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CHAPTER

4

Deciding Analytically or Trusting Your Intuition? The Advantages and Disadvantages of Analytic and Intuitive Thought

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The idea that decision making involves distinctive analytic and intuitive components resonates with everyday experience. It has also been discussed across at least two millennia. Recently, the distinctive natures of intuitive and analytic thought have been the subject of much psychological research, with many theorists postulating so-called *dual models* of thought.

Accepting this dichotomy, a natural question centers on whether one form of thinking is more valid (however defined) than the other. It is tempting to think that analytic thought must be better. After all, much education involves teaching people to think more analytically. Yet there is much anecdotal evidence supporting the use of intuition (as well as much that does not). However, what should people do when they find that their analysis contradicts their intuitions?

The purpose of this chapter is to illuminate this question. I first define *intuition* and *analysis* within the context of a dual-process model, where I distinguish between *tacit* and *deliberate* systems of thought. I next present a framework for understanding how these systems work in tandem. I assume that stimuli are first filtered by a *preconscious* processor, and that much thought takes place outside of cognitive awareness. The tacit system is always involved in making judgments and choices, but can be subject to control by the deliberate system. I further stress the role of tacit learning and how the environment affects the subsequent validity of tacit responses (see also Sedlmeier, chap. 5, this volume). In *kind* learning environments, people receive accurate and timely feedback. In *wicked* learning environments, feedback is lacking or misleading, and people can acquire inaccurate responses.

I next make some general comments about the relative validities of the tacit and deliberate systems prior to reviewing studies that have *directly* contrasted the relative validities of the two systems on the *same* tasks. This leads to identifying the underlying trade-off. Whereas the tacit system can be subject to bias, using the deliberate system appropriately requires knowledge of the "correct rule" as well as making no errors in execution. Assuming that the latter is a function of the analytical complexity of tasks, I present a framework illustrating the nature of this trade-off (i.e., bias [in implicit, tacit responses] vs. analytical complexity [when using the deliberate mode]).

Finally, whether tacit or deliberate processes are more valid than the other is not the critical issue. Rather, this is to make *valid* responses in which both systems are implicated. However, whereas much has been done to develop analytical abilities, intuition has received little attention. The payoff from understanding the relative strengths of analysis and intuition lies in identifying ways to educate the latter (cf. Hogarth, 2001).

DUAL SYSTEMS OF THOUGHT: THE TACIT AND THE DELIBERATE

Several areas of psychology acknowledge that people process information in two quite different ways: cognitive psychology (see Bruner, 1986; Hasher & Zacks, 1979, 1984; Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977; Sloman, 1996); personality (see Epstein, 1994); social psychology (see the extensive volume edited by Chaiken & Trope, 1999), as well as attitude research (see Sanbonmatsu, Prince, & Vanous, chap. 6, this volume; Wilson, Lindsey, & Schooler, 2000); judgment and decision making (see Hammond, 1996; Kahneman & Frederick, 2002; Stanovich & West, 1998); and neuropsychology (see Ochsner & Lieberman, 2001). Although differences exist between dualities proposed by different scholars, most agree that the systems differ by the presence or absence of cognitive effort. I call these systems the *deliberate* and *tacit* (Hogarth, 2001).

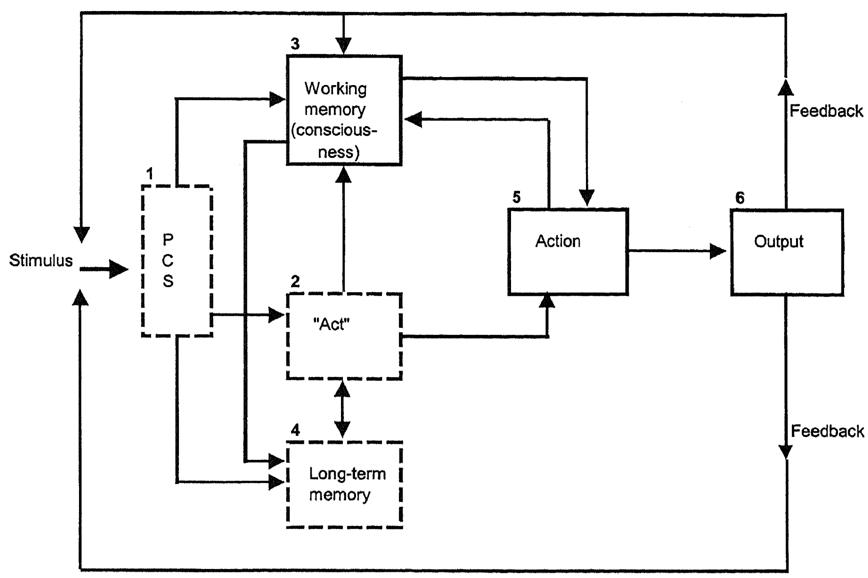
The deliberate system involves explicit reasoning. It is mainly rule-governed, precise, and capable of abstract thought. The tacit system is triggered to operate automatically. It is sensitive to context and operates speedily providing approximate responses, typically without conscious awareness. It often involves feelings and emotions.

Using an iceberg metaphor, tacit thought lies below the surface (of consciousness), and our access to it is severely limited; deliberate thought lies above the surface and can be made explicit. There is also much more activity below the surface than above it. Many tacit responses are genetic in origin (cf. Seligman, 1970, on *preparedness*.) However, learning is also critical. Responses that are initially acquired through the deliberate system can become automated and move to the tacit system.

The tacit–deliberate distinction helps define what are commonly known as *intuition* and *analysis*. Specifically, "the essence of intuition or intuitive responses is that *they are reached with little apparent effort, and typically without conscious awareness. They involve little or no conscious deliberation*" (Hogarth, 2001, p. 14; italics original). Intuitive responses are therefore outputs of the tacit system. Analysis is the domain of the deliberate system.

A FRAMEWORK FOR INTEGRATING THE TWO SYSTEMS OF THOUGHT

Figure 4.1 illustrates the interconnections between the tacit and deliberate systems (see also Hogarth, 2001, chap. 6). Boxes with heavy lines indicate the deliberate system; boxes with dotted lines indicate the tacit system. Actions and outcomes, the two right-hand boxes (numbers 5 and 6), denote events that can be observed by (in principle) both the organism and third parties.



The stimulus is an "object" or a "thought."
PCS = preconscious screen.
The dotted lines indicate functions of the tacit system.

FIG. 4.1. The deliberate and tacit systems (from Hogarth, 2001).

The diagram illustrates how the tacit and deliberate systems interact in the processing of a stimulus (shown on the left of the diagram). The stimulus can take several forms: It can be external to the organism (e.g., something that is seen or heard), it can be internal (e.g., a thought triggers other thoughts), and so on. A key assumption is that all stimuli are first processed *preconsciously* (by the preconscious screen–Box 1). Consider three types of cases.

In the first case, information about stimuli are recorded without conscious awareness and stored for possible future use. This lies at the heart of tacit learning (see e.g., Hasher & Zacks, 1979, 1984).

In the second case, actions are taken automatically and bypass consciousness. Thus, people are only aware of actions after their occurrence (i.e., the link from Box 1 to Box 5 does not involve Box 3). Consider reactions to fear-inducing stimuli. You hear a noise and find that you have already moved to avoid danger before realizing what it is. Thus, outcomes are used to make sense—at a conscious level—of what we have just done—at a subconscious level (see e.g., Bargh & Chartrand, 1999). More generally, this case also accounts for many priming phenomena as well as effects of mood, which can divert attention at subconscious levels (see also Bless & Igou, chap. 11, this volume).

In the third case—of deliberate actions—consciousness plays an important role. People use the deliberate system to produce specific actions. Consider reading or deciding explicitly to do something. Moreover, the deliberate system can overrule outputs of the tacit system provided action has not already taken place. For example, we can overrule suggestions of our own angry feelings. (Imagine another motorist has taken advantage of you and stolen "your" parking space.) People can also create intentions in consciousness and decide when to delegate to automatic processes. Consider driving a car. Typically, we decide where we want to go and then delegate many functions to automatic processing. However, we maintain sufficient attention to be able to assume control when necessary.

Attention is limited. Thus, because the deliberate system consumes limited resources, it is used sparingly. It is allocated to tasks that are deemed important, but can be switched as needed. It is rarely "shut down" completely and has a monitoring function. In most cases, the tacit system is our "default," and the deliberate system is invoked when either the tacit system cannot handle the task or we make a conscious decision (e.g., planning what to do). At any time, however, both the tacit and deliberate operate together.

Whereas cognitive processes occur inside the head and are unobservable, actions and outputs (Boxes 5 and 6) occur, for the most part, in the environment and are observable. Indeed the interpretation of automatic actions often takes place after the fact (as noted earlier). This is indicated in Fig. 4.1 by the arrow that leads from action (Box 5) to consciousness or working memory (Box 3).

Feedback from the environment occurs because actions (Box 5) lead to outcomes (Box 6). For example, you turn the steering wheel while driving and the car adjusts direction. For most small actions, feedback is immediate and impacts both consciousness (Box 3) and long-term memory (Box 4). Observed feedback also becomes a stimulus that is subsequently processed by the preconscious screen (Box 1). Thus, whereas its effect on working memory (Box 3) can be direct (when paying specific attention), its effect on long-term memory is mediated by the preconscious screen.

Finally, actions can affect the environment and create their own feedback. Thus, the feedback from action (Box 6) becomes the next stimulus to be processed by the preconscious screen (Box 1). For instance, the fact that a smile at a person was reciprocated can affect your sense that the person likes you. However, had you not smiled in the first place, failing to observe the person smile could automatically lead to inferring less attraction. (For elaboration of the interplay between affect-based choices and experience with outcomes, see also Betsch, chap. 3, this volume).

THE ROLE OF LEARNING

In Hogarth (2001), I noted that tacit learning can take place in environments that are *kind* or *wicked*. Kind and wicked environments are distinguished by the degree to which people receive accurate feedback. In kind environments, people receive timely and veridical feedback; in wicked environments, they do not. This distinction follows the analysis of learning situations developed by Einhorn and Hogarth (1978), which showed that, even in simple tasks, feedback can be distorted by many factors, including the actions that people take. For example, the fact that you take a particular action can prevent you from learning about outcomes associated with the actions you did not take. (For a more detailed discussion of the role of feedback, see Harvey & Fischer, chap. 7, this volume).

The key point is that the accuracy and timeliness of feedback affects the quality of the intuitions we acquire through tacit learning processes. You cannot learn from feedback you do not receive, and some feedback may simply act to increase confidence in erroneous beliefs (Einhorn & Hogarth, 1978). Thus, the quality of intuition is highly dependent on whether it was acquired in kind or wicked environments (see also Kardes, Muthukrishnan, & Pashkevich, chap. 8, this volume).

ON THE RELATIVE VALIDITIES OF TACIT AND DELIBERATE THOUGHT: SOME GENERAL COMMENTS

Recent decades have witnessed much interest in whether people are "good" or "bad" at making judgments and decisions. Several explanations have been offered. Some emphasize the role of individual variables such as experience and training (e.g., Klein, 1998; Ross, Lussier, & Klein, chap. 18, this volume). Others involve the role of incentives (cf. Camerer & Hogarth, 1999), problem formats (e.g., using frequencies instead of probabilities, Gigerenzer & Hoffrage, 1995; whether tasks are continuous or discrete, Hogarth 1981), as well as whether people respond analytically as opposed to intuitively (Stanovich & West, 1998).

Rather than considering this literature within the context of two systems that can produce different responses—"good" characterizing one system and "bad" the other—a more fruitful approach is to specify the relative advantages and disadvantages of both systems.

Consider the following thought experiment. You are at the checkout counter of your local supermarket. To assess your bill, you rely on a deliberate process. You let the clerk calculate the amount with an adding machine. As you are preparing to pay, the clerk announces the total—$2,376.53. You are astounded. In fact you had already implicitly estimated that your bill would be around $100. Surely, there must be an error?

This situation illustrates several points. First, although a deliberate process was used to estimate the bill, you still made a tacit estimation. In other words, we do not seem able to suppress the tacit response system.

Second, tacit and deliberate processes rely on different kinds of information. To appreciate this, consider how to model the deliberate and tacit processes involved is estimating your bill. The deliberate process can be represented by a formula,

$$\text{Grocery bill} = \sum_{i} \beta_i x_i,\ i = 1,\ldots\ldots k. \qquad (1)$$

where the x_is represent the prices of the k items purchased and, in this case, the β_is are all equal to 1.

The deliberate approach requires: (a) identifying and defining the variables (the products); (b) defining relevant measures for the variables (the prices); and (c) determining a rule for aggregating the information from the preceding step (arithmetic). Note that deliberate thought requires using information that is not contained in the triggering stimulus—here, the rules of arithmetic.

This example shows both the strengths and weaknesses of the deliberate process. If you define the appropriate variables and measures and use the "right formula" correctly, your solution will match the criterion. However, success depends on executing *all* of these steps correctly.

Now consider how one might model the tacit process. This could be described by an anchoring-and-adjustment process, where the person adjusts the typical bill by a variable capturing "how full" the shopping cart is relative to usual:

$$\text{Tacit estimate of grocery bill} = \alpha \,.\, z \qquad (2)$$

where z represents the typical bill and α indicates the estimate of how full the shopping cart is (relative to its usual level). There are several noteworthy features of this process. First, it is simple to execute (i.e., "fast and frugal"; Gigerenzer, Todd et al., 1999). Second, it uses a variable that is correlated with the criterion (i.e., grocery bills are correlated with the levels of goods in shopping carts). Third, although the estimate is based on only part of the information potentially available (the level of goods), this acts as a surrogate for the total. In addition, there is no need to access additional information such as the rules of arithmetic.

In this case, the tacit response is quite effective. However, this depends on the fact that the stimulus that triggered the response (i.e., the level of goods) is a good predictor of the criterion. Alternatively, imagine having bought an unusually expensive mix of products such that the level of goods is a biased estimator of total cost.

EVIDENCE ON THE RELATIVE VALIDITIES OF TACIT AND DELIBERATE RESPONSES

As noted earlier, there is much evidence that people process information in two distinctive modes. Moreover, whether the person engages primarily in tacit or deliberate processing depends heavily on the nature of the triggering stimulus as perceived by the individual. For example, although people may not remember the specific stimuli that triggered attitudes toward specific objects, their spontaneous judgments are quite accurate in reflecting the sum of their experiences (Betsch, Plessner, Schwieren, & Gütig, 2001). However, an issue addressed by relatively few studies is the specification of *when, faced by the same triggering stimulus*, it is tacit or deliberate processes that produce more *valid* responses in decision making.

To date, the most complete study of this issue was conducted by Hammond, Hamm, Grassia, and Pearson (1987). They emphasized that most studies have used *indirect* means to assess the adequacy of decision making—typically by comparing decisions with external criteria deemed to be "correct"—for example, the implications of probability theory (e.g., Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1983), the axioms of expected utility theory (e.g., Kahneman & Tversky, 1979), or empirically based criteria (see e.g., Dawes, Faust, & Meehl, 1989).

To address the issue of concern here, therefore, comparisons between tacit and deliberate (or intuitive and analytic) processes need to be *direct*. Facing the same stimuli, do people make decisions that are more valid when they use tacit as opposed to deliberate processes or vice versa?

Hammond et al. made both theoretical and empirical contributions. At the theoretical level, they postulated the existence of a continuum of cognitive styles, on the one hand, and a continuum of task characteristics, on the other. Cognition is assumed to vary from *intuitive* to *analytic* with intermediate or mixed styles labeled *quasirational*. Similarly, tasks can be defined by characteristics that induce intuitive as opposed to analytic thinking or vice versa. Their central hypothesis was that performance would be affected by the degree of match between task and mode of cognition on their respective continua. Thus, tasks with intuition-inducing characteristics are better handled in intuitive mode, and those with analytic-inducing characteristics are better handled in analytic mode. Empirically, in tasks that required experienced highway engineers to judge the safety of highways (based on different presentations of the same information and requiring the explicit use of different modes of thought), their hypotheses were confirmed.

Other studies have also used direct tests. Wilson and Schooler (1991) investigated the effect of introspection, in the form of providing explicit reasons, on the quality of choice. The question posed was whether people are better off trusting their initial feelings or taking time to reason deliberately.

Wilson and Schooler made the point that people cannot always explain why they have certain preferences. That is, many preferences simply reflect often passive interactions with the environment and are not easy to justify on reflection. For example, Betsch, Fiedler, and Brinkmann (1998) demonstrated how time pressure can trigger people's routine responses even when deviating from routine is in their interest. However, in many choice situations, there are also salient and plausible reasons that people recognize as being relevant, which, if they think explicitly, may come to mind. The question is whether thinking explicitly about such reasons changes people's preferences for the better.

In studies of preferences, it is problematic to establish what is or is not "good." Wilson and Schooler studied students' preferences for brands of strawberry jam and college courses and, for both types of stimuli, used expert opinions as the criterion of "goodness." Results show that introspection—or making reasons explicit—led to inferior decisions relative to control subjects who had not engaged in introspection. According to Wilson and Schooler, thinking about the choice led the experimental subjects to consider inappropriate reasons. Thus, had they not spent time in thinking, they would have responded in similar fashion to controls whose initial preferences were closer to the experts' opinions. In a further study, two groups of students evaluated several posters and were allowed to choose one to take home. One group was asked to introspect explicitly about their evaluations; the other was not. About 3 weeks later, the second group was found to be more satisfied with their choices (Wilson, Lisle, Schooler, Hodges, Klaaren, & LaFleur, 1993).

Although studies such as these have been cited as examples of how intuition may be superior to analysis, care should be taken in generalizing. First, what the studies show is that deliberation changes expressed preferences if subjects are unaware of the origins of those preferences (see also Wilson et al., 1993). However, other studies have shown that when people are aware of such origins, these are less likely to be changed by thinking about reasons (Wilson, Kraft, & Dunn, 1989).

Second, decision aids that force people to be explicit about reasons for their decisions heighten satisfaction in choices relative to control groups without such aids (Kmett, Arkes, & Jones, 1999). Similarly, several studies in judgmental forecasting have examined the validity of "decomposition" methods, in which people split the prediction task into subtasks, make judgments about the parts, and then aggregate the different judgments. Decomposition methods prove more accurate than directly estimating the outcome (MacGregor, 2002).

Third, McMackin and Slovic (2000) both replicated Wilson and Schooler's results and emphasized the importance of understanding the joint effects of types of task and cognition emphasized by Hammond et al. (1987). Specifically, McMackin and Slovic asked two groups of subjects to make judgments in two tasks: assessing how much people would like advertisements (an "intuitive" task), and estimating uncertain facts such as the length of the Amazon River (an "analytical" task). One group of subjects was just asked to answer the questions; the other was explicitly instructed to provide reasons for their answers. Results show that, for the intuitive task (advertisements), providing reasons had a negative effect on performance, thereby replicating Wilson and Schooler. In contrast, generating reasons had a positive effect on performance in the uncertain facts task. Thus, McMackin and Slovic also replicated the results of Hammond et al. (1987) involving the interaction of type of cognition with type of task (i.e., "intuition" was seen to be more valid in an "intuitive" task and "analysis" in an "analytic" task).

Fourth, there is much evidence that verbalizing thoughts leads to more deliberate thinking and cuts off access to tacit processes (Schooler, Ohlsson, & Brooks, 1993). What needs to be made clearer, however, is whether and when this leads to "better" outcomes (Schooler & Dougal, 1999). For example, when subjects engaged in problem solving are asked to verbalize their thoughts, this has deleterious effects on problems that require "insightful" solutions, although not on more analytical problems. Similarly, recognition memory is highly dependent on the tacit system and can be less accurate if people are asked to make explicit use of the deliberate system through verbalization (Schooler & Engster-Schooler, 1990).

INTUITION (TACIT THOUGHT) OR ANALYSIS (DELIBERATION)?

To summarize, tacit thought is based on part of the information present in the triggering stimulus, and its accuracy depends on the extent to which this leads to biased responses. Tacit thought typically involves approximate answers. Thus, even when a series of tacit responses might be unbiased (in a statistical sense), specific responses will involve some error. In deliberate thought, accuracy depends on whether the person knows and is able to apply the "correct formula." Unlike errors from tacit responses, errors in deliberate thought tend to have an "all or nothing" quality. (Recall the example of the checkout counter.) Let us now examine the trade-off between errors involved in the two kinds of thought.

Of course, there are many cases in which tacit responses are biased, but where such biases are functional (e.g., reactions to potential sources of danger). Ignoring these kinds of cases, bias in tacit decisions will reflect the conditions in which response tendencies have been learned. Were these acquired in *kind* or *wicked* learning environments? Similarly, is there bias in the information on which tacit responses are based?

In deliberate thought, what is the probability that the person will know and apply the appropriate "formula" correctly? Two factors are critical. One is how the problem is presented (i.e., does this invite use of the appropriate formula?). The second (possibly related to the first) is the complexity of the problem as presented. In the following, I assume that the probability that a person knows and applies the appropriate formula correctly is a monotonic function of the *analytical complexity* of the task. In other words, the greater the complexity a task exhibits in analytical terms (as measured, e.g., by the number of variables, types of functions, weighting schemes, etc.), the less likely it is that a person will both know the appropriate formula and apply it correctly. (Individuals vary, of course, in the extent to which they perceive tasks as analytically complex.)

Consider, for example, the experiment of McMackin and Slovic (2000) described earlier. From an analytical viewpoint, it is difficult to judge whether people will like an advertisement. (What are the appropriate variables and how should they be measured and combined?) Thus, an intuitive judgment based perhaps on how much the people just liked the advertisement would be a more valid response (assuming no significant bias). Similarly, when asked the length of the Amazon River, a first intuitive response could be biased by different sources of information. (What were the last distances in your mind?) Thus, thinking through different explicit reasons would not be difficult analytically and could help improve the accuracy of the response.

Figure 4.2 explores the trade-off between bias in tacit (intuitive) thought and the effects of analytical complexity in deliberate thought (analysis). It shows how the differential accuracy of the two modes varies when tasks are characterized by the extent to which they (a) induce different levels of bias in tacit thought, and (b) vary in analytical complexity. To simplify, I have considered three levels of each variable and thus nine types of situation. Bias is characterized as being "large," "medium," and "small/zero"; analytical complexity is said to be "easy," "moderate," or "hard." For the moment, I ignore individual differences.

Consider Cell 1, where bias is large, but the level of analytical complexity is easy. Here deliberation is likely to be more accurate than tacit thought. An example is provided by the Müller–Lyer illusion. A tacit judgment suggests that one line is larger than the other. However, the deliberate use of a ruler can demonstrate that both lines are equal.

However, note that as analytical complexity increases, the differential accuracy between the two types of thought is predicted to decrease. In Cell

Bias and error implied by tacit processes	Analytical complexity: Easy	Moderate	Hard
Large	1 D > T	2 D > T	3 ?
Medium	4 D > T	5 D ~ T	6 T > D
Small/zero	7 D = T	8 T > D	9 T > D

D > T means deliberate thought more accurate than tacit
D ~ T means deliberate and tacit thought approximately equally accurate
D = T means deliberate and tacit thought equally accurate
T > D means tacit thought more accurate than deliberate

FIG. 4.2. The relative accuracy of tacit and deliberate thought.

2—with moderate analytical complexity—deliberation is still preferable to tacit thought. (Imagine other optical illusions where people cannot resolve uncertainty by using a simple analytical device.)

In Cell 3—when analytical complexity becomes hard—it is not clear whether the errors of deliberate or tacit processes would be greater. Consider, for example, a person making a complicated investment but lacking relevant experience. The person could be biased by misleading prior experience and also lack the analytical ability to make the appropriate deliberate decision. However, it is not clear which error would be greater.

The interaction between bias and analytical complexity is most clearly illustrated in Cells 4, 5, and 6, where bias is maintained at a "medium" level. When analytical complexity is easy, deliberate thought should be preferred to tacit. For example, consider a simple base-rate task such as the "engineer-lawyer" problem (Kahneman & Tversky, 1973). This is not analytically complex (for most people), and even approximate use of the correct formula will be more accurate than the prototypical tacit response. However, as analytical complexity increases, tacit processes become progressively more accurate in a relative sense (Cells 5 and 6; i.e., the increasing probability of making errors in analysis eventually outweighs the bias and error inherent in tacit responses).

Finally, consider Cells 7, 8, and 9, where the bias from tacit thought is insignificant. For tasks that are easy in analytical complexity (Cell 7), there should be no difference in accuracy between deliberate and tacit responses. Consider adding two numbers explicitly (e.g., 2 + 2 = 4) or simply recognizing the pattern that the sum of two numbers makes (e.g., 4 can be "seen" to result from 0 and 4, 1 and 3, and 2 and 2). However, for moderate and hard levels of analytical complexity (Cells 8 and 9), tacit process responses are predicted to be more accurate. For example, when people are asked to judge frequencies spontaneously, they are quite accurate at doing so. However, if they think explicitly about this task, their judgments can be biased by the availability of exemplars (Haberstroh & Betsch, 2001).

Similarly, many areas of expertise depend on perceptual processes and use of the recognition heuristic for tasks that are difficult to analyze (Goldstein & Gigerenzer, 2002; see also Plessner, chap. 17, this volume; Ross, Lussier, & Klein, chap. 18, this volume). Presumably, these tasks fall in Cells 7, 8, and 9 as would the everyday ("nonexpert") use of our perceptual processes for a wide range of tasks. These can vary from discriminating between real and simulated phenomena from filmstrips (see Hogarth, 2001, chap. 4) or predicting teaching ability based on "thin slices" of behavior (short video clips; Ambady & Rosenthal, 1993).

The purpose of Fig. 4.2 is to provide a framework for considering the conditions under which tacit (intuitive) or deliberate (analytic) thought is likely to be more valid. In summary, deliberate thought is predicted to be more accurate than tacit thought in Cells 1, 2, and 4; intuitive thought is predicted to be more accurate than deliberate thought in Cells 6, 8, and 9; no differences are predicted in Cell 7; differences in Cell 5 will be small; and no predictions seem possible for Cell 3. Whereas this framework has not been empirically tested as such, it provides a means for classifying and thinking about studies that have been reported in the literature. Finally, one aspect not explicitly addressed here is the role of individual differences. Clearly people vary in their susceptibility to bias in tacit thought (depending on their learning history), and certainly expertise affects the extent to which people perceive tasks as analytically complex. Thus, the framework could also be adapted to predict when and where people with differential experience in specific domains would be better advised to trust their "analysis" or "intuition."

TOWARD MORE VALID JUDGMENTS AND DECISIONS

As this chapter shows, attempts to define the circumstances under which tacit (intuitive) or deliberate (analytic) judgments and decisions are likely to be more accurate raise a host of interesting issues. On the one hand, it is necessary to have a holistic view of how tacit and deliberate processes interact. On the other hand, one also needs to specify much of the minute details of each system. By looking at the operation of both systems in tandem, one is struck by senses of both complexity and efficacy. The human system is complex, but it is also effective at handling a wide variety of different cognitive tasks.

Although effective, we know that the human cognitive system is not perfect in the sense that people's judgments and decisions still involve errors that cannot be attributed merely to random events in the environment. An important issue, therefore, is how to help people achieve their goals by making fewer errors; indeed a large part of our educational system is dedicated toward this objective. As educators, we spend much time teaching analytic methods designed to help people hone their capacity for deliberate thought. It could also be argued that when such reasoning is assimilated, people can learn to use some tools of analysis in tacit fashion. However, what is not done is to train people explicitly in how to develop their capacity for intuitive thought.

In Hogarth (2001, chaps. 6, 7, & 8), I provide a framework and many suggestions as to how people can develop their intuitive skills. Central to these ideas is the notion that our tacit systems are constantly honing our responses to the feedback we receive in the environments in which we operate (recall the prior discussion on *kind* and *wicked* learning environments).

Thus, selecting appropriate learning environments and monitoring the kinds of feedback that we receive must rank high on the conditions that foster the acquisition of good intuitions. In addition, I believe that people need to be more aware of how often they allow themselves to take decisions automatically as opposed to exercising greater cognitive control (as elegantly discussed by Langer, 1989).

In the scientific study of decision making, there is undoubtedly a bias toward studying processes underlying *important* decisions. Yet it can be argued that it is the aggregate effects of *small* decisions that are more important for the ultimate quality of our lives. Moreover, many of these decisions reflect tacitly acquired routines and habits that escape our conscious control (cf. Betsch, Haberstroh, Glöckner, Haar, & Fiedler, 2001; Verplanken, Myrbakk, & Rudi, chap. 13, this volume). Greater awareness of the dual nature of thought can, by itself, lead to better use of our limited cognitive resources.

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