# Sources of Power

## How People Make Decisions

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# 2

# Learning from the Firefighters

In our first study of firefighters, my research team and I developed our methods and our basic model of naturalistic decision making. We came to this task in 1984, when the federal government issued a published notice asking for written research proposals to study how people make decisions under time pressure. The request came from the U.S. Army Research Institute for the Behavioral and Social Sciences, which is in charge of studying the human side of the battlefield equation. The notice was sent out through a new program for small research companies such as my own. The entire description of what the army wanted was covered in a single paragraph:

*Topic Description:* Commanders, intelligence analysts, and others are often required to make decisions under conditions of uncertainty and severe time stress. Uncertainties may be associated with missing, incomplete, or ambiguous information, or with future outcomes that are unknown. Research is needed to: (1) better understand the cognitive processes (e.g., memory, judgment, or problem solving) of the decisionmaker under such conditions, and (2) suggest approaches for supporting the cognitive processes so that the overall quality of timeliness of decisions made under uncertainty and time stress are enhanced.

My research company wrote a short proposal (it was requested to be only twenty-five pages or fewer), and we won the contract. Years later, during discussions with some civilians who administer programs at the Army Research Institute, I got some insight into why our proposal was judged favorably. They explained to me that the U.S. Government had spent millions of dollars in the 1970s and early 1980s finding out how people make decisions, and the army had used these findings to build very expensive decision aids for battle commanders in the field. Unfortunately, most of the aids were disappointing. No one would use them.

After ten years of research and considerable expense, they were not much further along than when they had begun.

These civilian program directors were also concerned about how to train people to make better decisions. Turnover in the army is high, with people coming in for two- or four-year stints. Even officers who stay in for a full twenty years are rotated every few years. For example, a new tank commander may spend six months getting trained in the rudiments, then another year coming up to speed. That gives him little more than a year to help train other people before he is moved to his next rotation. How can these officers develop skills faster? Here again, the decision research program had been a disappointment. The experiments did not shed much light on how to train a new lieutenant to make effective decisions in controlling his tank platoon. The army has doctrine about how decisions should be made, but it seemed that soldiers usually did not follow the doctrine.

## Recovering from a Research Plan

I am still amazed at how poorly I designed this study of decision making. We developed our recognitional model of decision making from this study and spent the next several years following up leads from our results, but almost every major design feature in my original plan was wrong.

In the following paragraphs, I list all the design features we had planned to use, along with our starting hypotheses. (You can try to guess which were the good ones and which were the bad ones.)

1. *Fireground commanders.* We wanted to study fireground commanders—the people in charge of urban and suburban fires. They decide how to attack the fire and how to use the crews. They are highly experienced and take charge of life-threatening situations. If someone is injured or killed, they are responsible. Commanders work under a great deal of time pressure. In between the fires, they might tolerate a team of scientists asking them questions.

2. *Observers.* We planned to train college undergraduates as observers and put them in firehouses or in radio communication with the fire dispatchers, so they could quickly get to the scene of new fires and observe the decision making on the spot. We planned to observe the commanders during the fires and then interview them after. If we used our higher-priced and better-trained researchers, we might have wasted a lot of money having them sit idly in station houses waiting for action.



3. *Exceptional cases.* We thought that the most interesting decisions to examine would be the most difficult ones, such as whether to try to extinguish a fire or to give up and make sure it does not spread, rather than the routine ones, such as where to park the trucks.

4. *Two-option hypothesis.* We hypothesized that under time pressure, the commanders could not think of lots and lots of options. Instead, they would have to consider only two options: one that was intuitively the favorite, and the other to serve as a comparison to show why the favorite was better.

5. *Analogies.* We expected to see lots of analogical reasoning. We believed that the commanders could use their experience like a memory bank, to recognize that a fire was just like one they had worked on previously. In this way, they could directly use their memory to make their decisions quickly.

6. *Data analysis.* We believed that all we would need to do to test the two-option hypothesis was to count how often the commanders had compared lots of options versus how often they had compared just two options.

Only two of these six expectations worked out well. The others were wrong.

1. Studying fire department commanders was a good idea—probably the best of the design. I was not always so sure. A friend who was in charge of some research programs for the U.S. Air Force asked, "What do these firefighters have to do with the military?" He argued that I had picked the wrong group to examine, since soldiers fight an intelligent adversary, whereas firefighters do not. "It makes all the difference in the world," he assured me.

My friend was wrong about the value of studying firefighters. These commanders showed us how people function under the stress of having to make choices with high stakes. Our later studies showed that military commanders use the same strategies as the fireground commanders.

2. Place college undergraduates in fire stations? This plan was foolish. The largest cities in Ohio—Cleveland, Cincinnati, and Columbus—do not have enough interesting fires to make this feasible. Our observers would have been sitting around all day, gathering no data. Fortunately, we found all of this out when the study began through preliminary interviews with fire department officials, and we dropped the idea.

Even if there had been enough fires, we should not have used relatively inexperienced undergraduates. For an initial study, we needed to be on the spot ourselves. Only after we knew what was happening could we have turned this task over to others. We can easily train inexperienced research assistants to collect data in a standardized laboratory experiment, but at this first step of observation, we needed researchers with more experience and sophistication.

3. Following exceptional cases was a good idea. If we had asked the commanders about the routine cases, we would have heard tired generalities. By focusing on the nonroutine cases, we were asking them about the most interesting ones—the ones they come back to the station house and tell everybody else about. We were asking for their best stories, and they were happy to oblige.

4. In the two-option hypothesis, we thought that under time pressure, the commanders would be making decisions by reducing the option set down to two: a favorite and a comparison. This is what Peer Soelberg (1967) found in a study of job-seeking behavior.

Soelberg's course on decision making at the MIT Sloan School of Management taught students how to perform the classical decision analysis method we can call the rational choice strategy. The decision maker:

1. Identifies the set of options.
2. Identifies the ways of evaluating these options.
3. Weights each evaluation dimension.
4. Does the rating.
5. Picks the option with the highest score.

For his Ph.D. dissertation, Soelberg studied the decision strategies his students used to perform a natural task: selecting their jobs as they finished their degrees. He assumed that they would rely on the rational choice strategy.



He was wrong. His students showed little inclination toward systematic thinking. Instead they would make a gut choice. By interviewing his students, Soelberg found he could identify their favorite job choice and predict their ultimate choice with 87 percent accuracy—up to three weeks before the students themselves announced their choice.

Soelberg had trained his students to use rational methods, yet when it was time for them to make a rational and important choice, they would not do it. Soelberg was also a good observer, and he tried to capture the students' actual decision strategies.

What did the students do during this time? If asked, they would deny that they had made a decision yet. For them, a decision was just what Soelberg had taught: a deliberated choice between two or more options. To feel that they had made such a decision, they had to go through a systematic process of evaluation. They selected one other candidate as a comparison, and then tried to show that their favorite was as good as or better than the comparison candidate on each evaluation dimension. Once they had shown this to their satisfaction (even if it meant fudging a little or finding ways to beef up their favorite), then they would announce as their decision the gut favorite that Soelberg had identified much earlier. They were not actually making a decision; they were constructing a justification.

We hypothesized that the fireground commanders would behave in the same way. We thought this hypothesis—that instead of considering lots of options they would consider only two—was daring. Actually, it was conservative. The commanders did not consider two. In fact, they did not seem to be comparing any options at all. This was disconcerting, and we discovered it at the first background discussion we had with a fireground commander, even before the real interviews. We asked the commander to tell us about some difficult decisions he had made.

"I don't make decisions," he announced to his startled listeners. "I don't remember when I've ever made a decision."

For researchers starting a study of decision making, this was unhappy news. Even worse, he insisted that fireground commanders *never* make decisions. We pressed him further. Surely there are decisions during a fire—decisions about whether to call a second alarm, where to send his crews, how to contain the fire.

He agreed that there were options, yet it was usually obvious what to do in any given situation. We soon realized that he was defining the making of a decision in the same way as Soelberg's students—generating a set of options and evaluating them to find the best one. We call this strategy of examining two or more options at the same time, usually by comparing the strengths and weaknesses of each, *comparative evaluation*. He insisted that he never did it. There just was no time. The structure would burn down by the time he finished listing all the options, let alone evaluating them.

Because Soelberg's theory was one of my favorites, we kept asking questions about the two-option hypothesis for much of this study. We never found any evidence for it.

5. Analogies. We expected to see a heavy use of analogous cases. We found very little. Never was there an entire fire that reminded a commander of a previous one. The people we studied had over twenty years of experience, and all of it had blended together in their minds. On the few occasions where they did think of an analogue, it had to do with an aspect of the incident rather than the entire incident. The following example shows how this worked.

**Example 2.1**
The Falling Billboards

Chief V, a veteran with about twenty-five years of firefighting experience, is in charge of putting out an apartment fire. He looks up and sees some billboards on the roof, then remembers a previous fire where the wooden supports for the billboards were burned through, sending the billboards crashing to the street below. He orders his crew to push the crowds farther back, to make sure no bystanders are injured by a falling billboard.

In this incident, the memory of an earlier experience led the commander to detect a possible danger and make a quick decision by issuing an order that would reduce that danger. The memory was of part of an incident, though, not of a whole fire.

6. Data analysis. We thought the data analysis would be straightforward. We expected that we would count the number of times people used the Soelberg evaluation strategy of favorite versus comparison, as opposed to the number of times they used a more complete decision matrix. In fact, they were using a different strategy altogether.



## Figuring Out How to Do the Project

Rather than waiting for the tough cases to happen, we asked the commanders to tell us about the big fires they had worked on during the previous few weeks or months. We treated each critical incident as a story and made the interview flow around the storytelling of the commanders. This method enabled us to get at the context of their decision making. It also ensured their interest and participation, because they enjoyed relating their experiences.

We have found the same thing in other studies. People who are good at what they do relish the chance to explain it to an appreciative audience. Once one of our data collectors was interviewing the command staff of firefighters who worked on forest fires. She was doing the interviews during an actual fire that had spread over six mountains in Idaho and took weeks to bring under control. Even under these circumstances, she got their cooperation. In fact, firefighters who watched what she was doing but were not on her list to be contacted would ask her for permission to be interviewed. They wanted to explain to her and to themselves what had happened at critical times.

The study did not just consist of people telling us stories. It is important to select the right incident to study. To define what we want to learn from the stories, we plan strategy, sometimes with checklists of items to cover so that if they do not emerge during the story, we can ask about them. Usually we send two people on an interview: one to lead the interview and get the story moving, and the other to take notes and review the checklist of probes to make sure everything has been included.

Over the years, we have compiled lists of cognitive probes we use, such as ways that the person's understanding of the situation changed during the episode or ways that someone with less experience might have faltered. We have learned where the expertise comes in during an incident, so we know where to probe more deeply. We have evolved ways of diagraming the incidents during the telling and after. New staff members

take a short workshop on interviewing and then assist others for at least six months before they lead any interviews. (I cover some of the details in chapter 11, when I discuss storytelling.)

In this first study with fireground commanders, we needed to build a framework for conducting the interviews and guiding the stories. Roberta Calderwood, one of the research team members, took the lead in preparing interview guides and standardizing them to make it easy to listen to the stories and direct them where needed.

In these first interviews, we asked the participants if they could recall a recent event that had been nonroutine and had demanded special experience. Once we found such an incident, we asked the commanders to go through it, telling it in their own words. After we had a sense of the story, we would go through the incident again to pin down what happened and when. We tried to identify what we call decision points—times when several courses of action were open. We asked whether the commander thought about other courses of action, and if so, how the choice was made. If the commander had not considered other options, we asked why not, and what about the situation made it so obvious. We tape-recorded the interviews and took extensive notes, since we were not sure what we were after or what would be important later.

# 3

# The Recognition-Primed Decision Model

As we conducted our interviews, we heard stories about rescues, fires that went out of control, restaurants and apartment buildings that burned down. We heard stories about bravery, and stories about mistakes. There were stories of teamwork—of young firefighters climbing on roofs to chop open holes for smoke to escape—and stories where teamwork broke down. A sergeant grimly remembered the time he had been in charge of a fire until a more senior official arrived, not his usual boss. The official had issued orders to section (cut a hole in) the roof. The sergeant had to climb off the roof to confront the man face to face to explain that because the roof was too spongy, he was going to pull his men off it. "This was a guy I hadn't worked with before. If it had been my usual commander, he would have trusted my judgment." We asked what a spongy roof is, and he told us that the heat weakens the supports so the surface feels softer just before it collapses, then drops everyone into the fire below. We asked what a spongy roof feels like, and he answered that he couldn't put it into words. To new firefighters, all roofs feel spongy.

**Example 3.1**
The Laundry Chute Fire

The initial report is of flames in the basement of a four-story apartment building: a one-alarm fire. The commander arrives quickly and does not see anything. There are no signs of smoke anywhere. He finds the door to the basement, around the side of the building, enters, and sees flames spreading up the laundry chute. That's simple: a vertical fire that will spread straight up. Since there are no external signs of smoke, it must just be starting.

The way to fight a vertical fire is to get above it and spray water down, so he sends one crew up to the first floor and another to the second floor. Both report that the fire has gotten past them. The commander goes outside and walks around to the front of the building. Now he can see smoke coming out from under the eaves of the roof. It is obvious what has happened: the fire has gone straight up to the fourth floor, has hit the ceiling there, and is pushing smoke down the hall. Since there was no smoke when he arrived just a minute earlier, this must have just happened.

It is obvious to him how to proceed now that the chance to put out the fire quickly is gone. He needs to switch to search and rescue, to get everyone out of the building, and he calls in a second alarm. The side staircase near the laundry chute had been the focus of activity before. Now the attention shifts to the front stairway as the evacuation route.

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This incident was typical of the ones we studied. We asked people to tell us about their hardest cases, thinking that these would show the most decision making. But where were the decisions? The commander sees a vertical fire and knows just what to do. But in an instant, that decision is negated because the fire has spread. He still knows just what to do in this changed situation. He never seems to decide anything. He is not comparing a favorite option to another option, as the two-option hypothesis suggests. He is not comparing anything.[1]

The commander did not seem to be making any decisions at all if a decision results from actively comparing two or more options in a process of comparative evaluation. We tried using a broader definition: a decision is a choice point where reasonable options exist, and the commander might have selected a different option. In other words, even if no other option was consciously considered, as long as one was available and known to the commander, a decision was made. We labeled these decision points. We did not bother with the trivial choices but rather concentrated on the points where there seemed to be a meaningful choice (e.g., "I wanted to section the roof but someone else might have held off until there was more information").

We developed a standard way of doing the interviews to highlight the decision points and define the types of questions, and we worked out a way to code the interviews to make our work easier. Each interview was tape-recorded. Then the interviewers listened to the tapes to write an



account of the incident, giving the background, the time line of events, and the decision points we probed.

### Listening to the Data

We still had a problem: the data would not conform to the hypothesis. I wanted the incidents to show how the commanders used the two-option strategy. I wanted the incidents to show analogical reasoning. I wanted the incidents to show us how people wrestled with choices. None of these things had happened. We still had to figure out just what those commanders were doing.

We sought to explain two puzzles: how the commanders could reliably identify good options and how they could evaluate an option without comparing it to any others.

Our results turned out to be fairly clear. It was not that the commanders were *refusing* to compare options; rather, they did not *have* to compare options. I had been so fixated on what they were not doing that I had missed the real finding: that the commanders could come up with a good course of action from the start. That was what the stories were telling us. Even when faced with a complex situation, the commanders could see it as familiar and know how to react.

The commanders' secret was that their experience let them see a situation, even a nonroutine one, as an example of a prototype, so they knew the typical course of action right away. Their experience let them identify a reasonable reaction as the first one they considered, so they did not bother thinking of others. They were not being perverse. They were being skillful. We now call this strategy *recognition-primed decision making*.

We tried classifying all the decision points according to whether the commander showed any evidence of comparing one option to another. We carefully defined the categories. The decision point was considered a comparative evaluation if the decision maker reported considering two or more options at the same time to contrast their relative advantages. Another category was composed of decision points, where the decision maker consciously made up a new course of action that he had never tried or seen before. In the recognitional decision category, the decision

makers used their experience to know what to do and showed no evidence of comparing options.

It was not easy to classify the decision points. After we identified 156 decision points, we had plenty of discussion about how to categorize each, and these exchanges helped us clarify what each category meant. We wanted to make sure that the classifications were reliable, so we adopted a rule that two people had to judge each decision point, at least one of whom had been at the interview and the other of whom had listened to the tape recording. If they could not agree, a third person was brought in to arbitrate. (In some of our later studies we established the reliability of these category judgments.)[2]

If we had any doubt about what strategy a fireground commander used, we put it in the comparative evaluation category. We did this to make sure we were not biasing the data in favor of recognitional decision making. We also found cases where the commanders were inventing procedures, rather than choosing them.

**Example 3.2**
The Overpass Rescue

A lieutenant is called out to rescue a woman who either fell or jumped off a highway overpass. She is drunk or on drugs and is probably trying to kill herself. Instead of falling to her death, she lands on the metal supports of a highway sign and is dangling there when the rescue team arrives.

The lieutenant recognizes the danger of the situation. The woman is semiconscious and lying bent over one of the metal struts. At any moment, she could fall to her death on the pavement below. If he orders any of his team out to help her, they will be endangered because there is no way to get a good brace against the struts, so he issues an order not to climb out to secure her.

Two of his crew ignore his order and climb out anyway. One holds onto her shoulders and the other to her legs.

A hook-and-ladder truck arrives. The lieutenant doesn't need their help in making the rescue, so tells them to drive down to the highway below and block traffic in case the woman does fall. He does not want to chance that the young woman will fall on a moving car.

Now the question is how to pull the woman to safety.

First, the lieutenant considers using a rescue harness, the standard way of raising victims. It snaps onto a person's shoulders and thighs. In imagining its use, he realizes that it requires the person to be in a sitting position or face up. He thinks about how they would shift her to sit up and realizes that she might slide off the support.



Second, he considers attaching the rescue harness from the back. However, he imagines that by lifting the woman, they would create a large pressure on her back, almost bending her double. He does not want to risk hurting her.

Third, the lieutenant considers using a rescue strap—another way to secure victims, but making use of a strap rather than a snap-on harness. However, it creates the same problems as the rescue harness, requiring that she be sitting up or that it be attached from behind. He rejects this too.

Now he comes up with a novel idea: using a ladder belt—a strong belt that firefighters buckle on over their coats when they climb up ladders to rescue people. When they get to the top, they can snap an attachment on the belt to the top rung of the ladder. If they lose their footing during the rescue, they are still attached to the ladder so they won't plunge to their death.

The lieutenant's idea is to get a ladder belt, slide it under the woman, buckle it from behind (it needs only one buckle), tie a rope to the snap, and lift her up to the overpass. He thinks it through again and likes the idea, so he orders one of his crew to fetch the ladder belt and rope, and they tie it onto her.

In the meantime, the hook-and-ladder truck has moved to the highway below the overpass, and the truck's crew members raise the ladder. The firefighter on the platform at the top of the ladder is directly under the woman shouting, "I've got her. I've got her." The lieutenant ignores him and orders his men to lift her up.

At this time, he makes an unwanted discovery: ladder belts are built for sturdy firefighters, to be worn over their coats. This is a slender woman wearing a thin sweater. In addition, she is essentially unconscious. When they lift her up, they realize the problem. As the lieutenant put it, "She slithered through the belt like a slippery strand of spaghetti."

Fortunately, the hook-and-ladder man is right below her. He catches her and makes the rescue. There is a happy ending.

Now the lieutenant and his crew go back to their station to figure out what had gone wrong. They try the rescue harness and find that the lieutenant's instincts were right: neither is usable.

Eventually they discover how they should have made the rescue. They should have used the rope they had tied to the ladder belt. They could have tied it to the woman and lifted her up. With all the technology available to them, they had forgotten that you can use a rope to pull someone up.

This rescue helped us see several important aspects of decision making. First, the lieutenant's deliberations about options took him only about a minute. That may seem too short, but if you imagine going through it in your mind, a minute is about right.

Second, the decision maker looked at several options yet never compared any two of them.[3] He thought of the options one at a time,

evaluated each in turn, rejected it, and turned to the next most typical rescue technique. We can call this strategy a *singular evaluation approach*, to distinguish it from comparative evaluation. Singular evaluation means evaluating each option on its own merits, even if we cycle through several possibilities.

Distinguishing between comparative and singular evaluation strategies is not difficult. When you order from a menu, you probably compare the different items to find the one you want the most. You are performing a comparative evaluation because you are trying to see if one item seems tastier than the others. In contrast, if you are in an unfamiliar neighborhood and you notice your car is low on gasoline, you start searching for service stations and stop at the first reasonable place you find. You do not need the best service station in town.

The difference between singular and comparative evaluation is linked to the research of Herbert Simon, who won a Nobel Prize for economics. Simon (1957) identified a decision strategy he calls satisficing: selecting the first option that works. Satisficing is different from optimizing, which means trying to come up with the best strategy. Optimizing is hard, and it takes a long time. Satisficing is more efficient. The singular evaluation strategy is based on satisficing. Simon used the concept of satisficing to describe the decision behavior of businesspeople. The strategy makes even more sense for fireground commanders because of their immense time pressure.[4]

Our model of recognitional decision making was starting to fit together. The experienced fireground commanders could judge a situation as prototypical and know what to do.[5] If their first choice did not work out, they might consider others—not to find the best but to find the first one that works.

But there was still the second puzzle. If they did not compare one course of action to another, how did they evaluate the options? All of the evaluation procedures we knew about required contrast: looking at the degree to which each option satisfies each criterion, weighing the importance of the criteria, tabulating the results, and finding the best option. If the commanders did not compare options, how did they know that a course of action was any good?



The answer lies in the overpass rescue story. To evaluate a single course of action, the lieutenant imagined himself carrying it out. Fireground commanders use the power of mental simulation, running the action through in their minds. If they spot a potential problem, like the rescue harness not working well, they move on to the next option, and the next, until they find one that seems to work. Then they carry it out. As the example shows, this is not a foolproof strategy. The advantage is that it is usually better than anything else they can do.

Before we did this study, we believed that novices impulsively jumped at the first option they could think of, whereas experts carefully deliberated about the merits of different courses of action. Now it seemed that it was the experts who could generate a single course of action, while novices needed to compare different approaches.

In one case we studied commanders who had no experience with the type of incident they faced. This helped us to see better what is required for proficient decision making.

Example 3.3
The Christmas Fire

Dotted around the Midwest are oil tank farms: large complexes of storage tanks filled with oil piped in from the Texas and Oklahoma fields and held at these farms before being pumped to specific points in the Midwest. This incident took place at a tank farm. The pipeline field at this farm had twenty tanks, each forty-five feet high and a hundred feet in diameter and each with a capacity of more than sixty thousand barrels of oil.

On Christmas night in the middle of a bitterly cold winter, one of the tanks bursts open. The oil comes pouring out—a bad enough situation—and then ignites. A large oil tank instantly turns into a giant torch and sets fire to another tank. Most of the big power lines of the tanks are down and burning. The telephone lines are also on fire. Burning oil has spilled into a ditch, and fierce winds push the fire along.

The setting is a rural farm community crisscrossed with underground oil pipes. If the flames spread, they can conceivably set the whole town on fire.

The fire departments of the surrounding townships report to the call. These departments are staffed by volunteer firefighters who are used to putting out barn fires and garage fires, and maybe a house fire or two in a year. Now they are looking at a wall of flames fifty to one hundred feet high. They have never seen anything like it before in their lives. As one commander described it to us, "Our heads turned to stone."

As they watch, one of the two burning tanks ruptures. A wave of crude oil rides over the highway and engulfs a new tank, number 91, which is filled with oil. A man from the pipeline company tells the fireground commanders that if the fire comes any farther south, it will reach a twenty-inch propane gas line. The oil is following gravity northward, "creepin' like a little monster" toward a large chemical plant.

Because of the cold, everyone is bundled up, many wearing face masks. The crews have trouble recognizing if someone is from their own district. It is hard to tell who the commanders are. Worse, there is no source of water in the area. Foam is needed to put out oil fires, but the commanders can locate only a thousand gallons.

In short, they have no resources for fighting the fire and no understanding of what to do. They are afraid the fire will spread to the other tanks. They wonder if they should evacuate the town. They are bewildered.

For two days, they remain uncertain about how to proceed. A commander of one of the fire departments orders a trench to be built to contain the oil. A different commander's idea is to pipe the oil out of tank 91. But no one can tell if the lines are still working, and no one wants to take a chance of leaking oil into a field where the fire might spread. A third commander calls the power company to turn off the electricity to the downed power lines, but the power company does not comply right away. Each department goes off in a different direction.

Eventually the power company turns off power in the early morning of the second day. Crews can approach tank 91. The plan is to spray foam down onto the fire, if they can get enough foam. It is freezing cold and windy. Where should they position the ladder truck? Should a firefighter, carrying a hose, climb up a ladder to the rim of tank 91? The dikes around the tank make it hard to get close, and the field around the dikes has dangerous ravines. Eventually a ladder truck gets near tank 91, and firefighters spray foam onto the rim of the oil tank. The wind just blows the foam away, and suddenly the origination point fire, in a nearby tank, starts to boil up menacingly. Fearing an eruption, the commander evacuates his men.

Sometime during the second day, one of the chiefs asks a person working at the oil company if all the pipes leading into the complex have been turned off. The reply is that no one knows, since the tangle of pipelines is so confusing. Spurred on by the question, the plant personnel start tracing all the incoming pipelines and find a source of fuel: a large twenty-two-inch pipe that has been pumping new oil directly into one of the burning tanks. During the second day, they get all the pipes turned off.

On the third day, the volunteer fire chiefs finally take organized action: they choose not to try to do anything. They let the fire burn while they devote all their energies to planning. One of the fireground commanders later told us that this was their first effective decision.

Here is how they go about planning. They ask themselves what their options are, and what the advantages and disadvantages are of each. Finally, in the confusion of a runaway oil fire, we find the strongest example of deliberative decision making—by chiefs who are essentially baffled about what is happening: they try rigging up a tower to get a man above the rim of a tank to spray foam down onto the fire. Near the rim, he sees cracks with crude oil coming through. The pumps start spraying foam, and the command is given to start the water truck cycle. Because of earlier delays, the water truck freezes up before it can be used. Then the foam pump starts to malfunction, so they give up and call the firefighter down.



Next they try rigging up a nozzle to spray the foam down, but the high winds sweep it away, and the heat cooks it off. They order more foam from a nearby U.S. Air Force base, but the different foams that arrive are incompatible. Finally, they give up, abandon their pride, and call in some consultants. They call in the team of "Boots and Coots," former colleagues of Red Adair, a world-famous fighter of oil well fires.

Boots and Coots arrive, look briefly at the scene, and say that they will need a great deal more foam. "We don't have that much foam," the volunteer fireground commanders argue. "Of course not," Boots and Coots answer. "We've already ordered it. It will be here tomorrow."

From that point on, under the direction of the experts, the fire operations go smoothly. The entire fire is extinguished within the next two days. Although no one is seriously injured, the cost of the fire is estimated at $10 to $15 million.

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From this episode we learn that there are times for deliberating about options. Usually these are times when experience is inadequate and logical thinking is a substitute for recognizing a situation as typical. Although the commanders in this case study had been firefighters for a long time, they had no experience with a fire this large. Deliberating about options makes a lot of sense for novices, who have to think their way through the decision. It is what I do when I have to buy a house or a car. I have to start from scratch, identifying features I might want, looking at the choices.

## Comparing the Categories

Table 3.1 shows how often we found examples of each category. The first category, preselected options, is for cases where the fireground commander was given a set of options by someone else and had to select one. There were no incidents of this nature.

The second category is for cases of comparative evaluation. There were only eighteen decisions of this type, with about half of them coming from

Table 3.1
Categories of the Decisions Studied

| Type of Strategy | Number of Cases |
|---|---|
| Choosing from preselected options | 0 |
| Comparative evaluation | 18 |
| Novel option | 11 |
| Recognitional decision (singular evaluation) | 127 |
| Total decision points classified | 156 |

the incident with the oil tank farm, where the fireground commanders were essentially novices.

The third category is for cases where new and creative options were initiated, like the overpass rescue. There were eleven decisions of this type.

Finally, there was the category for recognitional decisions. Fully 80 percent of the decisions fit in here. Moreover, these were the findings for nonroutine incidents. The results would have been more extreme with a sample of typical episodes.

## Defining the Recognition-Primed Decision Model

The recognition-primed decision (RPD) model fuses two processes: the way decision makers size up the situation to recognize which course of action makes sense, and the way they evaluate that course of action by imagining it.

Figure 3.1 shows the basic strategy, as variation 1. Decision makers recognize the situation as typical and familiar—a typical garage fire, or apartment building fire, or factory fire, or search-and-rescue job—and proceed to take action. They understand what types of *goals* make sense (so the priorities are set), which *cues* are important (so there is not an overload of information), what to *expect* next (so they can prepare themselves and notice surprises), and the *typical ways of responding* in a given situation. By recognizing a situation as typical, they also recognize a *course of action* likely to succeed. The recognition of goals, cues, expectancies, and actions is part of what it means to recognize a situation. That

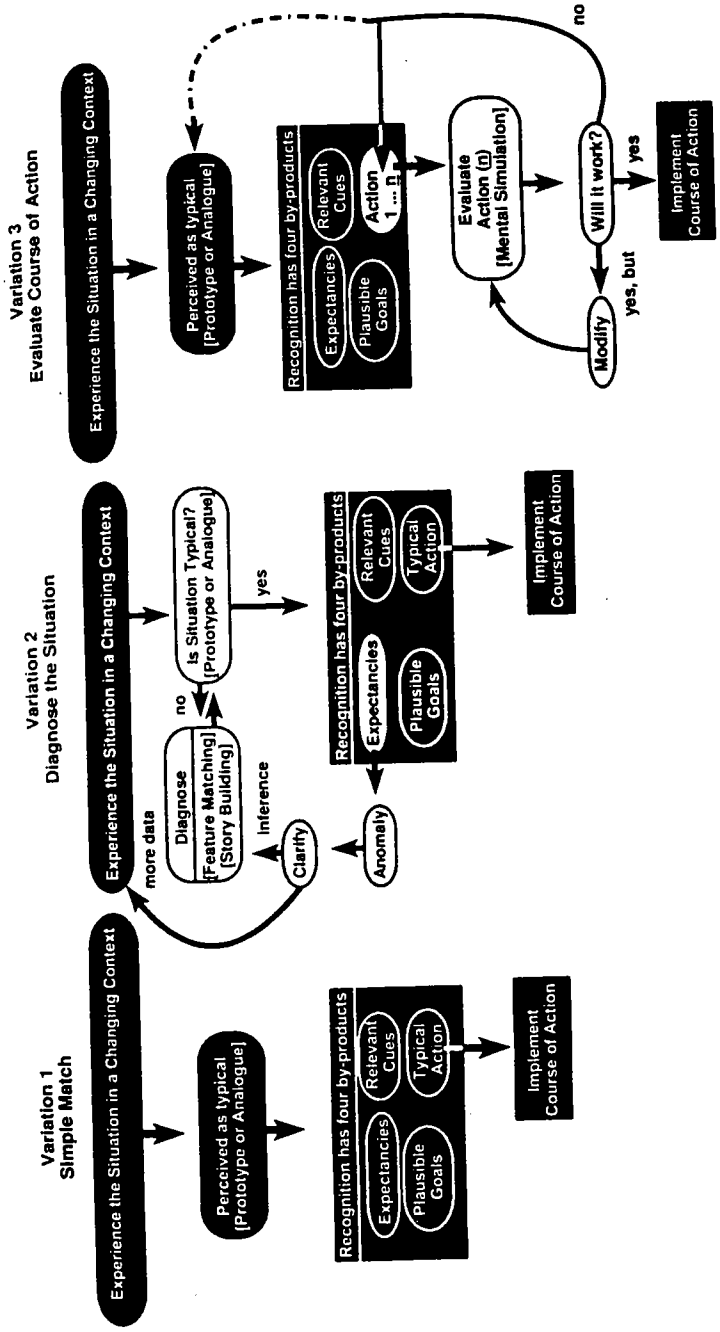


Figure 3.1
Recognition-primed decision model

is, the decision makers do not start with the goals or expectancies and figure out the nature of the situation.

Some situations are more complex, as shown by variations 2 and 3 in figure 3.1. Variation 2 occurs when the decision maker may have to devote more attention to *diagnosing* the situation, since the information may not clearly match a typical case or may map onto more than one typical case. The decision maker may need to gather more information in order to make a diagnosis. Another complication is that the decision maker may have misinterpreted the situation but does not realize it until some *expectancies* have been violated. At these times, decision makers will respond to the anomaly or ambiguity by checking which interpretation best matches the features of the situation.[6] They may try to build a story to account for some of the inconsistencies. (See chapters 5 and 6 for examples.)[7]

Variation 3 explains how decision makers evaluate single options by imagining how the course of action will play out. A decision maker who anticipates difficulties may need to *adjust* the course of action, or maybe *reject* it and look for another option. (These aspects are discussed in more detail in chapters 5 and 6.)

One way to think about these three variations is that variation 1 is basically an "if ... then" reaction, an antecedent followed by the rule-based response. The expertise is in being able to recognize when the antecedent condition has been met. Variation 2 takes the form "if (???) ... then," with the decision maker deliberating about the nature of the situation. Variation 3 takes the form "if ... then (???)" as the decision maker ponders the outcome of a reaction. Figure 3.2 shows an integrated version of all three variations.

The RPD model has some elements of other models, but in its integrated form, it has not been proposed before.[8] We have confidence in this model for several reasons. First, our results show how frequently this strategy is used.

Second, our coding in this and other studies was conservative. If there was any evidence that a person compared several options, even for an instant, we counted it as a comparative evaluation. We coded a decision point as recognitional only if the options came from experience and were



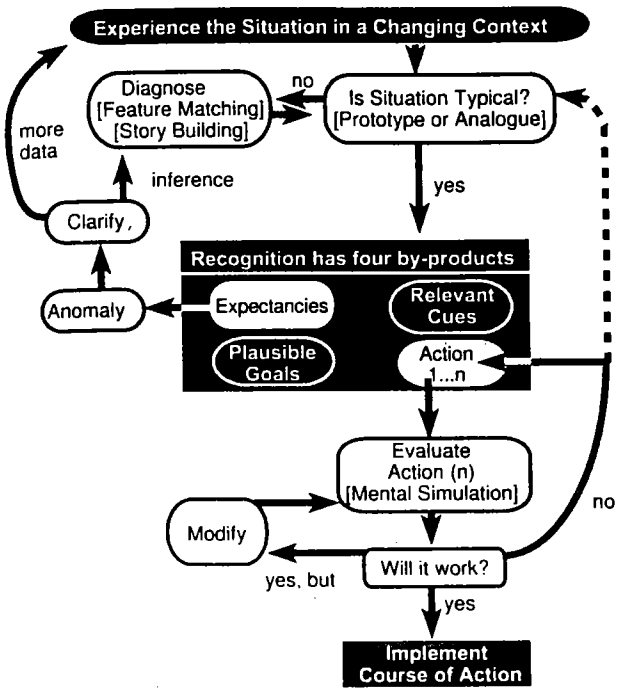


Figure 3.2
Integrated version of recognition-primed decision model

not consciously compared,[9] and the decision maker selected the first action that was acceptable.

Third, our data collection was conservative. We kept asking the fireground commanders if they had considered a set of options at each choice point. Even when they said they thought of only one option, we pressed them for others, hoping to find evidence for the two-option model that Soelberg had presented. That approach worked in our favor.

If we had started with the one-option hypothesis and only asked questions to elicit data that would support it, we could have been fooling ourselves. People conducting experiments have a certain power over the people being studied. We refer to this as the demand feature of the experiment. If we made it clear that we wanted data to support the

one-option hypothesis, some of the people we interviewed might have given us such data. Therefore, because we probed for evidence of the two-option hypothesis, which included concurrent evaluation, the demand characteristics worked against the recognitional strategy, giving us more confidence in our findings.

Fourth, we had gone after the most difficult decisions, not the easy ones. If the commanders did not contrast options for the toughest cases, then the model should apply even more strongly to all the other decisions they face.

Fifth, the RPD model has been widely accepted by the decision makers themselves. As we began to present our findings at conferences, we got the reactions, "Of course that's how people make decisions." Our findings seemed obviously right to everyone, even though they were so different from earlier decision theories. We began to realize that the force of our findings was in their obviousness. Of course the RPD strategy was the strategy used most frequently.

## The Theoretical Importance of the RPD Model

Recognitional decision making can be contrasted with the more classical approaches. Perhaps the most widely known of these models stems from the work of Janis and Mann (1977), who warned that people try to avoid making decisions because of the stress of carrying out the analysis. Janis and Mann offered these prescriptions for making better decisions:

- Thoroughly canvas a wide range of options.
- Survey a full range of objectives.
- Carefully weigh the costs, risk, and benefits of each option.
- Intensively search for new information in evaluating options.
- Assimilate all new information.
- Reexamine the positive and negative consequences of each option.
- Carefully plan to include contingencies if various risks occur.

Janis and Mann probably did not intend this advice for time-pressured situations, but the RPD model predominates even when time is sufficient for comparative evaluations. Yet in one form or another, Janis and Mann's prescriptive advice is held up as an ideal of rationality and finds its way into most courses on cognitive development. The advice is more helpful for beginners than for experienced decision makers. In most applied settings, beginners are not going to be put in a position to make critical decisions.



The prescriptions of Janis and Mann are an example of the rational choice strategy that we had encountered: define the evaluation dimensions, weight each one, rate each option on each dimension, multiply the weightings, total up the scores, and determine the best option—that is, unless you do not have all the data you need, or are not sure how to do the ratings, or disagree with the weights, or run out of time before you have finished.

There are advantages to the rational choice strategy:

- It should result in reliable decisions (that is, the same result each time for the same analysis).
- It is quantitative.
- It helps novices determine what they do not know.
- It is rigorous; it does not leave anything out.
- It is a general strategy, which could apply in all sorts of situations.

The problem is that the assumptions of the rational choice strategy are usually too restrictive. Rarely is there the time or the information needed to make this type of strategy work. Furthermore, if we cannot trust someone to make a big judgment, such as which option is best, why would we trust all of the little judgments that go into the rational choice strategy?[10] Clearly this method is not going to ensure that novices make good choices, and it usually is not helpful for experienced decision makers. It can be useful in working with teams, to calibrate everyone's grasp of the strengths and weaknesses of different options.

### *Applications*

One application is to be skeptical of courses in formal methods of decision making. They are teaching methods people seldom use.

A second application is to be sensitive to when you need to compare options and when you do not. For many tasks, we are novices, and the rational choice method helps us when we lack the expertise to recognize

situations. Sometimes we may need to use formal methods to look at a wide array of alternatives. Other times we may judge that we should rely on our expertise to look in greater depth at a smaller set of alternatives—maybe the first one considered.

One final application involves training. The ideas set forth in this chapter imply that we do not make someone an expert through training in formal methods of analysis. Quite the contrary is true, in fact: we run the risk of slowing the development of skills. If the purpose is to train people in time-pressured decision making, we might require that the trainee make rapid responses rather than ponder all the implications. If we can present many situations an hour, several hours a day, for days or weeks, we should be able to improve the trainee's ability to detect familiar patterns. The design of the scenarios is critical, since the goal is to show many common cases to facilitate a recognition of typicality along with different types of rare cases so trainees will be prepared for these as well.

*Key Points*

We can summarize the key features of the RPD model in comparison to the standard advice given to decision makers. The RPD model claims that with experienced decision makers:

- The focus is on the way they assess the situation and judge it familiar, not on comparing options.
- Courses of action can be quickly evaluated by imagining how they will be carried out, not by formal analysis and comparison.
- Decision makers usually look for the first workable option they can find, not the best option.
- Since the first option they consider is usually workable, they do not have to generate a large set of options to be sure they get a good one.
- They generate and evaluate options one at a time and do not bother comparing the advantages and disadvantages of alternatives.
- By imagining the option being carried out, they can spot weaknesses and find ways to avoid these, thereby making the option stronger. Conventional models just select the best, without seeing how it can be improved.
- The emphasis is on being poised to act rather than being paralyzed until all the evaluations have been completed.