Perspectives on the Nature of Intellectual Styles

EDITED BY

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Rick and Rhea know the material they have learned for their business administration class equally well. Yet, Rick will get an A in the course and Rhea will get a B–. How is this possible? Does the teacher discriminate against women? Does Rhea fail to show up for classes? Was Rhea sick the day of the final exam?

What teachers assume is a difference in students’ knowledge of course material may be nothing more than differences in styles of learning or thinking (Sternberg, 1997). For example, two students may know course material equally well, but one may have a style that thrives on multiple-choice testing and the other have a style that thrives on essay testing. In this case, if Rick and Rhea both take one or more multiple-choice tests, Rick may have a substantial advantage over Rhea.

Of course, this example is hypothetical and it may sound as though the whole concept of differences due to mode of testing is hypothetical as well. Yet, Hedlund, Wilt, Nebel, Ashford, and Sternberg (2006), studying the performance of students in a business school, found precisely the result described here for male versus female test takers. When the multiple-choice GMAT was used to assess students, men had a substantial advantage. When a supplementary, essay-based test was used instead, women had a substantial advantage. When both kinds of tests were used together, the two sexes did equally well. In other words, modality of testing made a large difference, a result comparable to that found by Sternberg and the Rainbow Project Collaborators (2006) when comparing results for different ethnic groups on college admissions tests.

Intellectual styles, an umbrella term for such constructs as cognitive styles, learning styles, teaching styles, and thinking styles, refers to people’s preferred ways of processing information. One kind of preference is for mode of testing, which in turn can result from differences in thinking styles. Someone with what Sternberg (1997) calls a “legislative” style tends to prefer a free-form essay test whereby he or she can think
freely and creatively. Someone with an “executive” style tends to prefer a multiple-choice test that is more constrained.

Since the 1930s, styles have been the focus of research by many scholars, though levels of interest have waxed and waned in the past 70 years. Several factors contributed to the lapse of interest (see Sternberg, 2001; Sternberg & Grigorenko, 1997).

First, some of the early theories proposed styles that were clearly distinguishable neither from abilities nor from personality traits. Second, many of the early theories not only were of isolated styles but also made little contact with other general literature in psychology and education. Third, the quality of some of the early empirical research was variable. Sternberg (2001) asserted that the major factor responsible for the untimely demise of styles research in the 1970s was the fact that the styles literature had failed to provide “any common conceptual framework and language for researchers to communicate either with one another or with psychologists in general” (Sternberg & Zhang, 2001, p. 250).

Styles have re-emerged as an area of interest because progress has been made in each of the aforementioned areas, although to varying degrees (see Sternberg, 2001). The field of styles has flourished in the past decade or so.

We had three motivations for editing this book. First, as just noted, after a quiescent period, the field of styles has become highly active. Even since the work of Zhang and Sternberg (2006), which covered research through 2005, substantial new empirical evidence has been accumulated. For example, in the last three years, the context of online learning environments has been a topic of special interest (e.g., Grigoriadou, Papanikolaou, & Gouli, 2006). As another example, empirical studies examining the nature of intellectual styles have been conducted (Betoret, 2007; Fan, 2006). Also, new inventories are being used in business settings (see Sternberg, Wagner, & Zhang, 2003; Zhang, 2005; Zhang & Higgins, 2008). Second, there is now more internal dialogue among workers in the field (Zhang & Sternberg, 2005).

Finally, in the field of styles, at least three major controversial issues are unresolved. The first is whether certain styles are better than others, that is, whether they are value laden. The second is whether styles are traits versus states. The third is the extent to which distinctly named styles are different constructs. These issues are important because the confusion over them has slowed the advancement of the field. Practitioners have also been more hesitant to use the concept of styles in their work. For example, if styles represent fixed traits, any attempt to teach
or develop particular styles would probably be in vain. If they are fluid, attempts at teaching and development might make good sense. Thus, addressing these issues has the potential for both advancing the field of styles and providing concrete guidelines for practitioners regarding how styles can be understood and used.

The main goal of this book is to integrate the most recent theories and research on intellectual styles. Specifically, the book intends to achieve five objectives: (a) to further distinguish styles from other constructs; (b) to foster a more profound internal dialogue among people in the field; (c) to situate the field of styles better within the larger context of the psychological, educational, and business literatures; (d) to present perspectives on the three controversial issues mentioned earlier; and (e) to provide more concrete guidelines for practitioners to apply the concept of styles to educational and business settings.

We asked leading worldwide experts in the field of intellectual styles to contribute chapters on topics that would facilitate the achievement of these objectives. We received an overwhelmingly positive response, enabling us to build a platform for leaders in the field to discuss various issues that are important from their perspectives. All the authors are scholars who have made major theoretical contributions, published important empirical data, or both. We attained international representation, including many of the major leaders who are currently active in the field of intellectual styles.

The book will be of interest to diverse audiences. Researchers in the field of intellectual styles and in related fields will be interested in the book as a basis for designing and conducting rigorous research projects. Educators will be interested in the book for ideas as to how to enhance their teaching and the psychological well-being of their students, as well as for providing means to foster their students’ learning and development. Psychologists will be interested in the book because, more and more, researchers are looking for ways to integrate different fields, such as cognition and emotion, and cognition and personality. Because styles are at the interface of cognition and personality, the book provides one means for achieving such integration. Ideas in this book will be of interest to psychologists not only in the fields of cognition and personality but also in the fields of educational psychology, industrial/organizational psychology, consulting psychology, developmental psychology, and student development.

Consultants can help people to understand their own styles and to improve their studying or their job performance by capitalizing on their
strengths and correcting or compensating for their weaknesses. As an example, someone in an auditing job will perform best if he or she is able to apply, as needed, a local style—concentrating on details—whereas someone in a top leadership position in any field will, for the most part, need a more global style—concentrating on large, long-term issues, while at the same time having advisors and subordinates who attend to local issues. CEOs and presidents with a local style risk getting enmeshed in details and losing the big picture of the work they are doing. They may under-perform because their style does not match their work.

Leaders in academic institutions and in business settings alike may be interested in the book because it is relevant to both successful recruitment and effective management of human resource portfolios. Undergraduate and graduate students in business management, education, and psychology (as well as those in other fields such as computer science, law, linguistics, and nursing) should be interested in the book because it will provide a window for them to see a more comprehensive and updated picture of the field of styles. Finally, laypeople may be interested in learning more about their own styles, how these styles affect their lives, and how they might use their knowledge of styles to improve their lives.

Existing work on styles should have exerted a stronger impact than it has on educators and human resource personnel. In educational settings, for example, knowledge about the match or mismatch of styles between teachers and students matters not only for students' academic achievement but also for their affective development. Such knowledge could help teachers to increase the effectiveness of their instruction and assessment. Moreover, teachers who take styles into account could be more confident in their ability to show sensitivity to the cultural and individual diversity that is so often absent in the classroom. For example, Nisbett (2003) found that North American students have a more linear style of thinking, whereas Asian students have a more dialectical style.

Although styles are primarily of interest in education, they are also of great interest in business. For example, the Myers-Briggs Type Indicator (MBTI; Myers, McCaulley, Quenk, & Hammer, 1998) and the Kirton Adaption-Innovation inventory (KAI; Kirton, 1976) are widely used in business as assessment tools for selection, placement, staff development, and organizational development. Laypeople may be interested in understanding their own styles and the effects of these styles on their daily life.
The principal chapters in this volume are divided into two parts. Part I includes five chapters, each having its focus on a particular kind of model of styles. Part II comprises five chapters, each placing its emphasis on the application of styles. Together, the two parts provide a comprehensive overview of the field of intellectual styles as it exists today.

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REFERENCES


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Models
A Duplex Model of Cognitive Style

EUGENE SADLER-SMITH

The question of whether human beings represent, organize, and process information in two contrasting modes has been debated in psychology for over a century, from Galton, James, Freud and Jung, up to the present (see Riding & Rayner, 1998). Such differences can be conceptualized in terms of cognitive style, defined by Messick (1976) as “consistent individual differences in preferred ways of organizing and processing information and experience” (p. 4). Styles have held particular allure for researchers and practitioners in a number of applied fields, including education and business management. The significance and popularity of cognitive styles as an area of research has waxed and waned, and it is regrettable that scientific progress has been impeded by a lack of coherent and useful theories (Kozhevnikov, 2007).

In this chapter I will argue that dual-process theories provide a simple and compelling conceptual framework for a model of cognitive style based on the workings of an intuitive (experiential) system and an analytical (rational) system (see Epstein, 2008). Within such a framework, affect and cognition may be thought of as parallel interacting processes that influence thought and behavior in an adaptive manner. The two modes of thought (intuitive and analytical) are qualitatively different in terms of, among other things, their perceptual processes, speed of operation, rate of formation, levels of conscious awareness, underlying
neural mechanisms, and their outcomes and effects. I will propose that a much-needed alternative to the dearth of theory and the plethora of measures that has dogged learning styles and cognitive styles research is to be found in a duplex model of style based on a distinction between an intuitive mode and an analytic mode of information processing (see Epstein, 2008) and a versatile style, which is a product of the interplay between these two modes.

**BACKGROUND**

Although many different labels are used for the concepts of style (see Riding & Rayner, 1998), *cognitive style* (rather than *thinking* or *learning* style) will be my preferred term since it is commensurate with the dual-process stance derived from social cognition research adopted in this chapter. I will use the term *cognitive style* to refer to relatively stable states that people have a proclivity to enter into that are more or less adaptive under different sets of circumstances (Zhang & Sternberg, 2005). Cognitive styles are malleable to the extent that they can be adapted to changing environmental demands and modified by life experiences (Kozhevnikov, 2007) and serve as “high level heuristics” that organize the deployment of strategies, operations, and propensities (including abilities) in complex processes such as “problem solving and learning” (Messick, 1976, p. 9). In spite of attempts to unify styles around one superordinate analytical-wholistic dimension (e.g., Allinson & Hayes, 1996), recent findings cast serious doubt on this dimension’s unitary nature and suggest a more complex hierarchical organization of style consisting of at least two subordinate dimensions (Kozhevnikov, 2007).

In a review of cognitive styles from the perspective of business and management, Sadler-Smith (in press) concluded that if cognitive style is to achieve its potential in making a more meaningful contribution to management research and practice, there are a number of crucial issues that styles researchers must address:

1. **Reliability and validity of assessment**: It is axiomatic that the measurement of cognitive style must employ instruments that are not only reliable and valid but have a robust theoretical basis. Disappointingly, even among the models that were judged favorably in the critical review by Coffield, Moseley, Hall, and Ecclestone (2004), a number of weaknesses in this regard
emerged, including problematic issues of reliability regarding the Cognitive Styles Analysis (Peterson, Deary, & Austin, 2003) and construct validity of the Cognitive Style Index (Hodgkinson & Sadler-Smith, 2003).

2. **Commonality of conceptual framework and shared theoretical basis:** The study of cognitive style would benefit considerably from a unifying model or conceptual framework (Sternberg, 1997, p. 149) underpinned by a coherent and current body of psychological theory.

3. **Integrated and interdependent nature of human thinking:** A problem with the notion of the polarization as opposites of contrasting styles (e.g., verbal or visual) is that complex, real-world tasks make demands on complementary modes of processing (e.g., visual and verbal, analytic and wholistic, intuitive and rational, divergent and convergent). In reality these are interdependent and integrated aspects of information processing that have each evolved for their own adaptive purposes. In the modern world a vital learning and managerial competence is the ability to take decisions and solve problems in cognitively versatile ways that integrate different modes of thinking (Coffield et al., 2004; Hodgkinson & Clarke, 2007; Hodgkinson & Sparrow, 2002; Louis & Sutton, 1991).

4. **Failure to draw on recent advances in cognitive and social psychology and cognitive neuroscience:** There were promising moves in the latter direction when in the 1990s Riding and his colleagues conducted research using electroencephalograph (EEG) techniques in an attempt to identify the neural correlates of the wholistic-analytical and verbal-imagery styles of processing (see Riding, Glass, Butler, & Pleydell-Pearce, 1997). However, with a small number of exceptions (Gevins & Smith, 2000; Goode, Goddard, & Pascual-Leone, 2002; Kozhevnikov, Kosslyn, & Shepard, 2005), the current generation of styles researchers has yet to take advantage of EEG or the more sophisticated imaging techniques such as PET and fMRI, which may help shed light on the neural correlates of differential processing modes and the biological nature of stylistic differences.

The inevitable conclusion is that cognitive styles research—including that which draws on the best of the available models and measures of
cognitive styles—is beset by problems in relation to the four issues outlined in the preceding list. A continued proliferation of weakly theorized measurement instruments will inevitably further dilute the styles concept and consign it to applied fields and the margins of mainstream psychological and social scientific inquiry—very much a reversion to the position it occupied in the 1970s (see Kozhevnikov, 2007). In the fullness of time, this could sound the death-knell for cognitive styles as a field of research characterized by both scientific rigor and practical relevance.

A DUAL-PROCESS CONCEPTUALIZATION OF COGNITIVE STYLE

Conspicuous by its absence from the influential critical review of styles by Coffield and his colleagues is any mention of dual-process formulations of human reasoning, as discussed by researchers such as Chaiken and Trope (1999), Evans (2003), and Stanovich and West (2000). This is symptomatic not necessarily of an oversight on Coffield et al.’s part (given their aims), but of the fact that cognitive styles researchers themselves have ignored or overlooked a potentially important body of theory and research, for example as did Sadler-Smith (1998). It is an omission that is all the more surprising given the significance that cognitive and social psychologists have accorded dual-process theories (Evans, 2008) and the qualitative (i.e., stylistic) differences attributed to the different forms of reasoning posited therein (Epstein, 1994, 2008).

Two Systems of Reasoning

Stanovich and West (2000) distinguished between two fundamental types of human information processing for which they use the generic terms “System 1” (contextually dependent, associative, heuristic, tacit, intuitive, implicit/automatic, fast, and cognitively undemanding) and “System 2” (contextually independent, rule-based, analytic and explicit, slow, and cognitively demanding; Stanovich & West, 2000). Evans (2003) described such theories as essentially positing the existence of “two minds in one brain” and summarized the distinctions thus:

1. **System 1**: old in evolutionary terms, universal amongst humans and shared with other animals, it comprises a set of autonomous subsystems that includes innate input modules and domain-
specific knowledge acquired by domain-general learning mechanisms. Its workings are unconstrained by working memory capacity and it is independent of “general intelligence”;

2. **System 2**: evolutionarily recent, heritable and distinctively human; its workings permit abstract, analytical and hypothetical reasoning processes constrained by working memory capacity and correlated with measures of general intelligence. (p. 454)

As Evans (2008) noted, the intuitive heuristic judgments researched by Kahneman, Tversky, and their colleagues (Gilovich, Griffith, & Kahneman, 2002) are associated with System 1 processing. In numerous rigorously executed experiments, such heuristics (essentially error-prone mental shortcuts) have been shown to lead to severe and systematic errors and biases in reasoning (Kahneman & Tversky, 1982). However, these arguably low-level heuristics deployed intuitively and with low cognitive effort are of a quite different and simpler order to the complex, nonconscious reasoning processes (see Lewicki, Hill, & Czyzewska, 1992) that result in intuition as defined by Dane and Pratt (2007, p. 40): “affectively charged judgments that arise through rapid, non-conscious and holistic associations.” Table 1.1 presents a number of dual-process theories (see Evans, 2008; Stanovich & West, 2000).

Given that cognitive styles are qualitatively different forms of thinking unrelated to ability, and with a predictive power beyond general abilities (Kozhevnikov, 2007; Sternberg & Zhang, 2001), any correlation of System 2 (in general) with intelligence creates a difficulty regarding System 2 processes as a dimension of cognitive style. A similar issue proved all but fatal for one of the first dimensions of cognitive style to be systematically researched: The fact that measures of field independence (e.g., the Embedded Figures Test, EFT) are positively correlated with intelligence (Goldstein & Blackman, 1978; MacLeod, Jackson, & Palmer, 1986; McKenna, 1984) led Sternberg to argue that “a significant portion of the genetic variance in field dependence-independence [up to 60%] is explainable by genetic variation in intelligence” (1997, p. 7), thus undermining its status as a style.

Stanovich (2002) drew a conceptual distinction between algorithmic-level individual differences (intelligence) and intentional-level individual differences and observed that correlations between the two levels are less than unity; therefore it is entirely feasible for the intentional (e.g., a rational style of processing) and the algorithmic (intelligence) levels to dissociate. Moreover, Stanovich (2002) also argued that identifying
### A Selection of Dual-Process Theories in Relation to Intuitive/Analytic Processing

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Adapted from Evans (2003, 2008), Sadler-Smith (in press), Stanovich (2002), and Stanovich & West (2000).
rationality with the intentional level and intelligence with the algorithmic level opens the door to resolving the paradox of the seemingly conflicting roles of emotion and rationality. Consequently, identifying rationality with style (intentional level) rather than assuming it is synonymous with intelligence (algorithmic level) may help to resolve any paradox in the roles played by intuition and analysis in human reasoning: Analysis is not a synonym for intelligence, nor is it an antonym for intuition.

Affect (including emotion) is not necessarily the enemy of reason. Its adaptive function may be to truncate the “combinatorial explosion” of conscious reasoning that might occur if System 2 tried to compute all possible alternatives and their relative utilities (Stanovich, 2002, p. 145). This view squares well with the somatic marker hypothesis (SMH) proposed by Bechara, Damasio, and their colleagues (Bechara, 2004; Bechara, Damasio, Tranel, & Damasio, 1997; Damasio, 1994). Essentially the SMH posits that a gut feeling serves a computational role by intervening in order to provide a somatic signal of attraction toward (positive valence) or avoidance of (negative valence) a possible course of action (Bechara et al., 1997; Pollock, 1995; Stanovich, 2002). Hence, if certain aspects of a dual system of thinking (such as analysis and intuition) are adaptive under different sets of circumstances (i.e., contextually appropriate) one system could not, of necessity, be deemed superior to the other.

A further difficulty for a duplex model of style is encountered if intuitions are equated merely with heuristic judgments (see Sadler-Smith & Sparrow, 2008). As noted previously, System 1 processes are automatic, associative, and heuristic. It is well-established that errors of reasoning associated with heuristics such as representativeness, availability, and anchoring-and-adjustment can lead to judgments that violate the laws of probability and rationality (Kahneman & Tversky, 1982). However, Lakoff and Johnson (1999) argued that human reasoning is far richer than can be recognized in rational-actor models and probability theory. Metaphorical, frame-based, and prototypical reasoning mechanisms developed in the course of evolution enable Homo sapiens to function as effectively as possible in real-world, everyday life oblivious to the laws of probability and statistics (Lakoff & Johnson, 1999).

The operations of System 1 have their own rationality of purpose (Sadler-Smith, 2008), of the kind that was needed to survive (Lakoff & Johnson, 1999) in the social and natural environment of the Pleistocene. However, the operation of System 1 is by no means redundant in the modern world; Kahneman (2000) himself noted that
System 1 may have its own kind of intuitive intelligence. For example some people may have particularly nuanced and subtle representations of persons and social categories. These people will make better judgements by [the] representativeness [heuristic] than others, and consequently may achieve greater predictive accuracy than others. (p. 683, emphases added)

Compelling evidence for the utility of intuitive reasoning is to be found in research from several applied domains. For example, intuition has a significant and positive role to play in complex, difficult-to-quantify processes in loosely structured situations such as expert judgment under time-pressured conditions (Klein, 1998), creativity (Policastro, 1995), social judgment (Myers, 2002), entrepreneurship (Mitchell, Friga, & Mitchell, 2005), and moral judgment (Haidt, 2001; Sonenshein, 2007).

**COGNITIVE-EXPERIENTIAL SELF-THEORY**

Dual-process theory is an eclectic domain (see Table 1.1). For example, Stanovich and West (2000) listed a dozen different models, including associative/rule-based (Sloman, 1996), implicit cognition/explicit learning (Reber, 1993), intuitive cognition/analytical cognition (Hammond, 1996), recognition-primed decisions/rational choice strategy (Klein, 1998), and experiential system/rational system (Epstein, 1994). The latter, more properly termed cognitive-experiential self-theory (CEST), is described by Epstein, Pacini, Denes-Raj, and Heier (1996) as a global theory of personality that integrates the cognitive and psychodynamic unconscious. Two parallel interactive modes of information processing are posited, the rational (analytic) and the experiential (intuitive). The two modes are served by separate cognitive systems (Epstein, 1994). CEST helps to explain a variety of social behaviors as well as a person’s receptivity to different kinds of complex cognitive tasks such as learning:

> Appeals to emotions, personal experience and the use of concrete examples could be more effective for people who process information primarily in the intuitive mode, whereas presenting facts and logical arguments could be more effective for individuals who process information primarily in the analytic mode. (Epstein et al., 1996, p. 390)

Epstein et al. (1996) speculated that in much the same way as rational processing can be disaggregated into various subcomponents (such as mathematical and verbal), the experiential (intuitive) system may have
Chapter 1  A Duplex Model of Cognitive Style

a hierarchical organization with various subcomponents including visualization, imagination, and aesthetic sensibility. In spite of the fact that it shares many of the features of other dual-process theories, CEST also differs from them in a number of important respects:

1. **Role of affect:** CEST gives greater primacy to affect in its conceptualization of System 1; for example, Shiffrin and Schneider (1977) and Posner and Snyder (1975) emphasize automatic processing and activation rather than affect. Moreover, unlike models of emotional intelligence (Salovey & Meyer, 1995), the use of the term *affect* is not restricted to emotions per se.

2. **Dynamic interplay:** As argued by Evans (2008), each system in CEST has access to distinct forms of knowledge and is linked by two processing styles (modes) that may compete with or complement each other when they engage in what Epstein (2008) terms a “dance” between the two systems.

3. **Value-free:** Each system has its own strengths and limitations, and neither is innately superior to the other (Epstein, 2008, p. 27).

The properties of the rational and experiential systems are summarized in the following sections and in Table 1.1.

**The Experiential (Intuitive) System**

The experiential (intuitive) system is a learning system that operates automatically, preconsciously, nonverbally, rapidly, effortlessly, associationistically and concretely. It is wholistic, associated with affect, and operates on the basis of schemas acquired from lived experiences. It is mediated by vibes from past events, concrete images, metaphors, and narratives, and it operates rapidly and with immediate effect. The experiential system is slower to form and more resistant to change than the rational system, and it changes with repetitive/intense experience (Epstein, 1994; Epstein et al., 1996). The experiential system is imagistic and nonverbal (Paivio, 1971) in that it encodes reality in concrete images, metaphors, and narratives. The experiential system is able to “effortlessly direct behavior in everyday life,” is a source of “motivation and passion,” and enables wholistic problem solving of a different order than that achievable by the rational system alone (Epstein, 2008, p. 26). The experiential system plays an important role in creativity, humor, and interpersonal functioning (Norris & Epstein, 2007). Intuition is a “subset of experiential processing” (Epstein, 2008, pp. 28–29).
The Rational (Analytical) System

The rational (analytical) system is an inferential logical system that operates consciously, primarily verbally, slowly, and effortfully; it is abstract, analytic, and affect-free, and it is evolutionarily the more recent of the two systems (Epstein, 1994, 2008). The operations of the rational system are analytic, intentional, effortful, logical, and mediated by conscious appraisal of events. It is slower, with a more delayed action than the experiential system but changes more rapidly on the basis of strength of argument and new evidence (Epstein, 1994; Epstein et al., 1996). The rational system is verbal (Paivio, 1971) in that it encodes reality in abstract symbols, words, and numbers.

CEST and related dual-process theories (e.g., Sloman, 2002) provide a simple yet compelling conceptual framework for cognitive style based on the parallel workings of an intuitive system and an analytical system. The two modes, which represent the operation of each system, are qualitatively different in terms of the type of data on which they draw, their operating principles, and their outcomes (Smith & DeCoster, 1999). The two systems interact both in their formation and in their operation. For example, in complex tasks under time-pressured conditions, intuitions—referred to by Simon (1987, p. 63) as “analyses frozen into habit and into the capacity for rapid response through recognition”—enable experts to arrive at involuntary, affectively charged, wholistic judgments (Dane & Pratt, 2007; Klein, 1998). Informed intuitive judgment draws on implicit and explicit knowledge that has become compressed into expertise through appropriate learning, exposure and practice, and feedback (see Hogarth, 2001, 2008) and is not something that a novice is able to execute effectively (Dreyfus & Dreyfus, 1986). Moreover, while microlevel neurobiological explanations of cognitive operations may be unnecessary for most purposes (Hofstadter, 2007), it is of interest and relevance that there is accumulating evidence indicating the brain structures that are activated when these modes of thought are engaged (see Kruglanski & Orehek, 2007; Lieberman, Jarcho, & Satpute, 2004).

A DUPLEX MODEL OF COGNITIVE STYLE

The duplex model of style based on dual-process theory in general, and CEST in particular, proposes two fundamental information-processing modes that individuals preferentially engage in during decision making
and problem solving. The intuitive mode is affect-laden, comparatively fast in operation, slow in formation, parallel and wholistic, involuntary, cognitively undemanding, imagistic/narrative-based, and unavailable to conscious awareness. The analytic mode is affect free, comparatively slow in operation, fast in formation, serial and detail-focused, intentional, cognitively demanding, abstract/symbolic-based, and open to conscious awareness (Epstein, 1994; Lieberman, 2007; Sloman, 2002; Smith & DeCoster, 1999; Stanovich & West, 2000) (see Table 1.1).

When averaged out over a variety of tasks and the longer term, the majority of individuals have a proclivity to process information using either the intuitive mode or the analytic mode. These predispositions develop as a result of a variety of factors, including age, gender, personality, ability, education, and experience, and the nature of the task (Agor, 1989; Allinson & Hayes, 1996; Betsch, 2004, 2008). For example, Betsch (2004) found that people were able to adapt to the requirements of the situation by choosing the appropriate strategy (e.g., opting for intuition when intuitive judgments were appropriate), but preferences led certain individuals to choose intuition more frequently than deliberation (analysis) across all scenarios; that is, certain people tended to opt for their preference (intuition or analysis) in spite of the demands of the task (see Betsch, 2008). About two-thirds of Betsch’s sample were either high on intuition and low on deliberation (analysis) or vice versa, while the remaining third were high or low on both scales, indicating that they use intuition or deliberation without clear preferences (Betsch, 2008). Similarly, Agor (1989), in his research with senior business executives, identified three different approaches to decision making: (a) giving intuition a free rein in order to foresee the correct path to follow and to avoid a rigorous step-by-step method (Agor described this group as “explorers”); (b) using a structured decision-making system that involved gathering and analyzing all the relevant data (“synthesizers”); and (c) cross-checking initial intuitive feelings against the data (“eclectics”). The duplex model of style, which shares some of the features both of Betsch’s and Agor’s conceptualizations as well as other two-dimensional frameworks (see Hodgkinson & Clarke, 2007; Sadler-Smith, 2002; Whetten, Cameron, & Woods, 1994), is summarized in Table 1.2 and Figure 1.1.

Zhang and Sternberg (2005) identified three controversial issues that are presented in the field of styles research, namely: (a) style as value-laden versus value-free: for example, they argue that the majority of styles that they identified as Type II (including those labeled as “surface,” “conventional,” “analytic,” “sensing,” “judging,” “concrete,”
THE DUPLEX MODEL OF STYLE

BASES OF THE DUPLEX MODEL OF STYLE

**Intuitive and analytic modes**

1. Intuition and analysis are two unipolar dimensions of information processing.
2. Intuition and analysis are complementary information-processing modes to which most people have access.
3. The intuitive and analytic modes are contextually appropriate and hence value-free.
4. When averaged out over tasks there are differences between individuals in their propensity to deploy the analytic or intuitive mode; that is, they are relatively stable states.

**Versatile cognitive style**

5. The extent to which an individual is able to deploy the intuitive or analytic mode in ways that are contextually appropriate is termed **cognitive versatility**.
6. Cognitive versatility is: (a) differentiated and (b) value-laden.
7. An individual’s propensity to deploy the intuitive or analytic mode in contextually appropriate ways is developable and may lead to enhanced cognitive versatility.

Table 1.2

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<td>&quot;sequential,&quot; &quot;adaptation,&quot; &quot;impulsivity,&quot; &quot;convergent thinking,&quot; &quot;field dependent,&quot; &quot;executive,&quot; &quot;local,&quot; &quot;conservative,&quot; and &quot;monarchic&quot;) are &quot;predominantly negative&quot; (p. 40, emphasis added); (b) styles-as-traits versus styles-as-states: thinking styles represent states rather than traits because they can be socialized and modified; (c) styles-as-different-constructs versus styles-as-similar-constructs: styles constructs overlap to varying degrees—for example, any one of the 10 styles models Zhang and Sternberg (2005) included in their threefold model of intellectual styles has been shown to be correlated with at least one of the other style constructs. In the duplex model of style in terms of these three issues it is argued that:</td>
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Chapter 1  A Duplex Model of Cognitive Style

1. Everyone (except for individuals who have incurred damage through injury or disease to the neural circuitry that infuses decision making with affect—see Damasio, 1994) has access to the intuitive and analytical modes in greater or lesser degree. The modes are modifiable by learning, development, and socialization. For the majority of people, each mode is a propensity for which they express preferences, averaged out over tasks and the longer term.

2. Styles are value-free in general, and only value-laden under certain sets of circumstances. The analytical mode and the intuitive mode each has its strengths and weaknesses; each mode can be positive under particular sets of circumstances, and education and training interventions have been designed and applied that have striven to make individuals both more analytic (much of education is directed toward the development of analysis; Bloom, 1956)\(^7\) and, admittedly to a lesser extent, more intuitive

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**Figure 1.1** The duplex model of style.
(see Robinson, 2006; Sadler-Smith & Shefy, 2007). In terms of the threefold model (Zhang & Sternberg, 2005), the versatile style corresponds to the notion of a Type III style: it is differentiated in that it can be exercised either with the characteristics of a Type I intellectual style (i.e., intuition) or with those of a Type II intellectual style (i.e., analysis).

3. Two fundamental aspects of human information processing are represented by similar constructs referred to under a variety of labels, namely: (a) intuitive: associative, heuristic, tacit, implicit, experiential, recognition-primed, automatic; wholistic; reflexive (System 1); (b) analytic: rule-based, explicit, rational, controlled, analytical, reflective (System 2) (see Evans, 2003; Stanovich & West, 2000, and Table 1.1). Statistically significant correlations have been observed between experientiality as measured by the Rational Experiential Inventory (REI; Epstein et al., 1996) and intuition as measured by the Cognitive Style Index (CSI; Allinson & Hayes, 1996), and between the corresponding rationality and analysis scales (Hodgkinson, Sadler-Smith, & Sinclair, 2006).

Cognitive style in terms of the duplex model of style has a hierarchical structure: At the specialized level, the intuitive mode and the analytic mode represent relatively stable preferences for intuitive processing or analytic processing; at the flexible level, the versatile style is such that intuitive or analytic processing is used interchangeably as the situation demands (see Figure 1.1). Individuals with a versatile style are able to engage in specialized intuitive or analytical processing (solid curved vertical arrows in Figure 1.1); individuals who operate with a preference for a specific mode may require education or training in order to acquire the necessary cognitive strategies to enable them to engage in a mode of processing complementary to their preferred mode and commensurate with the demands of the task they face; that is, analytics need to become more intuitively aware and vice versa (horizontal arrows in Figure 1.1). The issue of whether an individual with a relatively stable preference for intuitive or analytical processing can acquire a relatively stable versatile state is an open question (dashed curved vertical arrows in Figure 1.1) and is an important aim of metacognitive skills training programs (see the “Implications for Learning” section later in the chapter). Furthermore, the issues of the domain-specificity of intuition and analysis, the domain-generality of versatility, how versatility
might emerge ontogenetically from specialization, and how it may have
emerged phylogenetically (see Browne, 1996), are questions for further
theorizing and research.

**ASSESSMENT WITHIN A DUPLEX MODEL OF COGNITIVE STYLE**

Self-report, in spite of its inherent drawbacks, has been the mainstay of
cognitive styles assessment as a means of eliciting individuals’ subjective
perceptions of their preferences for organizing and processing informa-
tion. From the perspective of the duplex model of style, three candidate
instruments may be considered: the Cognitive Style Index (CSI; Allin-
son & Hayes, 1996); the Preference for Intuition and Deliberation scale
(PID; Betsch, 2004); and the Rational Experiential Inventory (REI;
Epstein et al., 1996).

**Cognitive Style Index**

The CSI (Allinson & Hayes, 1996) has been widely used, and its reliabil-
ity is well-established (Coffield et al., 2004). However, the unifactoral
structure of the intuition-analysis construct argued for by Allinson and
Hayes is problematic in the present context in two respects. First, it is
not fully compatible with a dual-process conceptual framework. Second,
it fails to stand up to empirical scrutiny in that exploratory and confir-
matory factor analytical studies suggest that—contrary to the guidance
offered by Allinson and Hayes (1996) and the position adhered to by
Hayes, Allinson, Hudson, and Keasey (2003)—it ought to be scored
as two separate intuition and analysis factors (Backhaus & Liff, 2007;
Coffield et al., 2004; Hodgkinson & Sadler-Smith, 2003).

**Preference for Intuition and Deliberation**

More recently, Betsch (2004) developed the PID for the “reliable, fast
and economical” assessment of individual strategy preferences based
on the presumption that intuition is not the opposite of deliberation
(Betsch, 2008, p. 234). The PID consists of two slightly negatively cor-
related ($p < -0.20$) nine-item scales, PID-Intuition ($0.76 \leq \alpha \leq 0.81$) and
PID-Deliberation ($0.76 \leq \alpha \leq 0.84$). Further concurrent and convergent
validity studies of this instrument are required.
Rational Experiential Inventory

Finally, the REI (Epstein et al., 1996) makes the conceptual presumption of individual differences in preferences for two modes (styles) of processing (intuitive and analytical); the issue of whether these styles are bimodal (i.e., intuitive versus analytical) or unimodal (i.e., intuitive and analytical) was left as an open question by Epstein and his colleagues, to be resolved empirically. Compelling evidence for unimodality was observed from Epstein et al.’s factor and correlational analyses. Specifically, correlations between scores on the intuitive (“Faith in Intuition”) and analytical (“Need for Cognition”) scales of the long (31-item) form of the REI were low and nonsignificant \( (r = -0.07) \), thus indicating that “rational [analytical] and experiential [intuitive] processing are independent” (Epstein et al., 1996, p. 395). A shorter 10-item version of the REI exhibited a similarly low scale intercorrelation \( (r = -0.09) \) (Epstein et al., 1996). An experiential (intuitive) thinking style was found to be positively associated with a variety of constructs, including esoteric beliefs, superstitious thinking, openness, positive thinking, naïve optimism, favorable interpersonal relationships, extraversion, agreeableness, favorable beliefs about the self and the world, sense of humor, creativity, social popularity, empathy, and aesthetic judgment, and negatively associated with categorical thinking (Epstein, 2008, p. 28). The content domain of the REI includes a verbal-visual facet of information processing (Paivio, 1971) to the extent that it aims to assess the role played by visualization in information processing (e.g., “I often have clear visual images of things” and “I am good at visualizing things”).

Within a dual-process conceptualization of style, the CSI, PID, and REI are or may be used as modal measures (Coffield et al., 2004; Hodgkinson & Sadler-Smith, 2003); however, this raises the question of how to assess the versatile style. There are a number of possible approaches. The first, a computational approach, would be to combine intuition and analysis scores from the respective scales of the CSI, PID, or REI in a variety of ways to obtain an overall Cognitive Versatility Index (CVI). A second approach, which may obviate any difficulties associated with respondents not discriminating sufficiently well between modes (i.e., indifferent or muddled responding), would be to develop a separate reliable and valid multi-item scale for the assessment of cognitive versatility per se. Sample items might include “I always run a ‘gut check’ on my analysis” and “I always check to see if my ‘gut feel’ squares with the available data.” In either case, the computation or assessment of a CVI may
be a potentially useful parameter not only for cognitive styles researchers but also for use by education and training practitioners.

Nonetheless, there has tended to be an overreliance on self-report methods of assessment in cognitive styles research. As a result, a whole body of work in this arena has developed founded on the bases of individuals’ subjective perceptions of the ways in which they process information. How accurate these perceptions are is an open question, but what is clear is that in the future it will be important to employ alternative approaches in the study of intuitive processing style. This might include the critical incident technique (CIT; Flanagan, 1954) and the cognitive mapping techniques as used by Clarke and Mackaness (2001) to study managers’ intuitions. Also, Hodgkinson, Langan-Fox, and Sadler-Smith (2008) saw potential in the use of the experience sampling method (ESM; Csikszentmihalyi & Larsen, 1987; Hogarth, 2006) and the day reconstruction method (DRM; Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004) as means of exploring individuals’ intuitive episodes. As is the case with self-report, the methods of CIT, cognitive mapping, ESM, and DRM are inherently subjective. Hence, it is all the more pressing that cognitive styles researchers use more direct methods in the assessment of intuitive processing and performance (e.g., the Tacit Knowledge Inventory for Managers; Wagner & Sternberg, 1985) in experimental and field settings. Moreover, in the brain sciences, a neuroscience of intuition is beginning to emerge with the application of fMRI to the study of intuitive processing in social cognition (Lieberman, 2007; Lieberman et al., 2004; Segalowitz, 2007), offering exciting prospects for future cognitive styles research.

**IMPLICATIONS FOR LEARNING**

The duplex model of style is parsimonious to the extent that it obviates any question of how our teaching could accommodate so many different styles (see Zhang & Sternberg, 2005, p. 43). It also provides a simple framework for educational and training practitioners to foster the development of cognitive strategies that enable learners to recognize the demands of a situation and be able to choose an appropriate information processing mode (analysis or intuition).

Traditional educational and training curricula and methods often aim to develop learners’ rational and analytical reasoning skills. Over a quarter of a century ago, in the field of business and management,
Taggart and Robey (1981) made a plea for the inclusion of intuition in the management education curriculum. However, little appears to have changed in the intervening decades in developing this aspect of management development. Sadler-Smith and Shefy (2004) argued that the rational model prevails in management education and training because it is safe, familiar, comforting, and reassuring, and in many situations (such as the computationally complex), it works perfectly well. Intuition, on the other hand, is unfamiliar, disconcerting, paradoxical, and ambiguous, and it may even be seen as a threat by the analytical mind; moreover, in many situations it is not needed (indeed machines, i.e., computers, can often outperform human judges in computationally complex and repetitive domains—see Meehl, 1954).

Sadler-Smith and Shefy (2004) argued, however, that intuition is pervasive, automatic, and involuntary and cannot be ignored; therefore managers have much to gain from being able to acknowledge and understand intuition (in much the same way that they appear to have embraced widely the concept and practices of emotional intelligence; see Goleman, 1995). Moreover, in certain situations (e.g., time-pressured decisions and creative problem solving), intuition is important and even necessary, and managers need to be able to harness its potential while being aware of its dangers. There are at least three ways in which managers may develop better intuitive judgment: (a) practice, (b) feedback, and (c) awareness (Burke & Sadler-Smith, 2006; Emery, 1994; Hogarth, 2001, 2008; Robinson, 2006; Sadler-Smith & Shefy, 2004).

Practice

Informed intuition is domain-specific and relies on pattern matching and pattern recognition using complex, domain-relevant schemas (Dane & Pratt, 2007) acquired by domain-general learning mechanisms (see Evans, 2008). These complex expert schemas support fast, nonconscious pattern recognition (Klein, 1998; Simon, 1987). An individual’s level of expertise in a domain sets an upper limit on the extent to which he or she can exercise intuitive judgment (it is difficult, ill-advised, and probably perilous, for a novice to engage in intuitive judgment). The fact that intuition is exercised on the basis of implicit cognitive processes does not mean that it was acquired in this way (Hogarth, 2008). A corollary of this is that in order to become more intuitive in a specific domain, an individual must engage in explicit, focused, and deliberate practice (see Ericsson, Prietula, & Cokely, 2007). The process might be accelerated
by participation in a community of practice (see Lave & Wenger, 1991), enlisting the assistance of expert mentors, coaches, and role models, consciously managing one’s experience by choosing to inhabit environments in which one wants to develop intuition (Hogarth, 2008), and by exposure to difficult problems in those environments (preferably using simulations to minimize risk in hazardous situations). Notwithstanding these suggestions, research into the development of expert knowledge suggests a rule-of-thumb of 10 or more years of learning and practice in order to develop sufficiently complex schemas in a particular domain (see Ericsson & Charness, 1994) to support expertise-based intuition. The inevitable conclusion is that in order to develop intuitive muscle power (Klein, 2003), there can be no substitute for an extensive period of intensive learning, deep immersion, and sustained effort and practice: As Wagner (2002) noted, “expertise is not acquired cheaply” (p. 57) and neither is informed intuition.

**Feedback**

Given that the intuitive learning system is operating constantly and without conscious awareness, Hogarth (2001, 2008) emphasized the importance of feedback in the learning of intuitions. He drew a distinction between two contrasting types of learning structures for developing intuition: (a) favorable: environments that enhance intuition through good (i.e., timely, accurate, relevant, honest, constructive) feedback are “kind” structures for learning and (b) unfavorable: environments that lead to the development of poor intuitive awareness through little or low-quality feedback he termed “wicked” structures for learning.

**Awareness**

As noted previously, intuitions are affectively charged judgments (Dane & Pratt, 2007); therefore, becoming intuitively aware involves not only treating affect as a form of data but also being able to distinguish between different forms of affect (e.g., feelings, moods, and emotions). The term affect, when used in connection with intuition, refers to a nonemotional feeling (i.e., it does not encompass happiness or love, for example). Emotions (more intense) and moods (longer lasting) are distinct from the positively or negatively valenced “affective charge” that accompanies intuitive judgment, and the latter was referred to by Epstein (2008, p. 28) as “vibes,” including feelings such as “disquietude” or “agitation” (negative
valence). The role of affect as data has already been discussed, and indi-
viduals need to be aware of the adaptive role that affect, in the form of
somatic markers (Bechara, 2004; Damasio, 1994), has evolved to play in
stopping the “combinatorial explosion of possibilities that would occur”
if System 2 tried to calculate all the options (Stanovich, 2002, p. 142).
Equally, as well as not confounding emotions with intuitions, individu-
als need to be able to distinguish intuitive judgments (i.e., ones that are
made on an informed basis and arise rapidly and involuntarily though
nonconscious pattern recognition and wholistic associations) from biased
social judgments made on the basis of individual or cultural prejudices,
and from hopes, desires, and wishful thinking. Novel methods such as fo-
cusing (Gendlin, 1981) and mindfulness meditation (Kabat-Zinn, 1990)
are of potential benefit for raising both cognitive and somatic phenom-
enal awareness. Preliminary steps have been taken using these and re-
lated techniques in order begin to understand how to enhance managers’
intuitive awareness in a wholistic (mind/body) fashion (Sadler-Smith &
Shefy, 2007; Shefy & Sadler-Smith, 2006).

CONCLUSION

Previous attempts at unification with the cognitive style paradigm were
inhibited by weak theorization, dogged by controversy surrounding con-
struct validity, and impeded by appeals to outdated notions of gross hemi-
spheric dominances for left-brain (analytical) or right-brain (intuitive)
processing (Kozhevnikov, 2007). As argued by Sloman (2002), an obvious
solution to the conundrum of the either analysis or intuition dilemma
is to conceive of the mind in both ways, that is, that it has dual aspects
conforming to the processes of an associative system (characterized by
intuition, fantasy, creativity, imagination, visual recognition, experiential-
ity, and associative memory) and a rule-based system (characterized by
deliberation, explanation, abstract symbolic representation, and formal
analysis with verification and ascription of purpose). Dual-process theory
offers cognitive styles researchers one way out of a sometimes bewildering
maze of concepts, models, theories, and measures in a way that connects
with other developments within the styles field (e.g., Zhang & Sternberg,
2005) and also with established and emerging insights from cognitive,
evolutionary, and social psychology, and cognitive neuroscience. In the
fullness of time, such developments may serve to reinvigorate this highly
practice-relevant field in ways that are scientifically robust.
NOTES

1. Coffield et al. (2004) reviewed 13 of the most influential style models and concluded that the Cognitive Style Index (CSI) had the best evidence for reliability and validity of all the models they studied.

2. Stanovich (2002) describes the two levels thus: (a) algorithmic level: concerned with computational processes; (b) intentional level: concerned with the goals of the computation (see Dennett, 1987).

3. The Pleistocene epoch stretched from \(2 \times 10^6\) years ago to 10,000 years ago and saw the evolution of Homo habilis, Homo erectus, and, eventually, Homo sapiens.

4. Cools and Van den Broeck (2007) disaggregated the analytic cognitive style by splitting it into a knowing style and a planning style.

5. I have preferred the term intuitive over experiential for three reasons: The term intuition has greater currency in management research (see, for example, Dane & Pratt, 2007); intuition subsumes experientiality; and intuition is the operation of the experiential system (Epstein, 2004).

6. The term analytical is offered as an alternative to rational because there are strong elements of rationality in both systems (Slovic, Finucane, Peters, & MacGregor, 2004).

7. Analysis is defined as “The breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit” (Bloom, 1956, p. 205). However, it is interesting to note that Bloom may have been alluding to a form of intuition in his inclusion of the analysis of implicit structure present in a communication of which the producer him/herself “may not be aware” (p. 147) and expressed objectively as the learner’s “ability to infer” (p. 148).

8. The popular Myers-Briggs Type Inventory (MBTI; Myers & Briggs, 1976) is excluded on the bases that: (a) it is a measure of personal style (rather than cognitive style per se); (b) its theoretical basis is in the Jungian psychoanalytic/psychotherapeutic tradition; and (c) there is ongoing controversy surrounding aspects of its construct validity (see Gardner & Martinko, 1996).

9. The simplest approach would be to sum intuition and analysis scores and to give an overall Cognitive Versatility Index (CVI)—see Equation 1; an alternative would be to compute the square root of the product of the values for each mode—see Equation 2. Equation 2 ameliorates the influence of any extreme values from either scale, but in this case the anchor for each scale score should be set to a nonzero value, otherwise the product of any calculation involving a zero term for either mode would be zero:

\[
\text{CVI} = \frac{\text{Analysis}_{\text{CSI, PID or REI}} + \text{Intuition}_{\text{CSI, PID or REI}}}{1005} \\
\text{CVI} = \sqrt{(\text{Analysis}_{\text{CSI, PID or REI}} \times \text{Intuition}_{\text{CSI, PID or REI}})} \\
\]

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Perspectives on the Nature of Intellectual Styles


