, 672-685.
- Marcus, G. E., Neuman, W. R., & MacKuen, M. (2000). *Affective intelligence and political judgment*. Chicago: University of Chicago Press.
- Markus, G. B., & Converse, P. E. (1979). A dynamic simultaneous equation model of electoral choice. *American Political Science Review*, 73, 1055-1070.
- Meehl, P. E. (1977). The selfish voter and the throw-away vote argument. *American Political Science Review*, 71, 11-30.
- Mellers, B. A., Schwartz, A., & Cooke, A. D. J. (1998). Judgment and decision making. *Annual Review of Psychology*, 49, 447-477.
- Miller, A. H., Wartenberg, M. P., & Malanchuk, O. (1986). Schematic assessments of presidential candidates. *American Political Science Review*, 80, 521-540.
- Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63, 81-97.
- Miller, W. E., & Shanks, J. M. (1996). *The new American voter*. Cambridge, MA: Harvard University Press.
- Mondak, J. J. (1993). Public opinion and heuristic processing of source cues. *Political Behavior*, 15, 167-192.
- Nie, N. H., Verba, S., & Petrocik, J. R. (1976). *The changing American voter*. Cambridge, MA: Harvard University Press.
- Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84, 231-259.
- Olshavsky, R. W. (1979). Task complexity and contingent processing in decision making: A replication and extension. *Organization Behavior and Human Performance*, 249, 300-316.
- Payne, J. W. (1976). Task complexity and contingent processing in decision making: An information search and protocol analysis. *Organizational Behavior and Human Performance*, 16, 366-387.
- Payne, J. W., Bettman, J. R., & Johnson, E. J. (1988). Adaptive strategy selection in decision making. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14, 534-552.
- Payne, J. W., Bettman, J. R., & Johnson, E. J. (1992). Behavioral decision research: A constructive processing perspective. *Annual Review of Psychology*, 43, 87-131.
- Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker*. New York: Cambridge University Press.
- Payne, J. W., & Braunstein, M. L. (1978). Risky choice: An examination of information acquisition behavior. *Memory and Cognition*, 6, 554-561.
- Pitz, G., & Sachs, N. (1984). Judgment and decision: Theory and application. *Annual Review of Psychology*, 35, 139-163.
- Quadrel, M. J. (1990). *Elicitation and Evaluation of Adolescents' Risk Perceptions: Quantitative and Qualitative Dimensions*. Ph.D. Dissertation, Carnegie Mellon University.
- Quadrel, M. J., Fishhoff, B., & Davis, W. (1993). Adolescent (in)vulnerability. *American Psychologist*, 48, 102-116.
- Rahn, W. M. (1993). The role of partisan stereotypes in information processing about political candidates. *American Journal of Political Science*, 37, 472-496.
- Rahn, W. M., Aldrich, J. H., & Borgida, E. (1994). Individual and contextual variations in political candidate appraisal. *American Political Science Review*, 88, 193-199.
- Rahn, W. M., Krosnick, J. A., & Breuning, M. (1994). Rationalization and derivation processes in survey studies of political candidate evaluation. *American Journal of Political Science*, 38, 582-600.
- Reder, L. M., & Anderson, J. R. (1980). A partial resolution of the paradox of interference: The role of integrating knowledge. *Cognitive Psychology*, 12, 447-472.
- Redlawsk, D. P. (2001). You must remember this: A test of the on-line model of voting. *Journal of Politics*, 63, 29-58.
- Raiffa, H. (1968). *Decision analysis: Introductory lectures on choices under uncertainty*. Reading, MA: Addison-Wesley.
- Riggle, E. D., & Johnson, M. M. S. (1996). Age differences in political decision making: Strategies for evaluating political candidates. *Political Behavior*, 18, 99-118.
- Riggle, E. D., Ortafi, V., Weyer, R. S., Kuklinski, J., & Schwartz, N. (1992). Bases of political judgments: The role of stereotypic and nonstereotypic information. *Political Behavior*, 14, 67-87.
- Riker, W. H., & Ordeshook, P. C. (1968). A theory of the calculus of voting. *American Political Science Review*, 62, 25-42.
- Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 28-50). Hillsdale, NJ: Erlbaum.
- Rosenberg, S. W., Kahn, S., & Tran, T. (1991). Creating a political image: Shaping appearance and manipulating the vote. *Political Behavior*, 13, 345-367.
- Rosenstone, S. J. (1983). *Forecasting presidential elections*. New Haven: Yale University Press.
- Rubenstein, A. H. (1998). *Modeling bounded rationality*. Cambridge, MA: MIT Press.
- Russo, J. E. (1977). The value of unit price information. *Journal of Marketing Research*, 14, 193-201.
- Russo, J. E., & Doshier, B. A. (1983). Strategies for multiattribute binary choice. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 17, 676-696.
- Savage, L. J. (1954). *The foundations of statistics*. New York: Wiley.

- Shugan, S. M. (1980). The cost of thinking. *Journal of Consumer Research*, 7, 99-111.
- Simon, H. A. (1947). *Administrative behavior*. New York: Macmillan.
- Simon, H. A. (1957). *Models of man: Social and rational*. New York: Wiley.
- Simon, H. A. (1979). Information processing models of cognition. *Annual Review of Psychology* 30, 363-396.
- Simon, H. A. (1985). Human nature in politics: The dialogue of psychology with political science. *American Political Science Review*, 79, 293-304.
- Simon, H. A. (1995). Rationality in political behavior. *Political Psychology*, 16, 45-61.
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (1977). Behavioral decision theory. *Annual Review of Psychology*, 28, 1-39.
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (1982). Response mode, framing, and information processing effects in risk assessment. In R. Hogarth (Ed.), *New directions for methodology of social and behavioral science: The framing of questions and the consistency of response* (pp. 21-36). San Francisco: Jossey-Bass.
- Slovic, P., & Lichtenstein, S. (1971). Comparison of Bayesian and regression approaches to the study of information processing in judgment. *Organizational Behavior and Human Performance*, 6, 649-744.
- Smith, E. R. (1998). Mental representation and memory. In D. T. Gilbert, S. T. Fiske, & G. Lindzey, (Eds.), *The handbook of social psychology* (4th ed., vol. 1, pp. 391-445). Boston: McGraw-Hill.
- Sniderman, P. M., Brody, R. A., & Tetlock, P. E. (1991). *Reasoning and choice: Explorations in political psychology*. New York: Cambridge University Press.
- Sniderman, P. M., Hagen, M. G., Tetlock, P. E., & Brady, H. E. (1986). Reasoning chains: Causal models of policy reasoning in mass publics. *British Journal of Political Science*, 16, 405-430.
- Svenson, O. (1979). Process descriptions of decision making. *Organizational Behavior and Human Performance*, 23, 86-112.
- Taber, C. S., & Steenbergen, M. R. (1995). Computational experiments in electoral behavior. In M. Lodge & K. M. McGraw (Eds.), *Political judgment: Structure and process* (pp. 141-178). Ann Arbor: University of Michigan Press.
- Taylor, S. E. (1981). The interface of cognitive and social psychology. In J. Harvey (Ed.), *Cognition, social behavior, and the environment* (pp. 189-211). Hillsdale, NJ: Erlbaum.
- Tversky, A. (1969). Intransitivity of preferences. *Psychological Review*, 76, 31-48.
- Tversky, A. (1972). Elimination by aspects: A theory of choice. *Psychological Review*, 79, 281-299.
- Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5, 207-232.
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185, 1124-1131.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-463.
- Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, 59, S251-S278.
- Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5, 297-323.
- Tversky, A., & Sarath, S. (1979). Preference trees. *Psychological Review*, 86, 542-573.
- Tversky, A., Sarath, S., & Slovic, P. (1988). Contingent weighting in judgment and choice. *Psychological Review*, 95, 371-384.
- Wright, P. (1975). Consumer choice strategies: Simplifying vs. optimizing. *Journal of Marketing Research*, 12, 60-67.
- von Neuman, J., & Morgenstern, O. (1947). *Theory of games and economic behavior*. Princeton: Princeton University Press.
- Vriend, N. J. (1996). Rational behavior and economic theory. *Journal of Economic Behavior & Organization*, 29, 263-285.