

## PSYCHOLOGICAL CHARACTERISTICS AND STRATEGIES OF EXPERT DECISION MAKERS \*

James SHANTEAU

*Kansas State University, Manhattan, USA*

Previous studies of expert decision makers have concluded that experts, because of cognitive limitations, are generally inaccurate, unreliable, biased, lack self-insight, and gain little with experience. Overall, previous psychological studies have painted a rather bleak picture of the decision-making abilities of experts. The research reviewed here provides a different view of experts in two respects. First, expert decision makers have been found to use strategies, such as reliance on group feedback, willingness to make adjustments, and a divide-and-conquer approach, which help them overcome the effects of cognitive limitations. Second, top decision makers in agriculture, personnel selection, health care, accounting/auditing, and management have been observed to share psychological characteristics such as perceptiveness, communication skills, self-confidence, and creativity under stress. These findings have implications for (1) image and expectations of experts, (2) classifying different types of experts, (3) training and/or selecting novices to become experts, and (4) design of expert systems.

‘Skrebneski has a special *aura*. He makes it appear as though getting this photograph perfect is the most important thing in his life.’ (Comment by socialite Sugar Rautbord explaining why she paid \$5,000 for a portrait.)

This quote illustrates that experts are perceived as different from nonexperts in some potentially important ways. Experts are often seen as having an aura or mystique not possessed by others. The goal of this

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Author's address: J. Shanteau, Dept. of Psychology, Bluemont Hall, Kansas State University, Manhattan, KS 66506, USA.

paper is to explore some of these differences from the perspective of psychological decision making.

The paper is organized into six sections. The first outlines the prevailing view of experts as cognitively limited decision makers. The second summarizes the approach used in the present research program on experts. The third discusses some issues related to definitions of expert, novice, and naive decision makers. The fourth section describes six strategies used by experts which help them overcome their limitations. The fifth section presents ten psychological characteristics consistently observed in experts. The final section considers several implications of these findings.

### **Cognitive limitations of experts**

The initial concern in psychological studies of experts involved the psychometric properties of *validity* and *reliability* (Chan 1982). In a 1962 study, for instance, Trumbo et al. observed that expert grain judges frequently were invalid and unreliable. Nearly one-third of wheat samples were found to be misgraded; when judged a second time, more than one-third of the samples were graded differently. Trumbo et al. found that greater experience increased the confidence of judges, but was not necessarily related to the accuracy of grain inspections. Perhaps most important was that the experts were unaware of these various shortcomings. Similar findings have been reported for other types of experts, such as medical doctors (Einhorn 1974) and clinical psychologists (Goldberg 1959).

One frequent explanation for this low level of performance is that experts reportedly rely on heuristics (or mental rules of thumb) in making judgments. Heuristics are necessary because of the limited cognitive processing capacity of the human brain (Simon 1983). These heuristics often lead to biases or judgmental errors relative to normative standards. Moreover, similar heuristics and biases have been reported for both novice and expert decision makers (Kahneman, Slovic and Tversky 1982).

In addition, many studies have found that expert judgments are based on surprisingly little information. Presumably, experts should make use of any and all relevant information. Yet, court judges have been found to use only one to three dimensions when sentencing

defendants (Ebbesen and Konecni 1975); medical pathologists have been observed to be equally limited (Einhorn 1974).

In all, previous research has painted a rather bleak picture of the decision-making abilities of experts. Indeed, it can be difficult to find cited psychological studies which have anything positive to report about experts (Beach and Christensen-Szalanski 1984).

### **An alternative approach to expertise**

My research on expert decision makers began in the mid-1970's with analyses of livestock judges (Phelps and Shanteau 1978). Based on earlier findings, the expectation was that these judges would be as limited as experts in other areas had been reported to be. Surprisingly, livestock judges were observed to be careful, skilled, and knowledgeable decision makers (Shanteau 1978). Although the findings of cognitive limitations were replicated, these experts nonetheless were able to make competent judgments (Phelps 1977). Since then, my emphasis has been on investigating factors which lead to *competence* in experts, as opposed to the previous emphasis on *incompetence*.

Subsequent research has looked at decision making in auditors, personnel selectors, registered nurses, soil judges, and business managers. The primary goals of this research were (1) to evaluate how experts use information to make decisions; (2) to compare the judgment strategies of expert and novice decision makers; (3) to determine the impact that irrelevant information has on expert decisions; and (4) to develop training methods for helping both novices and experts make better decisions.

Although our present research program has led to a number of insights about particular types of experts (e.g., Dino and Shanteau 1984; Shanteau and Gaeth 1983), it is not the goal here to review domain-specific findings from this work. Rather, this paper reflects more global observations made while conducting various research projects on experts.

### **Some comments on definitions**

The definition of *who* is an expert obviously is vital to any study of expert decision making. Although it might seem desirable to rely on objective criteria, external standards frequently do not exist for many

real-world problems (such as livestock judging). Indeed, experts are essential in precisely those domains where there are *no* right answers. Even when standards do exist, as in auditing, it is experts who establish these standards and who have the power to change them. Thus experts define the standards, not the other way around.

The absence of objective criteria makes it necessary to take a different approach to defining experts. In my research, experts are identified by referrals from others in the profession. Although such peer designations clearly can lead to problems, I have yet to find a better starting point. Consequently, when the term 'expert' is used here, it refers to those considered by colleagues to be the best at making decisions.

It is also worth commenting on the distinction between 'novice' and 'naive' on the one hand, and 'expert' on the other. Naive decision makers have little, if any, skill in making decisions in a given area. Although they may have some knowledge and background, they are beginners. In comparison, novices are decision makers who may have considerable knowledge and experience, but have yet to reach the level of the experts. Novice livestock judges, for instance, frequently have a dozen or more years of school and club training/experience. In my research, novices often provide a useful comparison group for studying experts. There is generally little value, however, in comparing experts to naive decision makers.

In contrast, experts are those who have reached the pinnacle of their profession. Using a pyramid as a framework, the naive are at the bottom and novices are at an intermediate level; at the top are the experts. Thus only those who are the best at what they do should be considered experts.

This approach to defining experts stands apart from that used by most investigators. In many studies, self-designation or scores on a short knowledge test are used to select 'experts' (e.g., Bradley 1981). In other studies, job titles or academic credentials have been used (e.g., Oskamp 1965). From the present view, such 'experts' in fact are more like novices. Similarly, many expert systems analyses have been based on novice-level decision makers rather than actual experts. Thus much of what has been labeled 'expert decision making' might better be referred to as 'novice decision making'. (Although their terminology is somewhat different, Dreyfus and Dreyfus (1986) present distinctions similar in spirit to those offered here.)

Because of the exalted position of experts within their profession, it can be difficult for researchers to study or even to communicate with them. Experts typically are busy and reluctant to talk – and their time is valuable. In comparison, novices generally are more available and willing to talk – and their time is relatively cheap. It is therefore easier to study novices, but such research won't answer questions about experts. Despite the difficulties, I have found the payoff from working with experts to be more than worth the effort.

### **Decision strategies of experts**

By studying and interacting with experts, my students and I have observed the use of various decision strategies by experts. Although some of these strategies are domain specific, others have been found in widespread use. Several of these strategies have the effect of helping experts overcome the effects of cognitive limitations. Six such strategies are described here.

First, experts are willing to *make adjustments* in initial decisions. They take advantage of subsequent feedback in dynamic environments and avoid rigid adherence to prior decision policies (also see Einhorn and Hogarth 1981; Hogarth 1981). They seem aware that always staying with the same decision doesn't work. Rigidity and blind commitment to prior choices is characteristic of inexpert decision makers; experts have apparently learned that making corrections is more important than being consistent.

Second, top decision makers *rely on others* to assist in making decisions. Experts seldom work in isolation, but either operate with a group or have the opportunity to obtain feedback from others. This allows them to consult with colleagues and subordinates to gain additional insights and perspectives. Such group interaction has been reported by Sniezek and Henry (1987) to increase judgment accuracy and confidence. Experts seem aware that isolation from associates can lead to inferior decision making.

Third, experts know how to *learn from past decisions* and to make appropriate changes in future decision strategies. Although they may not learn in the most efficient fashion, experts nonetheless are responsive to past successes and failures. In contrast, novices frequently appear more interested in rationalizing or defending past decisions

than in learning from them. It is important to note that experience, *per se*, is not sufficient to produce expertise (Brehmer 1980); the important thing is what is learned from that experience (Kolodner 1984).

Fourth, experts in various domains often have developed *informal decision aids* which allow them to avoid the biasing effects of heuristics. These aids may take the form of written records of prior decisions to eliminate hindsight biases, as was observed in the training of livestock judging (Shanteau and Phelps 1977). Alternatively, aids may be normative guides to calibration, as in soil-category decisions where complementary constraints are imposed to insure internal consistency (Gaeth and Shanteau 1984). Interestingly, these aids seemed to have been introduced without awareness or appreciation of psychological processes or concerns (such as biases or heuristics). Nevertheless, they have the effect of permitting experts to make less biased decisions.<sup>1</sup>

Fifth, although expert decision makers may make small errors, they generally *avoid large mistakes*. They seem to have discovered that for many decisions coming close is often good enough: The key is not to worry about being exactly right, but to avoid making really bad decisions. Experts often use a dual strategy of first coming up with a rough 'ball part' estimate, perhaps by using a simplifying heuristic,<sup>2</sup> and then conducting a more careful analysis. By making sure that they are fairly close, experts avoid making sizable errors. An analogy might be made to flat maxima in statistical optimization (Edwards 1965); if you are close to a flat maximum, it doesn't matter if you are off a little.

Finally, experts almost always follow some sort of *divide-and-conquer* strategy. That is, they break large problems into smaller parts, find solutions to the parts, and then put the partial solutions back together again. How this is done varies with the domain area, but all the types of experts we examined have developed some systematic way for separating decisions into more manageable parts. Although such an approach is often prescribed as part of decision analysis (e.g., Gardiner and Edwards 1975), experts appear to have evolved this strategy without concern for formal analyses.

<sup>1</sup> Edwards and von Winterfeldt (1986) argue that experts, of necessity, will adopt whatever aids are needed to assist their decision making. In that sense, most expert decisions may be aided in some way.

<sup>2</sup> It has been suggested (see Hogarth 1981; Thorngate 1980) that heuristic strategies may produce cost-effective decisions in certain contexts. This implies that evaluation of the quality of expert decision making should reflect the environment; that is, decisions cannot be analyzed in isolation.

### Some characteristics of experts

In addition to common decision strategies, experts in various domains often display rather similar psychological characteristics. These appear to reflect, in part, what Goffman (1959) calls *self-presentation*: the creation and maintenance of a public image. Beyond that, however, these characteristics are part of a decision style or set of abilities common to many experts. This section contains a brief presentation of some of these psychological traits. A more complete list and an elaborated discussion of these expert characteristics appears in Shanteau (1984, 1987).

(1) Experts generally have highly developed *perceptual / attentional* abilities. They are able to extract information that non-experts either overlook or are unable to see. When already extracted information is presented to novices, they often are capable of making decisions that are nearly as good as the experts. The difference is that experts (such as auditors) are able to see patterns of information that novices cannot (Krogstad, Ettenson and Shanteau 1984).

(2) Experts have a sense of what is *relevant* and *irrelevant* when making decisions. The assessment of relevance can be quite difficult and experts have been observed to use irrelevant information to their detriment (e.g., Gaeth and Shanteau 1984). Nonetheless expert nurses, for instance, are better than novices in distinguishing relevant from irrelevant (Shanteau et al. 1981). Moreover, the decisions of novice nurses was found to improve when they were trained to make explicit distinctions between relevant and irrelevant information.

(3) Experts have an ability to *simplify complex problems*. As one medical specialist commented, 'an expert is someone who can make sense out of chaos.' In part, this is related to the superior pattern recognition abilities reported for game-playing experts, such as chess masters (De Groot 1965). There appears to be more involved, however. Experts in personnel selection, for example, have an enhanced capacity to get to the crux of a problem (Nagy 1981).

(4) Experts can *effectively communicate* their expertise to others. Regardless of how good decision makers actually are, their livelihood depends on the ability to convince others of that expertise. As one manager put it, 'an expert is anyone who can persuade someone else that he (she) is an expert' (Dino and Shanteau 1984). This can be

circular, of course, in that weak communicators may not be given the opportunity to make decisions and hence are unable to show their skills. (Goffman's (1959) concept of 'face' provides a related perspective on the performance of experts.)

(5) Experts are able to *handle adversity* better than non-experts. Even when things are not going well, experts continue to make effective decisions. Novices have yet to learn the saying of professional musicians: 'if you are going to make a mistake, make a good one' – there is no point in worrying about past errors, you have to keep on going (Shanteau 1987). This is also related to the superior ability of experts to work under stressful conditions (Dino et al. 1984).

(6) Experts know that to be effective, it is important to be *selective* in picking decision problems. As one executive related, 'a lot of my job is knowing what problems to tackle – and what not to.' In comparison, novices frequently adopt one of two extremes: They either want to be perceived as 'decisive' and thus aggressively take on all decisions. Or they are so reluctant to make a mistake that they avoid making any decisions (Dino and Shanteau 1984).

(7) Almost all experts show strong *outward confidence* in their decision-making ability. One respected agricultural judge when confronted with an inconsistent decision about which of two animals was best-of-show commented: 'there must have been two grand champions.' That is, the source of any inconsistency must reside elsewhere beside the expert (Shanteau and Phelps 1977). Although this might be viewed as arrogance, it generally comes across as a highly-developed faith in one's own abilities. Experts really do believe in themselves and their capacity to make decisions.

(8) Almost without exception, experts have an extensive and up-to-date *content knowledge*. They know a lot and pride themselves in staying up with the latest developments in their field. One recently retired agronomy expert commented that he 'felt unqualified' because he had 'not kept up with developments in the past few months' (Gaeth 1980). This was despite the fact that he had been a leading expert for nearly 40 years. You can't be out of touch and still be a good decision maker.

(9) Expert decision makers seem to be *more creative* in discovering new decision strategies. When presented with atypical stimuli or tasks, experts are better able to generate appropriate decisions. Often experts are able to suggest scenarios or frameworks for reinterpreting difficult



decisions in novel ways (Dino et al. 1984). In comparison, novices know what they know, but seem unable to create anything new.

(10) Although experts can be quite verbal in personal conversations, they generally are *inarticulate* about the processes used to make decisions. When asked to describe their strategies, they will often refer to vague concepts such as 'that's just the way it is.' Lusted (1960) reports, for instance, that an acclaimed radiologist explained a difficult diagnosis by saying, 'Because it looks like it.' That is consistent with the greater automaticity observed for expert problem solvers (Anderson 1982). This may explain, in part, why it is difficult for patients or clients to talk to experts about decision making. The experts may be unable to verbalize their thoughts behind a decision.

## **Implications**

These observations have implications for (a) defining the image and expectations of an expert, (b) specifying different types of experts, (c) training/selecting novices to become experts, and (d) developing and using expert systems.

### *Image and expectations of experts*

Many observers have commented that experts, such as in medicine, seem egotistical, self-important, and overconfident. Despite the negative tone of this behavior description, such traits actually may serve two important purposes. On the one hand, these traits can contribute to helping experts handle the responsibility of making major decisions; without strong self-belief it can be difficult for an expert to continue making decisions after a negative outcome, e.g., the death of a patient. On the other hand, it may be that without outward signs of extreme self-confidence, clients would be less willing to listen to the decision maker (Golde 1970); thus, the expert would soon be out of work. This suggests that it is necessary for experts to convey a certain image in order to be accepted (Shanteau and Gaeth 1983). The nature of this 'expert image' and the expectations that arise from it deserve further analysis. It also might be interesting to know more about how people expect experts to behave (Korda 1977) and how they go about selecting experts.

### *Types of expertise*

Although this paper describes strategies and characteristics shared by many experts, it should be obvious that not all types of experts are alike. Just as being a plumber and a lawyer requires different skills, so will experts in these two areas demonstrate their abilities in different ways (Schlenker 1980). If researchers fail to distinguish between types of expertise, then important limits on generality may be overlooked. As a start, there appears to be three distinctions that might be worth exploring. One is the difference between perceptual experts (e.g., livestock judges) and cognitive experts (e.g., auditors). The former are experts because of their sensory abilities – they can perceive differences not apparent to others. The latter experts possess unique problem-solving abilities – they are experts because they can discover relations not found by others. A second distinction is between knowledge experts (e.g., academics) and inference or diagnostic experts (e.g., medical doctors). Knowledge experts are able to make decisions based on a large amount of information. Diagnostic experts, in contrast, can make decisions based on limited information; they are experts because they can make reasonable assessments in the face of considerable uncertainty. The third distinction is between advice experts (e.g., accountants) and action experts (e.g., business managers). The former experts are relied on to provide information to others, but not necessarily to act on those judgments. The latter are skilled in carrying out decisions, although the quality of their decisions may be evaluated more on style than substance (Ringer 1976).

### *Training of experts*

In their review of the judgment and decision making literature, Pitz and Sachs (1984) state, 'The final test of an understanding of judgment and decision making processes is to develop procedures for helping people make better decisions.' In that light, it is discouraging to find that most efforts at improving decision skills through training have been unsuccessful (Gaeth 1984). Typically, training has been intended to improve decisions relative to an objective standard, e.g., Bayes theorem. From the present perspective, however, it should not be surprising that such training efforts almost always fail. If the goal is to make novices more like experts, then Bayes theorem (or any other

normative standard) may not be relevant. To train experts successfully, it is necessary to recognize the special characteristics of experts and to devise training programs which reflect those characteristics. Training efforts along this line, in fact, have worked well (Gaeth and Shanteau 1984; Shanteau and Gaeth 1983). On the other hand, it is conceivable that at least some of the characteristics associated with experts may be untrainable, e.g., self-confidence and creativity. Such traits may be more-or-less unmalleable; as such there is little that training can do to prepare a novice to think like an expert. For such characteristics, the emphasis might best be placed on selecting novices whose cognitive processes most closely fits the pattern associated with experts. These novices could then receive training on other more teachable skills. Such an approach may be both more effective and more efficient in preparing decision makers to become experts (Shanteau 1984).

### *Expert systems*

Using techniques from artificial intelligence, expert systems are increasingly being implemented to assist or even replace skilled decision makers. Getting experts to interact with expert systems, however, has often proved to be difficult (Michie 1982). There are a number of potentially useful systems, such as MYCIN, which are largely unused by those experts the systems were designed to help (Ham 1984). In part, this difficulty arises because experts frequently are asked to act as 'input devices' or to answer questions with the system making the final decision. Yet as argued here, communication and confidence are essential parts of the expert decision-making process. Current expert systems typically take much of the communication and confidence away from decision makers. Such systems, in effect, alienate the expert from his/her normal psychological environment. It should not be surprising, therefore, to find that decision makers are unwilling to work with systems which are fundamentally incompatible with their perceived roles as experts (also see Dreyfus and Dreyfus 1986.) If this analysis is correct, then more attention should be directed to preserving the role of the decision maker in expert systems. That is, systems should be designed about the needs of the experts, rather than expecting experts to adapt to the needs of the system. In short, more emphasis should be placed on the psychology of experts when constructing expert systems.

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