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Cognitive Bias in Strategic Decision-Making:
Some Conjectures

Charles R. Schwenk

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Cognitive Bias in Strategic
Decision-Making: Some Conjectures

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ABSTRACT

Strategic decision-making can be viewed as a special kind of decision-making under uncertainty. Researchers in a variety of fields have identified a number of cognitive or perceptual mechanisms by which decision makers distort information from the environment to make it appear simpler and reduce the apparent uncertainty in a decision-making task. Within this paper, a four-stage model of strategic decision-making is developed and the possible effects of cognitive biases at each stage are discussed. Finally, techniques for introducing conflict into strategy formulation are proposed as ways of counteracting the effects of these biases.

COGNITIVE BIAS IN STRATEGIC
DECISION-MAKING: SOME CONJECTURES

Strategic decision-making has been defined as a special kind of ill-structured problem-solving process and as a special type of decision-making under uncertainty (Hofer & Schendel, 1978:46). Because of the importance of strategic decision-making, much effort has been devoted to developing procedures for improving the effectiveness of the process by increasing the amount of data considered and the thoroughness with which it is evaluated (Grant & King, 1979:104-122).

A number of recent articles in the strategic management field have developed and validated descriptive models of the strategic decision-making process (Mintzberg, Raisinghani, & Theoret 1976; Glueck 1976; Mazzolini, 1981; Hofer & Schendel, 1978). These models involve various numbers of stages and are generally similar to earlier models of the organizational decision-making process (Lang, Dittrich, & White, 1978). The decisional activities at each stage have been examined experimentally by cognitive psychologists and behavioral decision theorists and numerous biases have been identified which limit decisional effectiveness. An understanding of these biases is necessary for the design of effective strategic decision-making aids.

Theorists in the field of Strategic Management have pointed out that human cognitive limitations might affect strategic decision-making (Steiner & Miner, 1977:226-231; Mintzberg, 1973:45-46), basing their arguments on Simon's notions of "bounded rationality" and "satisficing." They have pointed out that strategic decision-makers are subject to bounded rationality and do not optimize in their decisions but have not

discussed the specific effects of bounded rationality on decision-makers' perceptions or the specific decisional behaviors adopted in preference to optimizing. However, some researchers have discussed the effects of specific cognitive biases on general managerial decision-making (Taylor, 1975; Hogarth, 1980) and on the use of forecasts (Hogarth & Makridakis, 1981).

This paper develops conjectures about possible biases in strategic decision-making by drawing on literature in the fields of cognitive psychology and behavioral decision theory dealing with problem formulation and decision-making under uncertainty. These biases allow for some specific predictions about the types of errors to which decision makers will be subject in various activities or phases of strategic decision-making. Such information could be helpful to researchers in attempting to explain decisional failures and to practitioners interested in reducing the effects of these biases through the use of decision aids. This paper does not, of course, represent an exhaustive review of the literature in these fields. Rather, attention is focused on some of the more widely discussed cognitive biases.

Research on these biases has dealt with them individually and has not focused on the interaction between them. For this reason, and the fact that most of the research was conducted in laboratory settings using relatively simple judgement and decision tasks, statements about the effects of these biases on strategic decision-making must remain speculative.

In this paper, a general model of the strategic decision-making process will be synthesized from existing models. Cognitive biases

which may operate at each stage of the process will then be discussed. Finally, suggestions for future research on cognitive biases and for improving strategic decisions will be offered.

A DESCRIPTIVE MODEL OF THE STRATEGIC DECISION-MAKING PROCESS

The strategic management literature contains a number of strategic decision-making models. Since cognitive biases will be discussed in terms of their effects on various processes in strategy formulation, it is necessary to generate a model which represents the essential features of the most prominent models in the field. Hofer & Schendel (1978, p. 47) have developed a model which builds on the major analytical models of Andrews (1965, 1980), Ansoff (1965), and others. It includes the seven steps of strategy identification, environmental analysis, resource analysis, gap analysis (problem identification), generation of strategic alternatives, strategy evaluation, and strategic choice.

The fact that such processes actually occur in organizational decision-making has been confirmed by Mintzberg, Raisinghani, & Theoret (1977). Several of the stages dealt with in Hofer & Schendel's model are also covered by Mintzberg, et al. However, their model begins with the identification and diagnosis of a problem. This is followed by the search for alternatives and information related to the alternatives. This stage, in turn, is followed by the evaluation and selection of an alternative. This is an iterative model involving numerous feedback loops which allow decisional activity to cycle from later to earlier stages as the strategic problem definition is progressively refined.

It may be that the two models actually describe two different but equally legitimate types of strategic decision-making. Leotiades (1979:96-102) distinguished between strategy formulation which is part of a regular strategic planning cycle and strategy formulation which occurs in response to a particular problem (for example, a need to make a particular acquisition decision). The former begins with attempts to systematically collect information about the environment and the company's resources and is best described by Hofer & Schendel's model. The latter, which begins in response to a particular problem, is probably best described by Mintzberg's model.

Glueck (1976) proposed a model which included the stages of Appraisal (including an analysis of environmental opportunities and threats and company resources), Choice (generation and consideration of alternative strategies and choice among the alternatives), Implementation, and Evaluation. Finally, Mazzolini (1981) developed a model involving five major activities based on his own research and literature review. The five activities included Decision-need identification, Search for alternatives for action, Investigation of courses of action, Review and approval, and Implementation.

These models are built on earlier and more general decision-making models and are consistent with at least the first three stages of Simon's four-stage description of the management decision-making process (1960:40-44).

Decision making comprises four principal phases:
finding occasions for making a decision, finding possible courses of action, choosing among courses of action, and evaluating past choices.

The first phase of the decision-making process--searching the environment for conditions calling for decision--I shall call intelligence activity (borrowing the military meaning of intelligence). The second phase--inventing, developing, and analyzing possible courses of action--I shall call design activity. The third phase--selecting a particular course of action from those available--I shall call choice activity. The fourth phase, assessing past choices, I shall call review activity.

(Simon, 1960:40-41)

As a basis for the discussion of simplification mechanisms, a simplified four-stage model of the strategy formulation process has been developed based on earlier models. The four stages in the present model are strategic problem identification, strategic alternatives generation, evaluation and selection, and strategy implementation. There seems to be a good deal of agreement among researchers in this field (represented by those whose model we discussed) that at least these basic activities characterize strategic decision-making. However, this model is not intended to represent the full complexity of strategic decision-making.

Any model which is representative of the more popular models in the field would have to include the notion of feedback loops. Thus in this derived model, decisional activity may cycle from later to earlier stages as in the Mintzberg et al. model.

Problem identification includes attempts to identify the company's current implicit and explicit goals, objectives, and strategies as well as an assessment of the significant opportunities and threats in the environment, and the company's current resources. Assessment of opportunities and threats in the environment is a preliminary stage to gap analysis and often requires forecasting. Problem identification

also includes a recognition that a problem exists. This presumably takes the form of a gap between current or projected future performance and the explicit and implicit goals and objectives of management. The problem is then defined and clarified as causes of the gap are identified. Alternatives generation involves the identification of gap-closing options and their development to a state of refinement in which they can be evaluated against each other. The evaluation and selection stage involves the screening and evaluation of alternatives and the selection of the alternative which best solves the problem defined in the preceding stage. Finally, the implementation stage involves carrying out the strategy chosen. This model, along with the Mintzberg et al., Glueck, Hofer & Schendel, and Mazzolini models, is presented in Table 1.

Insert Table 1 about here

Obviously, all of these stages do not occur in all decisions in exactly this sequence. In fact, Witte (1972:179) found from examining 233 organizational decision processes that the activities related to the "stages" of gathering information, developing alternatives, evaluating alternatives, and making choices were carried out in approximately the same proportion to each other throughout the decision process. The phase theorem (i.e., the theorem that decision-making occurs in distinct phases or stages) postulates that activities associated with gathering information should predominate early in a decision process and that activities related to choice should dominate toward the end of the decision process. In contrast, Witte found that there was a

relatively high level of the activities associated with all four "stages" at the beginning of the decision process, a lull toward the middle of the process, and a very high level of activity toward the end of the process. Witte concluded "we believe that human beings cannot gather information without in some way simultaneously developing alternatives. They cannot avoid evaluating these alternatives immediately, and in doing this they are forced to a decision" (Witte, 1972:180).

Therefore, the four activities in the derived model may be seen simply as decisional processes which may or may not occur as stages. It may be that the structured process which often characterizes cyclical, formal strategic planning makes it more likely that the phases will be executed in this order while in strategy formulation guided by a particular problem, the activities are less likely to be executed sequentially. Normative work in strategic management suggests that problem identification should be based on detailed data which reveals gaps between performance and expectations, numerous strategic alternatives should be generated, and these should be thoroughly and objectively evaluated prior to choice (Hofer & Schendel, 1978). However, the complexity and uncertainty involved in strategic decision-making makes it unlikely that these normative prescriptions will be carried out.

The next section of the paper will discuss cognitive biases which may operate to reduce the apparent complexity and uncertainty in a decision situation and may simultaneously reduce the quality of the strategic decision.

COGNITIVE BIASES IN STRATEGIC DECISION-MAKING

Research in cognitive psychology and behavioral decision theory has identified numerous cognitive biases which may operate in strategic decision-making. These biases may not operate in all strategic decisions. However, their effect may help to explain failure in strategic decision-making.

In the next section, the biases identified in cognitive psychology and behavioral decision theory research have been classified according to strategic decision-making stage they seem most likely to affect.

Table 2 represents the stages of the strategy formulation process and the cognitive biases which may operate at the first three stages. The biases which operate at each stage will be discussed, as well as their probable effects on each stage.

Insert Table 2 about here

Some biases may operate to reduce decisional effectiveness at more than one of the stages.

Problem Identification

In the strategic decision-making models previously discussed, the major purpose of information gathering in the beginning of the process is to identify gaps between objectives and performance. However, such gaps may indicate either random fluctuations or changes requiring revisions in strategy. Decision-makers' expectations may determine how such gaps are interpreted or even whether information on such gaps will be accepted and used. The following have been identified as cognitive biases which may affect problem identification: prior hypothesis bias,

adjustment and anchoring, escalating commitment, the illusion of control, reasoning by analogy, salience, and misguided parsimony (see Table 2).

Prior Hypothesis Bids

Researchers have identified a number of biases which lead decision-makers to ignore or misinterpret information. Levine (1971), Pruitt (1961) and Wason (1960) showed that individuals who formed erroneous beliefs or hypotheses about the relationship between variables tended to make decisions on the basis of these beliefs despite abundant evidence over numerous trials that they were wrong. Further, they sought and used information consistent with these hypotheses rather than disconfirming information. Jervis (1976:143-181) has also provided numerous examples from international relations of peoples' tendency to accept information which conforms to existing expectations and beliefs. Under the effects of this bias, decision-makers who wish to believe that the company's current strategy is working may ignore information suggesting gaps between performance and expectation. Conversely, those who wish to believe it is failing may overweight information on such gaps.

Adjustment and Anchoring

Tversky & Kahneman (1974) discuss another bias which helps decision-makers deny gaps. They call this the anchoring bias. In strategic decision-making individuals must often make initial judgements about values of variables critical in particular decisions and revise these judgements as new data comes in. However, the adjustments are typically

insufficient. Final estimates of values are biased toward the initial values. Individuals involved in the ongoing process of strategy formulation may attend to negative information about the success of present strategy but they will tend not to make full use of it in revising their predictions of company performance under the present strategy. These revisions will be smaller than are justified by the new information.

Escalating Commitment

If these initial biases do not come into play, and the gap is recognized, some research suggests that decision-makers deny the significance of the gap and the need for the revision of strategy. That is, once they have recognized the gap, they may define the problem indicated by the gap as one which does not require a change in strategy. Staw (1976), Staw & Fox (1977), Staw & Ross (1978), and Fox & Staw (1979), in laboratory studies using undergraduates as subjects with simulated investment tasks, demonstrated escalating commitment to a chosen alternative despite negative feedback. They found that once an individual commits a significant amount of money to an investment project, he will tend to allocate more funds to the project if he receives feedback indicating that the project is failing than if he receives feedback indicating that the project is succeeding. The feeling of personal responsibility for the project apparently induces decision-makers to remain with their chosen project in spite of evidence that it is not paying off. Staw (1976) found a much weaker tendency to escalate commitment in subjects who had not made the

initial commitment but were dealing with a commitment made by an earlier decision-maker.

Staw & Fox (1979) showed that when decision-makers face a series of commitment decisions the escalating commitment effect is strongest in the early decisions and may not persist over time, which suggests that decision-makers may decrease their assessment of the probability of recovering losses with repeated failure. Thus, decision-makers' perceptions of the causes of failure seem to be important determinants of escalating commitment. Staw & Ross (1978) examined the effects of information indicating either exogenous or endogenous causes of failure and found that subjects invested more resources in a failing project when information pointed to an exogenous rather than an endogenous cause of the setback.

Finally, Fox & Staw (1979) found that escalating commitment was most likely to occur when decision-makers were vulnerable to job loss and when there was strong organizational resistance to the chosen course of action. An excellent review of these studies is found in Staw (1981). In these studies, it is obvious that the decision-makers perceive the discrepancy indicating a project's failure since they allocate more money to projects which appeared to be failing. However, they did not use this perceived discrepancy to alert them to the need to change their strategy. Rather, they seemed to interpret the negative feedback as a signal that they should commit more funds to save the project.

Other research indicates a possible hypothesis which decision-makers may adopt to explain a perceived discrepancy in such a way that it appears

to require no change in strategy. They may explain it as a result of chance factors rather than a result of a flaw in initial strategy. If they adopt this interpretation, they are likely to persist in the current course of action and escalate commitment to it. Staw & Ross (1979) found that subjects committed significantly more funds to a failing project when the reason for the failure was extrinsic (a chance event which could not have been foreseen) than when the reason was seen to be intrinsic.

Illusion of Control

It may be that decision-makers tend to overestimate the role of chance in their failures. This speculation is supported by the work of Langer and Roth (1975) which shows that decision-makers tend to attribute unsuccessful outcomes to chance while attributing successful outcomes to their own skill.

Lefcourt (1973), Langer (1975) and Larwood & Whittaker (1977) have conducted research which deals with decision-makers' judgements about the role of chance in the outcome of a decision and have defined a bias they call the illusion of control. Among other things, the illusion of control leads decision-makers to attribute desirable outcomes to internal factors (such as their own skill, intelligence, insight, etc.) but to blame such external factors as luck for failures. Decision-makers who note gaps between performance and expectation may tend to attribute these to chance if the gaps tend to reflect badly on the strategies they were responsible for designing earlier. This would cause them to resist changing strategies which have led to performance which is below expectation, strategies which are failing.

This tendency appears to be stronger in individuals who have experienced a string of successes and may therefore be especially strong in upper-level managers involved in strategy formulation. Having risen to the top in their organizations, they would tend to view themselves as successful decision makers and good managers. This would increase their tendency to attribute performance gaps to chance rather than the failure of their strategies. This bias also has a very strong effect on the evaluation of alternatives, as will be discussed in the section on alternatives evaluation.

Reasoning by Analogy

Decision-makers may admit that the gap does exist and that it indicates a need to change current strategy. If this happens, there is at least one mechanism which helps to determine the manner in which the problem will be defined. Steinbruner (1974) has called this mechanism reasoning by analogy. Reasoning by analogy involves the application of analogies and images from one problem situation to another. In strategic decision-making, it typically involves the application of analogies from simpler situations to complex strategic problems. This mechanism helps to reduce the aversive uncertainty perceived in the environment. Reasoning by analogy has been shown to be effective in generating creative solutions to problems (Gordon, 1961; Huff, 1980). However in strategic decisions, which involve a great deal of uncertainty and complexity, the use of simple analogies is likely to mislead the decision-maker into an overly simplistic view of the situation and an incorrect definition of the problem (Steinbruner, 1974, p. 115).

A major problem with arguments from analogy is that they are subject to a bias which Tversky & Kahneman (1974) call availability. According to Tversky & Kahneman, decision-makers assess the probability of an event by the ease with which instances or occurrences can be brought to mind. In any strategic decision situation there are potentially many analogous situations which may occur to decision-makers. Which analogy will decision-makers choose? It may be that they will choose the analogy which most readily comes to mind. Thus for example, the analogy chosen may be influenced by a decision-maker's functional specialization. Further, recent experiences may provide the most readily available analogies.

Saliency and Misguided Parsimony

If decision-makers do not use simple analogies to prematurely define the problem, but rather attempt to locate the real causes of the present problem, there are two possible biases which would make it less likely that they will be successful. These biases are discussed by Nisbett & Ross (1980:115-130) under the headings of saliency and misguided parsimony. According to these authors, highly visible or salient events or variables are most likely to be taken as causes, leading decision-makers into a post hoc, ergo propter hoc fallacy. The availability bias will cause these events to be most readily recalled. Citing research by Pryor and Kriss (1977), and Taylor and Fiske (1978), they argued that when decision-makers are given verbal information about events, characteristics of the message can determine which aspects of the events are seen as causal factors. When decision-makers observe events directly, accidental features of the

environment or their own position in it can be important in determining causal interpretations.

Regarding misguided parsimony, Nisbett & Ross suggest that decision-makers tend to believe that events have unitary causes. Because of this, they may fixate on the first plausible cause which occurs to them rather than seeking the multiple causes. Essentially, this is a satisficing approach to determining causality. This bias may have been identified first by John Stewart Mill in his discussion of "the prejudice that a phenomenon cannot have more than one cause" (1843/1974, p. 763).

Nisbett and Ross also cite a statement by Kanouse which summarizes the bias:

individuals may be primarily motivated to seek a single sufficient explanation for any event, rather than one that is the best of all possible explanations. That is, individuals may exert more cognitive effort in seeking an adequate explanation when none has yet come to mind than they do in seeking for further (and possibly better) explanations when an adequate one is already available. This bias may reflect a tendency to think of unitary events and actions as having unitary (rather than multiple) causes; individuals may assume, in effect, that no more than one sufficient explanation is likely to exist for a single phenomenon (Kanouse, 1972, p. 131).

Alternatives Generation

After the strategic problem has been defined, the next stage in the normative model involves the generation of strategic alternatives for dealing with the problem. As Alexander (1979) points out, alternatives may either be created or "found" through a search process. According to normative theory, a large scale search for alternatives should be undertaken at this point. This search should produce a

large number of alternatives which are then evaluated in order to select the best. However, Cyert & March (1963) and Lindblom (1959) indicate that the search for solutions to organizational problems does not meet these demands. Rather, very few alternatives are evaluated in any depth. Alexander (1979) found support for this assertion in his study of three top-level decisions. He concluded "[the three decisions'] most salient common feature is the rapid convergence of options, both in number and in range, before the formal evaluation process ever began" (1979: 396). In some cases cognitive biases may lead to a situation in which there is no search for alternatives.

Since the biases discussed in this section tend to eliminate the search for alternatives, they could be considered biases in the evaluations stage. However, since alternatives generation is part of most normative models, these biases are discussed in terms of their limiting effects on alternatives generation. These biases include: single outcome calculations, inferences of impossibility, denying value tradeoffs, and problem sets (see Table 2).

Single Outcome Calculation

Steinbruner (1974) elaborates on Cyert & March's notions of problemistic search and applies it to individuals as well as organizations with his discussion of single outcome calculations and related mechanisms identified in behavioral decision theory research. Rather than attempting to specify all relevant values and goals and all alternative courses of action as normative decision theory would suggest, decision-makers may focus on a single one of their goals or values and a single alternative course of action for achieving it.

Steinbruner argues that, contrary to normative models of organizational decision-making, uncertainty is not resolved in most instances by probabilistic calculations of the outcomes of alternatives. Rather, favorable outcomes are inferred for preferred alternatives while unfavorable outcomes are projected for non-preferred alternatives. Thus strategic decision-making involves a single-valued problem and a single-preferred alternative to which the decision-maker is committed from the outset of the decision process (1974, pp. 122-123). This is an extremely powerful simplification bias and is more likely to be used in highly complex and uncertain decision environments. Since this bias allows decision-makers to deny the unpleasant value trade-offs which are always present in a choice between alternatives it significantly reduces the stress associated with ill-structured decision-making.

Inferences of Impossibility

Steinbruner suggests that decision-makers deal with non-preferred alternatives through inferences of impossibility. In contrast to the suggestions from normative decision theory, Steinbruner points out that decision-makers may devote a good deal of effort to identifying the negative aspects of non-preferred alternatives and attempting to convince themselves that they are not possible to implement (1974:119). Since this forces premature rejection of alternatives, it may have disastrous consequences for decision-makers who use it. They will achieve a premature closure at the possible cost of rejecting the most feasible alternative.

Denying Value Tradeoffs

In addition, as both Steinbruner and Jervis point out, decision-makers over-value their favored alternative by denying value tradeoffs (Jervis, 1976:128-136). That is, they attempt to interpret facts in such a way that the favored alternative appears to serve several values simultaneously and appears to have no costs associated with it. They attempt to deny that there are tradeoffs and that there are some values which may not be served by their favored alternative.

Problem Sets

Problem set is another decisional bias which has been demonstrated in laboratory research in cognitive psychology (Anderson & Johnson, 1966; Newell & Simon, 1972). Basically, problem set is demonstrated when perceiving an object serving one function makes it more difficult to perceive it as capable of serving some other function or when repeated use of one problem-solving strategy makes it more difficult to develop other strategies (Anderson & Johnson, 1966, p. 851). Though this bias has only been experimentally demonstrated using relatively simple and discrete problem-solving tasks, a similar process may be operating when strategic decision-makers become strongly committed to a set of assumptions about the nature of their business and appropriate solutions to its problems. Mason & Mitroff (1981) have identified this as a persistent problem in corporate strategy formulation.

Evaluation and Selection

The evaluation of strategic alternatives is the phase of the decision-making process in which the limitations of Simon's "Administrative Man" are most evident. As Simon (1976) points out, the

evaluation and selection stage of administrative decision-making falls short of objective rationality in at least three ways.

- (1) Rationality requires a complete knowledge and anticipation of the consequences that will follow on each choice. In fact, knowledge of consequences is always fragmentary.
- (2) Since these consequences lie in the future, imagination must supply the lack of experienced feeling in attaching value to them. But values can be only imperfectly anticipated.
- (3) Rationality requires a choice among all possible alternative behaviors. In actual behavior, only a very few of all these possible alternatives ever come to mind.

(Simon, 1976:81)

The following discussion deals with biases which may affect the activities of evaluation and selection. These include: representativeness, the illusion of control, certainty effects, restriction of evaluation criteria, focus on negative criteria, and devaluation of partially described alternatives.

Representativeness

Tversky & Kahnemann (1974) have pointed out a number of individual cognitive biases which may distort judgements. The first they call the representativeness bias. This causes a decision-maker to overestimate the extent to which a situation or sample is representative of the situation or population to which he wishes to generalize. This bias may be responsible for the fact that decision-makers tend to view strategic decisions in terms of simple analogies. It also causes them to overestimate the extent to which the past is representative of the

present and the extent to which solutions offered for problems in the past will be of value in the present problem.

Part of this representativeness bias involves insensitivity to predictability. In making predictions of the effects of various courses of action decision-makers do not take into account the extent to which the evidence for the predictions is reliable, or the extent to which the criterion is related to the cues which they use to predict it (Tversky & Kahnemann, 1974:1125).

Decision-makers are also insensitive to sample size in making predictions. Though a large number of observations are necessary in order to make generalizations to a population, strategic decision-makers are often unable to collect data on a large number of past strategies and are quite willing to generalize from a small data base. Further, they have too much confidence in their predictions from small amounts of data, feeling that these data are representative of the population as a whole. Tversky & Kahnemann call this a belief in "law of small numbers" (Tversky & Kahnemann, 1974:1125). Nisbett & Ross (1980:55-59) have suggested that decision-makers are especially susceptible to the law of small numbers when considering one or a few very vividly described cases. A single vivid description of a new venture's failure in a particular industry may influence the decision about entering the industry more than volumes of statistical data indicating high success rates in the industry.

Finally, in decision-making tasks which involve high levels of uncertainty, decision-makers should be aware of this uncertainty and of their inability to accurately forecast events in the decision environment.

Their lack of ability to forecast outcomes should make them wary of becoming overcommitted to particular courses of action and should encourage them to develop contingency plans. However, decision-makers tend to be overly confident in their ability to predict outcomes (Tversky & Kahnemann, 1974:1129) which perpetuates the illusion that they do not need to develop formal contingency plans. Einhorn & Hogarth (1978) call this overconfidence the illusion of validity.

Illusion of Control

Langer's illusion of control may also affect decision-makers' perceptions of the need for contingency plans. They will overestimate the extent to which the outcomes of a strategy are under their personal control and may assume that through additional effort they can make their strategy succeed should problems arise. Langer (1975) conducted six studies which showed that subjects making a variety of decisions expressed an expectancy of personal success inappropriately higher than the objective probability would warrant. They tended to overestimate the impact of their skill on the outcome or to overestimate their skill. Larwood & Whittaker (1977) comparing management students' and executives' performance on a marketing problem found further evidence for the illusion of control. The management students tended to overestimate their abilities and the performance of the hypothetical firm of which they were sales managers. Managers also overestimated performance in this exercise but showed less tendency to do this if they had experienced unsatisfactory results in earlier planning experiences.

Certainty Effects

Another decisional bias which may be related to the desire for control over the environment is the certainty effect (Kahnemann & Tversky, 1979; Tversky & Kahnemann, 1981). Kahnemann & Tversky summarize a number of studies which show that people exhibit decisional biases when they evaluate outcomes which are considered certain against to outcomes which are merely probable. When given a choice between a certain outcome with a given expected value and a probabilistic outcome with a slightly higher expected value, decision-makers will often choose the certain outcome. This result alone might simply be evidence of risk aversion. However, when given a choice between a certain loss of a small amount and the probability of a higher expected loss, they will tend to choose the probabilistic loss. As Kahnemann & Tversky point out (1979:269), these results are incompatible with the concept of risk aversion which holds that certainty is always desirable. Rather, it appears that certainty increases the aversiveness of losses as well as the desirability of gains.

These results may be explained in terms of the desire for control over the environment if we assume that control over the environment involves the ability to avoid negative outcomes. People will choose certainty when faced with a potential gain because the certain outcome minimizes the possibility of a zero gain which is aversive. On the other hand, when people are faced with a choice of alternatives, one involving a potential loss and one involving a certain loss, they will choose the alternative which, though more risky, at least gives them a chance of avoiding the loss. In other words, they are risk averse

with respect to gains and risk seeking with respect to losses. It is often possible to formulate a problem as either a choice between losses or a choice between gains. Thus, these authors have shown that different formulation of a problem, different reference points against which outcomes are evaluated, may result in different choices.

Criteria Restriction and Negative Forces

Wright (1974) has conducted laboratory research which reveals two additional biases which come into play under time pressure or stress. Business undergraduates made a choice among a number of car models based on a number of cues with time pressure and distractions varied. The results support the claim that decision-makers restrict the number of cues they use in evaluating the quality of various alternatives. Further, they tend to pay most attention to and accentuate negative cues, those which provide evidence which will lead to the rejection of alternatives. In strategic decision-making, this could lead to the rejection of alternatives which have important positive features but which have perhaps one negative feature (Wright, 1974:588-559).

Devaluation of Partially Described Alternatives

Finally, Yates, Jagacinski, & Faber (1978) demonstrated a preference for completeness of information which biases decision-makers' evaluation of alternatives. Among a group of strategic alternatives, it is likely that the probable consequences of some of the alternatives will be more completely described than others. Yates, et al. found that decision makers tend to devalue the alternative that is partially described. Since partially described alternatives involve

uncertainty for decision-makers, they tend to negatively evaluate these against alternatives which are better described and therefore, resolve more uncertainties.

CONJECTURES

The biases discussed in the preceding sections form the basis for some conjectures about probable errors in the strategic decision-making process. These conjectures, which are numbered below, suggest the specific ways in which strategic decision-making may depart from normative prescriptions.

Strategic Problem Identification:

1) Decision-makers will tend to perceive fewer gaps than their data indicate due to the prior hypothesis and adjustment and anchoring biases (Levine, 1971; Pruitt, 1961; Wason, 1960; Jervis, 1976; Tversky & Kahnemann, 1974).

2) Decision-makers will minimize the significance of gaps and not use the gaps as a basis for strategy revision due to the escalating commitment (Staw, 1976 & 1981; Staw & Fox, 1977; Staw & Ross, 1978; Fox & Staw, 1979).

3) Decision-makers will tend to attribute unfavorable gaps to chance due to the illusion of control (Langer, 1975; Langer & Roth, 1974; Lefcourt, 1973; Larwood & Whittaker, 1977).

4) If the significance of a gap is recognized, decision-makers will tend to define the problem causing the gap through an analogy to a simpler situation. Recent experience is most likely to provide the analogy (Steinbruner, 1974; Tversky & Kahnemann, 1974).

5) Because of the effects of salience and misguided parsimony, decision-makers who do seek the causes of a strategic problem will tend to identify a single, highly visible cause (Nisbett & Ross, 1980; Pryor & Kriss, 1977; Taylor & Fiske, 1978; Kanouse, 1972; Wilson & Nisbett, 1978).

Strategic Alternatives Generation

6) In searching for a solution to a strategic problem, decision-makers will tend to generate a single alternative rather than several alternatives due to the effects of the bias toward single outcome calculation (Steinbruner, 1974).

7) Decision-makers will tend to deal with non-preferred alternatives by denying that they serve any values better than the preferred alternative and by overestimating the difficulty in implementing them. This is due to the biases toward denying value tradeoffs and inferences of impossibility (Steinbruner, 1974).

8) Because of unchallenged assumptions and problem sets, decision-makers who attempt to generate more than one alternative will tend to generate very few (Anderson & Johnson, 1966; Newell & Simon, 1972; Mason & Mitroff, 1981).

Evaluation and Selection

9) Decision-makers will tend to over-estimate the accuracy of their predictions of the consequences of alternatives because of the representativeness bias (Tversky & Kahnemann, 1974; Nisbett & Ross, 1980).

10) Decision-makers will tend to overestimate the importance of their own actions in assuming the success of strategic alternatives due to the illusion of control (Langer, 1975; Langer & Roth, 1974; Lefcourt, 1973; Larwood & Whittaker, 1977).

11) Because of certainty effects, decision-makers will tend to choose more certain outcomes when attempting to maximize gain and riskier alternatives when attempting to minimize loss (Kahnemann & Tversky, 1979).

12) Decision-makers will exhibit a bias toward restricting the number of evaluation criteria used and focusing on negative evaluation criteria (Wright, 1974).

13) Decision-makers will exhibit a preference for alternatives described in greater detail, even though partially described alternatives may score higher on the decision-maker's evaluation criteria (Yates et al., 1978).

Though most of these biases were identified in research on individual decision-makers, it is assumed that they will also operate in group and organizational decisions. This assumption is by no means universally held. Indeed, Nisbett & Ross (1980, pp. 249-254) have suggested that collective decision-making may be a way of reducing the effects of some cognitive biases. For this reason, among others, the preceding statements about the effects of the biases are stated in the form of conjectures.

However, there is some support for the assumption that these biases may actually be aggravated by group and organizational processes which serve to restrict information reaching decision-makers.

Those responsible for making the top-level strategic decisions may not be those who collect the information required for the decision. Organizational structures and processes distort the information reaching upper-level decision-makers. Crozier (1963:51) summed up the problem in the following way, "Those who have the necessary information do not have the power to decide, and those who have the power to decide cannot get the necessary information." Information passing from "experts" to top level decision-makers is subject to hierarchical distortion in both quantity and quality. This much is well-known and intuitively plausible. However, there is less discussion in the literature about the direction this bias could be expected to take.

First, since experts may act as mindguards, protecting decision-makers from potentially threatening information (Janis, 1972; Janis & Mann, 1977) information threatening to top-level decision-makers or information which reflected negatively on their past decisions may be distorted or omitted. Second, information presented by experts is often presented as part of a proposed solution to a problem or strategy. In this case, information might be distorted in favor of the proposed solution.

Carter (1971) documented the effects of the use of experts in strategy formulation when he attempted to apply Cyert & March's (1963) organizational decision-making framework to top level corporate decisions. He examined six top level strategic decisions and found that these decisions differed from the operational decisions described by Cyert and March in two ways. First, they tended to involve more levels of the organization and second, they involved people of more varying

backgrounds. For these reasons, proposals for solutions to top level problems were often presented by coalitions to top-level corporate decision-makers and supported by staff experts' analysis.

Carter suggests that bias will be added to the appraisal of proposed problem solution by technical or functional staff experts to the extent that:

- a) The success of the project depends on the top-level decision-makers' acceptance of the staff's representation of the relevant issues in the problem.
- b) There is uncertainty in data relevant to the problem.
- c) The top-level decision-makers possess much less knowledge about the problem than do the staff people.
- d) The top-level decision-makers perceive a great deal of uncertainty in the problem and a need for the expertise of the staff.

All four of these conditions are likely to hold in strategic decisions.

Further, Carter suggests that the amount of bias added to data provided for the evaluation of a given decision and the amount and type of data provided will depend on the following factors:

- a) Which data are perceived as desired by higher levels of management.
- b) The amount of data necessary to gain a favorable decision.
- c) The ease of developing data.
- d) The extent to which the staff people or their departments will be held accountable for the consequences of decisions which were based on the data.

The actions of experts or mindguards may reinforce biases through the restriction of information necessary to adequately formulate the problem, to generate feasible alternatives, and to evaluate those alternatives.

CONCLUSIONS AND IMPLICATIONS

In this paper, research on selected cognitive biases has been summarized and conjectures regarding the possible effects of these biases on strategic decision-making have been developed. In this final section of the paper, some implications for research and practice in strategic management will be drawn.

Research Implications

Future research should focus on documenting the presence of these biases in strategic decision-making and assessing their effects.

There are those who argue that we cannot draw inferences about executives' performance at real world decision-making from students and laboratory decision-making tasks (Ungson, Braunstein, & Hall, 1981). They hold that decision-making abilities required to rise to a position of strategic responsibility and extensive experience with a variety of complex decisions produce generally high-quality decision-making performance in executives which is relatively free from bias. In support of this claim, there is some evidence to show that some groups of professional decision-makers such as weather forecasters make good use of statistical information in forecasting do not exhibit a high degree of decisional bias (Hogarth, 1975, pp. 277-278). However, these decision-makers were able to learn from their mistakes and improve

their performance over time because they are required to make numerous predictions based on clearly identified data and receive continuous relatively unambiguous feedback soon after they make their predictions (Hogarth, 1975, p. 278; Nisbett & Koss, 1980, p. 265). It could be argued that none of these conditions hold in strategic decision-making; that such decisions occur infrequently and involve ambiguous data and possibly a disagreement about which data are relevant. Further, the feedback about the success of the strategy is often ambiguous since there may be multiple evaluation criteria applied to the company's performance, some of which may yield contradictory results and may not be available for years after the implementation.

These considerations make the existence of these cognitive biases in organizational decision-making more plausible. Further support for their existence and effects comes from the fact that several of these biases have been found to operate in private and public sector decision-makers (Steinbruner, 1974; Staw, 1981; Larwood & Whittaker, 1977; Einhorn & Hogarth, 1981).

At this point, it is tempting to suggest that researchers attempt to identify possible examples of each bias in the literature describing well-known business decision-making failures. Indeed, books such as Hartley's Marketing Mistakes (1976) and Smith's Corporations in Crisis (1963) offer numerous potential examples of some of these biases. However, there is a consideration which suggests that such examples may be of little value. Since most of the biases have been identified in laboratory settings very different from businesses, their existence in strategic decision-making is still to some extent a matter of

conjecture. This being the case, effort should be made to document the existence of these biases in managerial decision-making through more detailed data including interviews with managers or records of meetings. Records of business decisions such as those found in the above-mentioned books merely demonstrate behavior on the part of the managers which appears consistent with the biases and which may (or may not be) the result of these biases. These reports are insufficient, by themselves, to demonstrate the biases' existence.

Future research on these potential biases should take two directions. First, since many have been examined exclusively in laboratory research, an attempt should be made to document their existence and effects in field settings. Researchers may be able to identify the biases in executives' detailed descriptions of problem solving processes such as those collected by Mintzberg, et al. (1976). Field observation of decision processes may also provide insights into the effects of these biases.

A second approach would involve further laboratory research investigating these biases in laboratory tasks more representative of the ill-structured problems encountered in strategic decision-making. Such concurrent laboratory and field research has been advocated in the most fruitful approach to research for several questions in strategic management (Schwenk, 1982).

Implications for Practice

It is necessary to establish that these biases do in fact exist in strategic decision-making before making strong recommendations to managers regarding techniques for avoiding them. However, practitioners

who suspect that any of these biases may be adversely affecting their decisions have a wide variety of techniques available for reducing their effects. Schwenk and Thomas (1982) have summarized research on a number of techniques for reducing cognitive biases, three examples of which will be discussed here. For improving the collection and use of information in problem identification a technique called Strategic Assumption Analysis has been recommended (Emshoff & Finnel, 1978; Emshoff & Mitroff, 1978; Mason, 1969; Mason & Mitroff, 1981; Mitroff & Emshoff, 1979; Mitroff, Emshoff, & Kilmann, 1979). This technique involves the structured presentation and analysis of divergent assumptions about data relevant to a problem.

There are a variety of creativity stimulants which have been proven useful in stimulating the generation of alternative solutions (Gordon, 1961; Huff, 1980; Stanford Research Institute, 1969; Warfield, 1975). The focus of such techniques is typically the suspension of critical processes and the encouragement of unusual associations. Finally, for improving the evaluation of alternatives, the use of the devil's advocate technique has been proposed (Cosier, 1978, 1980; Cosier & Aplin, 1980; Cosier & Rose, 1977; Cosier, Ruble, & Aplin, 1978; Herbert & Estes, 1977; Janis, 1972; Jervis, 1976; Schwenk & Cosier, 1980). This technique involves the development of critiques questioning the wisdom of a preferred alternative and the challenging of data and analysis supporting this alternative.

Schwenk and Thomas point out that decision-makers must be aware of the nature of the strategic decision-making process in order to make effective use of these aids. Since the process is iterative and

cyclical, techniques designed to improve performance at one stage may have impacts at other stages as well. For example, decision-makers using the devil's advocate approach to improve the evaluation of alternatives may find that its use leads to the generation of new alternatives and identification of new strategic problems. Of course, this can greatly increase the time and effort involved in reaching a decision. Thus, the use of any of these decision aids may reduce biases at all stages of the strategic decision-making process as well as increasing decision time. Practitioners should be aware of this trade-off relationship in making use of them.

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TABLE 1

MODELS OF THE STRATEGIC DECISION-MAKING PROCESS

Hofer & Schendel (1978)	Mintzberg et al. (1976)	Glueck (1976)	Mazzolini (1981)	Derived Model
1.) Strategy Identification	<u>Identification Phase</u> 1.) Decision recognition	Appraisal (determine environmental threats & opportunities; company's comparative advantage)	1.) Decision- Need Identification	Strategic Problem Identification
2.) Environmental Analysis	2.) Diagnosis			
3.) Resource Analysis				
4.) Gap Analysis				
5.) Strategic Alternatives	<u>Development Phase</u> 3.) Search 4.) Design	Choice: Phase I (consider strategic alternatives)	2.) Search for Alternatives for Action	Strategic Alternatives Generation
6.) Strategy Evaluation	<u>Selection Phase</u> 5.) Screen 6.) Evaluation 7.) Authorization	Choice: Phase II (choose the strategy)	3.) Investigation of Courses of Action 4.) Review and Approval	Evaluation and Selection
7.) Strategy Choice			5.) Implementation	Implementation
				Evaluation

TABLE 2

BIASES IN EACH STAGE OF STRATEGIC DECISION-MAKING ACTIVITIES

Strategic Problem Bias	Stage I		Stage II		Stage III	
	Strategic Problem Identification Effect	Bias	Strategic Alternatives Generation Effect	Bias	Evaluation and Selection Bias	Effect
1) Prior Hypothesis Bias	1) Evidence ignored gaps not perceived.	1) Single Outcome Calculation	1) Restricts alternatives.	1) Representativeness a) insensitivity b) insensitivity to sample size c) illusion of validity	1) Inaccurate prediction of consequences.	
2) Adjustment and Anchoring	2) Evidence underutilized, gaps not perceived.	2) Inferences of Impossibility	2) Premature rejection of alternatives.	2) Illusion of control	2) Inaccurate assessment of risks of alternatives.	
3) Escalating Commitment a) Expert Bias b) Mindguarding	3) Significance of gap minimized, strategy not revised.	3) Denying Value Tradeoffs	3) Non-objective use of evaluation criteria.	3) Certainty effect.	3) Framing of alternatives affects preference.	
4) Illusion of Control a) Prior Success b) Competition	4) Causes of gap not identified, strategy not revised.	4) Problem Sets	4) Alternatives restricted.	4) Restriction of evaluation criteria.	4) Reduces number of evaluation criteria used.	
5) Reasoning by Analogy a) Availability b) Recency	5) Problem misdefined (oversimplified), inappropriate strategy revision.	5) Focus on negative evaluation criteria.	5) Focus on negative evaluation criteria.	5) Choice of "safe" but perhaps weak alternatives.		
6) Salience	6) Cause not correctly identified	6) Devaluation of partially described alternative.	6) Devaluation of partially described alternative.	6) Rejection of strong but poorly presented alternatives.		
7) Misguided Parsimony	7) Single cause of problem identified, inappropriate strategy revision.					

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