

## Chapter 6

### A Recognition-Primed Decision (RPD) Model of Rapid Decision Making\*

Gary A. Klein  
Klein Associates Inc.  
Fairborn, OH

#### INTRODUCTION

Traditional models of decision making do not take into account many critical aspects of operational settings, as described in Chapter 1. Decision makers in operational settings are usually very experienced, in contrast to the naive subjects used in laboratory studies. In this chapter I present a recognition model of decision making that shows how people can use experience to avoid some of the limitations of analytical strategies. This model explains how people can make decisions without having to compare options. It fuses two processes—situation assessment and mental simulation—and asserts that people use situation assessment to generate a plausible course of action and use mental simulation to evaluate that course of action. I believe this recognition model describes how decision making is usually carried out in real-world settings. This conclusion is based on a series of studies in which it was found that recognition decision making is much more common than analytical decision making. Finally, I contrast the strengths and weaknesses of recognition and analytical decision strategies.

\* Funding for the research cited in this chapter was received from the U.S. Army Research Institute for the Behavioral and Social Sciences, Contracts MDA903-86-C-0170 and MDA903-85-C-0327. However, the views, opinions, and/or findings contained in this chapter are those of the author and should not be construed as an official Department of the Army position, policy, or decision. I wish to thank Caroline Zaambok, Michael Doherty, and Reid Hastie for their helpful suggestions for improving this chapter.

#### RECOGNITIONAL DECISION MAKING

For the past several years, my colleagues and I have been studying command-and-control performance and have generated a *Recognition-Primed Decision* (RPD) model of naturalistic decision making. We began (Klein, Calderwood, & Clinton-Cirocco, 1986) by observing and obtaining protocols from urban fireground commanders (FGCs) about emergency events that they had recently handled. Some examples of the types of decisions these commanders had to make include whether to initiate search and rescue, whether to initiate an offensive attack or concentrate on defensive precautions, and where to allocate resources.

The fireground commanders' accounts of their decision making do not fit into a decision-tree framework. The fireground commanders argued that they were not "making choices," "considering alternatives," or "assessing probabilities." They saw themselves as acting and reacting on the basis of prior experience; they were generating, monitoring, and modifying plans to meet the needs of the situations. We found no evidence for extensive option generation. Rarely did the fireground commanders contrast even two options. We could see no way in which the concept of optimal choice might be applied. Moreover, it appeared that a search for an optimal choice could stall the fireground commanders long enough to lose control of the operation altogether. The fireground commanders were more interested in finding actions that were workable, timely, and cost effective.

It is possible that the fireground commanders were contrasting alternatives, but at an unconscious level, or possibly the fireground commanders were unreliable in their reports. We have no way of demonstrating that the fireground commanders weren't contrasting alternative options, but the burden of proof is not on us. There is no way to prove that something isn't happening. The burden of proof is on those who wish to claim that somehow, at some level, option comparison was going on anyway. The reasons we believe that the fireground commanders were rarely contrasting options are: it seems unlikely that people can apply analytical strategies in less than a minute (see, for example, Zakay & Wooler, 1984); each FGC argued forcefully that he or she wasn't contrasting options; and they described an alternative strategy that seemed to make more sense.

Clearly, the fireground commanders were encountering choice points during each incident. During the interviews the fireground commanders could describe alternative courses of action that were possible, but insisted that, during the incident, they didn't think about alternatives or deliberate about the advantages and disadvantages of

the different options. Instead, the fireground commanders relied on their abilities to recognize and appropriately classify a situation, similar to the findings of Chase and Simon (1973) for chess players. Once the fireground commanders knew it was "that" type of case, they usually also knew the typical way of reacting to it. They would use available time to evaluate an option's feasibility before implementing it. They would imagine how the option was going to be implemented, to discover if anything important might go wrong. If problems were foreseen, then the option might be modified or rejected altogether, and another highly typical reaction explored.

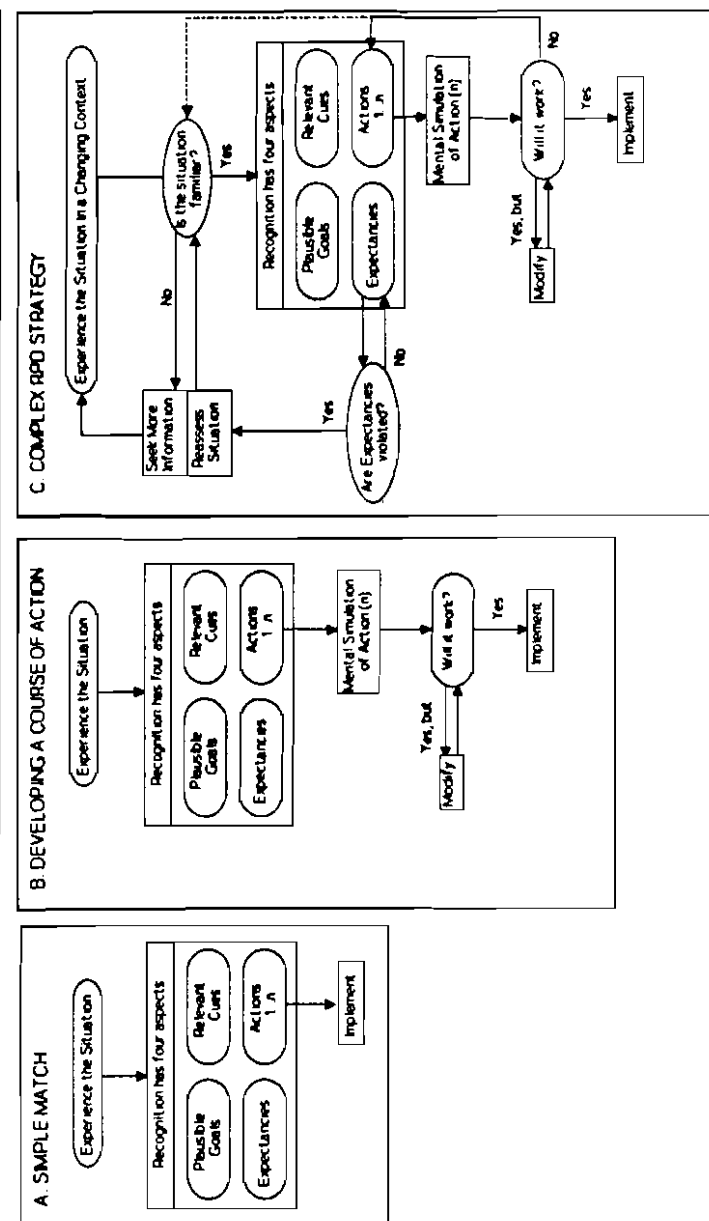
We have described this strategy as a Recognition-Primed Decision (RPD) model (e.g., Klein, 1989a; Klein et al., 1986) of how experienced people can make rapid decisions. For this task environment, a recognition strategy appears to be highly efficient. The proficient fireground commanders we studied used their experience to generate a workable option as the first to consider. If they had tried to generate a large set of options, and to systematically evaluate these, it is likely that the fires would have gotten out of control before they could make any decisions.

The RPD model is presented in Figure 6.1. The simplest case is one in which the situation is recognized and the obvious reaction is implemented. A somewhat more complex case is one in which the decision maker performs some conscious evaluation of the reaction, typically using imagery to uncover problems prior to carrying it out. The most complex case is one in which the evaluation reveals flaws requiring modification, or the option is judged inadequate and rejected in favor of the next most typical reaction. Because of the importance of such evaluations, we assert that the decision is primed by the way the situation is recognized and not completely determined by that recognition.

Orasanu and Connolly, in Chapter 1, presented one of the firefighting incidents we studied—a reported fire in the basement of a four-story apartment building. Upon arrival, the FGC assessed the problem as a vertical shaft fire in a laundry chute. Since there had been no sign of smoke from the outside, he judged that the fire was just getting underway. This situation assessment included plausible goals (he believed there was time to put it out before it got out of control), critical cues (he needed to find out how far the fire had spread up the shaft), expectancies (he believed that the firefighters could get above the fire in time to put it out), and an obvious course of action (send teams with hoses up to the first and second floors).

Unfortunately, the fire had just spread beyond the second floor, and the crews reported back that they were too late. The FGC then walked back to the front of the building, where he saw smoke beginning to

Figure 6.1. Recognition-Primed Decision Model



escape from under the eaves, just under the roof. He imagined how the fire had just reached the fourth floor, pushing smoke down the hall. His situation assessment shifted—this was no longer a simple vertical shaft fire. The whole building was being engulfed. The goals were now obvious—search and rescue. The critical cues included the front stairway as a prime evacuation route. The side stairway, previously the focus of activity, was now irrelevant. The expectancies now centered around the FGC's belief that spread of the fire might be too fast to ensure complete evacuation of the building. The course of action was straightforward—cease attempts to extinguish the fire, begin search and rescue operations, and call in a second alarm.

There seem to be four important aspects of situation assessment (a) understanding the types of goals that can be reasonably accomplished in the situation, (b) increasing the salience of cues that are important within the context of the situation, (c) forming expectations which can serve as a check on the accuracy of the situation assessment (i.e., if the expectancies are violated, it suggests that the situation has been misunderstood), and (d) identifying the typical actions to take.<sup>1</sup>

In the case of the laundry chute fire, the goals were partially determined by doctrine (e.g., when to conduct search and rescue) and partially by the nuances of the situation—the goal of trying to extinguish the fire did not prevent the FGC from later ordering his crews to begin search and rescue. But the FGC did have to make sure that the attack on the fire didn't take too long or become too exhausting. In addition, during the initial attempt to extinguish the fire, the crew members were all clustered around the rear stairway where the fire was spreading, so they were well positioned to shift into a search and rescue mode when necessary. The FGC had to be sensitive to a variety of goals at the same time. A simplistic decision analysis that separated different goals might have been misleading, whereas a more sophisticated decision analysis would be difficult to carry out under these time pressures.

Continuing with the discussion of Figure 6.1, if there is enough time the decision maker will evaluate the dominant response option by

<sup>1</sup> It should be noted that we had anticipated that the fireground commanders would rely on retrieval of analogue cases. But despite our probes, the fireground commanders rarely were able to identify analogues they had used. Each incident had so many unique aspects that there was no incident where an analogue matched the entire episode. Analogues were cited as occasionally helpful for aspects of an incident. For the most part, the vast experience of the fireground commanders had enabled them to merge the individual cases and to be able to use a judgment of familiarity or prototypicality that would not be present with the retrieval of an individual analogue case.

imagining it, conducting a mental simulation to see if it will work. If it does, it will be implemented. If it runs into problems, it will be modified. If it can't be fixed, then it will be rejected, and another likely option will be considered. If there is not adequate time, the decision maker is prepared to implement the course of action that experience has generated as the most likely to be successful. Note that this evaluation is context-specific. The evaluation is directed at how a course of action will fare in an actual situation, not at rating the advantages/disadvantages for various dimensions.

A recognitional decision process can also be seen in the example of the Libyan airliner incident, presented in Chapter 2. The Israeli general did not try to generate a set of options or evaluate the options in terms of utilities, probabilities, standard evaluation dimensions, or base rates. Instead, the focus was on forming a situation assessment. The general appeared to be willing to treat the airplane as being off course during a commercial flight, but the deviant behavior of pretending to land and then fleeing to the west challenged this interpretation. The general used mental simulation to try to imagine how a legitimate pilot would have taken such actions in good faith and could not come up with a plausible scenario. Using the failure to find a plausible story as evidence, the general concluded that the pilot was not on a legitimate flight. From this situation assessment, the goal was obvious—prevent the airplane from escaping. The course of action was also obvious—force the plane down. Even in retrospect, knowing the consequences, it is hard to specify a superior decision strategy.

Mental simulation is also used in evaluating a course of action. One incident from our study of forest fires involved a decision to use a key road to transfer crews to and from the fire line. A staff member noted that a slight shift in wind direction could quickly bring the fire right across the road. The other staff members saw this was a real danger, so they decided to close that road and transfer operations to another, less convenient road. This decision did not involve any comparison of the strengths and weaknesses of using each of the roads. Instead, there was a sequential evaluation in which the prime option was identified, mental simulation was carried out, the prime option was rejected, and was replaced by a second option.

There are a number of features that distinguish the RPD model from classical decision models.

- The RPD model focuses on situation assessment rather than judging one option to be superior to others.
- The RPD model describes how people bring their experience to bear on a decision.

- The RPD model asserts that experienced decision makers can identify a reasonably good option as the first one they consider, rather than treating option generation as a semi-random process, requiring the decision maker to generate many options.
- The RPD model relies on satisficing (Simon, 1955) rather than optimizing—finding the first option that works, not necessarily the best option.
- The RPD model focuses on serial evaluation of options and thereby avoids the requirement for concurrent deliberation between options that marks the focus on the “moment of choice.”
- The RPD model asserts that experienced decision makers evaluate an option by conducting mental simulations of a course of action to see if it will work, rather than having to contrast strengths and weaknesses of different options.
- Finally, a recognitional strategy enables the decision maker to be continually prepared to initiate action by committing to the option being evaluated. Formal strategies require the decision maker to wait until the analyses are completed before finding out which option was rated the highest.

We have studied the use of recognitional decision making in a variety of tasks and domains, including fireground command, wildland fire incident command teams, U.S. Army Armored Division personnel (see Klein, 1989a, for a description of these), battle planning (Thorsen, Galushka, Klein, Young, & Brezovic, 1990), critical care nursing (Crandall & Calderwood, 1989), and chess tournament play (Calderwood, Klein, & Crandall, 1988).

These studies reflect a broad range of task constraints. The studies cover decisions made over several days as well as those made in less than 1 minute; decisions involving primarily a single individual and also teams of 5–9 people; decision makers with more than 20 years of command experience and newly promoted officers. Both qualitative and quantitative methods of investigation were employed in these studies, including semistructured interviews, on-site observations, and protocol analysis. The tasks performed ranged in the level of realism from the observations and interviews during an actual wildland fire requiring coordination of 4,000 crew members, to military exercises and computer simulations, to classroom planning exercises.

The results have provided support for the validity and utility of the model as it applies to individual decision makers. Table 6.1 reports the results of five studies that attempted to tabulate the incidence of RPD strategies vs. concurrent deliberation of options, for nonroutine decisions. We can see that the recognitional strategies were more frequent,

Table 6.1. Frequency of RPD Strategies Across Domains\*

Study	# Decision Points	Proportion of Decision Points Handled Using RPD Strategies
1. Urban Fireground Commanders (FGC-1)	156	80%
2. Expert Fireground Commanders (FGC-2)	48	58%
Navice Fireground Commanders (FGC-2)	33	46%
3. Wildfire	110	51%
4. Tank Platoon Leaders	55	42%
5. Design Engineers	51	60%

\*These data were adapted from *Advances in Man-Machine Systems Research*, 5, 1989. Copyright © 1989 by JAI Press. Reprinted by permission.

even for these very difficult cases. This is true under circumstances where the coding system involved a liberal criterion for categorizing a decision as “analytical” (i.e., relying on concurrent generation and evaluation of options). If there was any indication that two or more options were contrasted, even if the decision maker abandoned the effort or used it for only a limited part of the incident, it was classified as analytic. Our coding methods were shown to be highly reliable; Taynor, Crandall, and Wiggins (1987) found intercoder agreement to be between 87%–94%.

For the first study in Table 6.1, Urban FGC-1, we looked at all the decision points in nonroutine incidents, including trivial decisions. These decision makers averaged 23 years of experience and showed 80% recognitional decisions. The second study (FGC-2) only examined the nonroutine command decision points of nonroutine incidents. The proportion of recognitional decisions was 58% for the experts and 46% for the novices. In Study 3, the functional decisions about fighting the forest fires showed 56% recognitional decisions, whereas the organizational decisions (whether to relieve someone of command) required more comparisons of different options. There the rate of recognitional decision making was only 39%, yielding an average of 51%. The incident commanders in this study averaged 24 years of experience. In Study 4, the tank platoon leaders were cadets in their first 10 days of training, and the proportion of recognitional decisions was below 50%. For Study 5, we found that experienced design engineers who were *not* under time pressure still relied heavily on recognitional decision making for difficult cases (60%). These data suggest that recognitional strategies are the most frequent, even for nonroutine decisions. Analytical strategies are more frequently used by decision makers with less experience.

## STRENGTHS AND WEAKNESSES OF RECOGNITIONAL DECISION MODELS

I am *not* proposing that there is a best decision strategy. Both recognitional and analytical approaches have their functions. Sometimes, both are applied within the same decision task. My claim is that recognitional strategies can be adaptive, can allow experienced decision makers to respond effectively, and should be acknowledged as a potential source of strength.

I have noted some limitations of analytical decision strategies. If they are used in the wrong conditions, they can leave the decision maker unable to react quickly and effectively. Conversely, the danger of misapplying recognitional decision strategies is that personnel will lack the experience needed to identify effective courses of action as the first ones considered, or will lack the ability to mentally simulate the option to find the pitfalls, or will fail to optimize when necessary. For example, the task of generating an operational order of battle requires speed and satisficing, and can be compromised by excessive use of analytical decision strategies. However, the task of anticipating the enemy's course of action requires optimizing to identify the worst thing that the enemy might do, and here recognitional processes can lead to tunnel vision and self-deception.

Studies by other researchers suggest that there are a number of factors affecting the use of analytical vs. recognitional decision "strategies" (e.g., Hammond, Hamm, Grassia, & Pearson, 1987). Our research has shown that recognitional decision making is more likely when the decision maker is experienced, when time pressure is greater, and when conditions are less stable. In contrast, analytical decision making seems to prevail when the available data are abstract and alphanumeric rather than perceptual, when the problems are very combinatorial, when there is a dispute between different constituencies, and when there is a strong requirement to justify the course of action chosen.

We do not believe that an RPD process approach should be taught, since the RPD model is already a description of what people do. Instead, we would argue that training is needed in recognizing situations, in communicating situation assessment, and in acquiring the experience to conduct mental simulations of options.

This chapter has tried to show that when people use recognitional rather than analytical strategies, it is not a sign of incompetence or irrationality. Recognitional strategies have strengths and value in naturalistic settings.

## KEY POINTS

- Prescriptive decision strategies are not designed for ill-defined tasks or for time-pressured situations.
- A Recognition-Primed Decision (RPD) model describes how decision makers use their experience to avoid painstaking deliberations.
- Experience enables a person to understand a situation in terms of plausible goals, relevant cues, expectancies, and typical actions.
- Experienced decision makers usually try to find a satisfactory course of action, not the best one.
- Experienced decision makers can usually identify an acceptable course of action as the first one they consider, and rarely have to generate another course of action.
- Decision makers can evaluate a single course of action through mental simulation. They don't have to compare several options.
- Recognitional decision strategies are more appropriate under time pressure and ambiguity; analytical strategies are more appropriate with abstract data and pressure to justify decisions.
- In a variety of operational settings, recognitional decision strategies are used more frequently than analytical strategies, even for difficult cases.