

**"COGNITION IN ORGANISATIONAL ANALYSIS:  
WHO'S MINDING THE STORE?"**

by

**Susan C. SCHNEIDER\***  
and  
**Reinhard ANGELMAR\*\***

**N° 90/88/OB/MKT**

\* Associate Professor of Organisational Behaviour, INSEAD, Boulevard de Constance, Fontainebleau 77305 Cedex, France.

\*\* Professor of Marketing, INSEAD, Boulevard de Constance, Fontainebleau 77305 Cedex, France.

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**Susan C. Schneider**

**Reinhard Angelmar**

**INSEAD  
Bvd. de Constance  
77305 Fontainebleau  
FRANCE**

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## Cognition in Organizational Analysis: Who's Minding the Store?

This paper provides a framework for organizing research and theory on cognition as discussed in the managerial/organizational literature. Cognition is herein considered to be a property of systems and thereby independent of a specific level of analysis. Research on cognition can be classified on the basis of whether the main concern is with the structure or process of cognition and whether it attends to differences in cognitive style. Cognition is discussed across the individual, group and organizational levels of analysis. The theoretical and methodological issues which emerge are then explored. Future research directions are suggested.

The increasing interest in the cognitive approach to organization analysis is based on the assumption that organizational behaviors are manifestations of cognitive phenomena. But beyond this assumption, researchers differ widely in their preferred level of analysis and methodological approach. Many insist that "organizations don't think only people do" (Sims, Gioia and associates 1986) or that "organizations don't cognize" (James, Joyce and Slocum 1988; Glick 1988) thus raising issues of anthropomorphism and reification. Those who search for cognition at the organizational level of analysis often run into measurement difficulties and succumb to cross-level fallacy, i.e. measuring at one level a phenomena theoretically discussed at another (Rousseau 1985).

As the cognitive paradigm is becoming increasingly popular, there exists the risk of overreliance on models and methods borrowed from specific disciplines and becoming constrained by them. For example, while cognitive psychology offers well developed models and methodologies that have been proven valid and reliable (see Fiske and Taylor 1984), one may overemphasize the individual level and neglect the social and organizational context. Adopting a sociological (Durkheim and Mauss 1903) or anthropological (Douglas 1985) approach, one runs the risk of neglecting the influence of individuals, such as organizational founders, on cognition at the organizational level. To advance the development of the cognitive paradigm in organizational analysis requires understanding cognitive phenomena at different levels of analysis and demonstrating the relationships of those cognitive phenomena across levels. This calls for an interdisciplinary approach.

In this paper we review the literature on cognition in organizations in order to construct a map that will let us see where we are and where we need to go. First, cognition is defined in terms of structure, process and styles. Next these concepts are reviewed as they have been discussed at the individual, group, and organizational levels of analysis. While it is beyond the scope of this paper to provide a review of the literature on cognition as treated in the various disciplines of psychology, sociology, anthropology, political science and cognitive science, this discipline-specific literature will be referred to as necessary. This framework helps us to

identify critical issues and gaps in theory and in research. In the second part of this paper, theoretical and methodological issues in the development of the cognitive paradigm at the organizational level of analysis are addressed. Finally, future research directions are proposed.

### Cognition in Organizations

Interest in the cognitive paradigm in organization research flourished following Cyert and March's (1963) description of the flows of information, and the subprocesses and tasks involved in organizational decision making. Organizations were subsequently described as information processing systems (Galbraith 1974; Tushman and Nadler 1977), social information processing systems (Salancik and Pfeffer 1978), multicephalous organisms capable of symbolic representation (Pondy and Mitroff 1979), bodies of thought and sets of thinking practices (Weick 1979a), interpretive systems (Daft and Weick 1984), and as minds (Sandelands and Stablein 1987).

Central to these discussions are notions of structures (often referred to as schema) that serve to assimilate or accommodate information, and that represent and store knowledge (e.g. memory). In addition there is the notion of information processing or cognitive processes which describe the manner in which information and knowledge is acquired and utilized. Furthermore, there is a notion of differences, i.e. that organizations may differ in their ways of structuring, acquiring and utilizing information and knowledge, that can be referred to as style. In this paper we define cognition as the structures and processes by which information is acquired, stored, transformed and utilized. While the existence of these structures and processes is considered to be universal, the characteristics of these structures and processes vary sufficiently to explain, in part, differences in behavior. In the next section we will provide a framework to organize cognition as discussed in the literature using the following dimensions: structure, process and styles as described, at each level of analysis, as shown in Table 1. This table provides representative examples of the different functions at different

levels of analysis. Its purpose is not to provide exhaustive coverage of this burgeoning research field.

-insert Table 1 about here -

### Cognition: Structure, Process and Style

Cognitive structures are representations of knowledge that contain and organize information, frequently referred to in the management literature as schemas, cognitive maps or knowledge structures (see Sims et al. 1986; Bougon, Weick and Binkhorst 1977; Walsh 1989). Information is sorted into categories based on similarities of attributes (for a review of categorization theory in psychology see Rosch 1975, 1978) which in turn influence the subsequent information input. Categories may differ, for example, in the extent to which they are broadly or narrowly defined, referred to as category width, which can result in over-inclusion described as "simplification" (Schwenk 1986) or in underinclusion, resulting in a "narrow framework" discussed by Bartunek, Gordon and Weathersby (1983).

Construct systems evolve between categories based upon hierarchical relationships ranging from abstract to concrete, or associative connections similar to that seen in the construction of nomological nets. Cognitive taxonomies have been developed regarding competitor analysis (Porac and Thomas 1990). An example in the strategic management literature is that of grouping problems into "strategic issues" (Dutton, Walton and Abrahamson 1989). Construct systems are often described in terms of complexity which refers to the degree to which elements within a construct system are relatively distinct (differentiated) yet interrelated (integrated). The Repertory Grid technique developed by Kelly (1955) is often used to measure cognitive complexity (defined in terms of degrees of differentiation and integration) of strategic decision makers to explain which strategies are subsequently pursued (Ginsberg 1989; Reger 1987; Walton 1989).

Causal systems develop that are based on relationships of cause and effect or temporal sequencing (e.g. scripts, see Abelson 1976). Causal systems are described in terms of tightly

associated, as in the case of habits, or loosely coupled, as in the case of contiguous events. Causal systems can be established by trial and error, empirical testing, or can be created by saliency or contiguity (Kiesler and Sproull 1982). For example, superstitious behavior is caused by erroneous perceptions of cause and effect based on contiguous events. Causal systems are also responsible for attribution phenomena that are apparent in leadership, for example, and in performance appraisal (Ford 1985). The degree of individual causality (i.e. perceived control over events) has been measured by cognitive mapping techniques (Weick and Bougon 1986).

Cognitive processes refer to the search, selection and retention involved in information processing. Discussions in cognitive psychology and cognitive science provide the underlying foundation which describes how information is sought, selected, organized, interpreted and stored (Simon 1979, 1981). Cognitive processes are implicit in the discussions of bias due to escalation and self-justification (Staw 1981), simplification (Schwenk 1986), and irrationality (Brunsson 1981). The construct of "bounded rationality" of organizational behavior is attributed to the limits imposed on information processing capacity by existing cognitive structures and processes (March and Simon 1958). Decision making in organizations, for example, has proven to be fertile ground for observing these processes and their consequences (see Hogarth and Makridakis 1981 for a review in forecasting). Lord and Maher (1990) provide a taxonomic system of models of information processing which underlie different research domains, e.g. attribution theory, decision making and performance appraisal.

Cognitive processes are also implicit in the discussions of learning. Learning is a change in behavior based presumably upon changes in cognitive structure and process. Expert performance, for example, is considered to reflect easily recognized patterns of events, processed quickly, and eliciting well-rehearsed sequences of behavior (Simon 1987). The role of experience on the development of cognitive structures is also discussed and prescribed for dealing with situations of "novelty" and crisis (Kiesler and Sproull 1982). Organizational behavior is considered to be "mindless" when based on performance of scripts that are learned

through organizational socialization, work experience and symbolic management (Ashforth and Fried 1988).

Cognitive styles refer to the differences in structure or process. Differences in cognitive structures have been demonstrated in terms of category width (Gul 1984, 1985) and cognitive complexity (Kelly, 1955; Schroder, Driver and Streufert 1967). In terms of process, the Myers-Briggs Inventory (1962) measures differences in the style of gathering and evaluating information. This instrument has been extensively used for management development and research despite debate as to its validity and reliability (see Schweiger 1983; Taggart and Robey 1981; Robey & Taggart 1981; 1983). It has been found to be related to preferences for types of information, organizational design, and strategy (Blaylock and Rees 1984; Gupta 1984; Miller, Toulouse and Belanger 1985; Nutt 1990; Haley and Stumpf 1989). There is also evidence of differences in how managers and organizations process information that refer to both content and process, e.g. "frames of reference" (Shrivastava and Mitroff 1982; Shrivastava and Schneider 1984).

Individual differences in information processing received much attention in the psychological literature in the 1960's (e.g. Witkin, Dyk, Faterson, Goodenough and Karp 1962). However, much of that research is currently being criticized and the current focus seems to be directed at what is universal about cognitive structures and processes. There is evidence, however, of increasing interest in organizational differences in managing information, e.g. in terms of speed (Eisenhardt 1989) and reliability (Roberts 198).

Discussion. In trying to classify theory and research in terms of structure, process and style, it becomes evident that the boundaries are not always clear. For example, although "memory" is usually seen as a structure for storage, it can also be seen as a retrieval process (Walsh and Ungson 1989). Processes can themselves become stored, thus becoming structures in the form of "programs" or "routines" (Cyert and March 1963; Nelson and Winter 1982). That structures are not static but are formed with experience and subsequently shape later

experience, also blurs the structure-process distinction. Nonetheless, these distinctions are useful in establishing functional equivalence and examining interactions of structure and process within and across levels of analysis. The next section discusses the use of cognitive constructs at the different levels of analysis in the organizational literature.

### Level of Analysis

Individual level of analysis. Research in organizational behavior often discusses individual level cognitive phenomena by way of models developed by various schools of psychology (e.g. developmental (Piaget 1954), social (Abelson 1976), cognitive (Fiske and Taylor 1984; Rosch 1975) which are then demonstrated in a variety of tasks performed within the organizational setting. Isenberg's (1986) verbal protocol analysis of managers' decision making processes is an example of the methodology used. Cognitive structures and processes are shown responsible for bias in performance appraisal (Jolly, Reynolds and Slocum 1988), strategic decision making (Schwenk 1986), and cross cultural communication (Shaw 1990). Individual behavior in organizational settings is inferred or explained by way of cognition. For example, individuals are given scenarios, cases, or simulations in which they are asked to respond or to indicate how they would respond. A cognitive map is elicited which then becomes the independent variable explaining that behavior.

Individual cognitive maps are often aggregated and said to represent group or organizational-level cognition. Controversy erupts when individual cognitive phenomena are attributed to other levels of analysis triggering the debate as to whether cognition exists beyond the individual level of analysis. Issues of aggregation and anthropomorphism will be addressed later on.

Group level of analysis. The key question in the study of cognitive structure, process and style at the group level of analysis is to what degree the total (or collective) differs from the sum of the parts (or individuals). While group cognitive maps may be derived by aggregating individual cognitive maps, group processes may influence and shape the individual maps. The

influence of group pressures for conformity on individual behavior have been well demonstrated in the social psychology literature (Asch 1955; Schachter 1951; Janis 1972). Whether conformity in behavior indicates changes in cognitive structures is yet to be proven, however, cognitive dissonance theory would argue that behaving as if one believes results in believing what one does (Festinger, Riecken, and Schachter 1956). Therefore it could be argued that group processes do change individual cognition and that the total may be different from the sum of the parts as the parts themselves change in the process of becoming part of the whole.

Group-level cognition evolves through social interaction (Douglas 1986; Gray, Bougon and Donnelon 1986), communication (Donnelon, Gray and Bougon 1985) and politics (Walsh and Fahey 1986). For example, through the interaction of individuals and issues in groups making strategic decisions, cognitive structures are created through which reality is subsequently construed. Sapienza (1985) has described how metaphors emerge from group discussions that then influence the strategies pursued. Janis (1972) also describes the emergence of "shared stereotypes" as well as the processes of gathering and interpreting information that occur at the group level. For example, "mindguards" keep certain information out of the discussion arena, while "illusions of unanimity" may keep individuals from voicing opposing views. In both cases, individual cognition does not contribute to group level cognition.

The process of surfacing assumptions and encouraging dialectical debate in groups making strategic decision encourages the construction of an enriched representation (or cognitive structure) of a given event or environment which is assumed to be better than summing those of the individuals (Mitroff, Emshoff and Kilmann 1979; Mason and Mitroff 1981) or consensus (Schweiger, Sandberg, and Rechner 1989). However, limited participation of group members in decision making due to distrust, for example, or distortion of information gathered due to political behavior on the part of the group members can result in group level cognitive structures and processes that may be less than the sum of the parts.

Group cognitive structures can be derived from group interaction and consensus such that "composite cause maps" are developed by being discussed, argued over, and agreed upon

(Weick and Bougon 1986). Walsh, Henderson and Deighton (1988) measure group maps along dimensions of coverage and consensus. Coverage demonstrates the breadth and degree of differentiation of the group's cognitive structure by summing the elements of the individual members, while consensus demonstrates the overlap or degree to which the elements are shared by group members. The political dimension can also be tapped by measuring the differential impact of individual members on the outcome of group decisions (Walsh and Fahey 1986).

Groups differ in their cognitive style in terms of their integrative capacity, i.e. cognitive complexity, which has been related to the nature of the tasks performed (Driver and Streufert 1966; Schroder et al. 1967). For example, routine tasks requires less cognitive complexity than those that are nonroutine; this would also be true for problems that are "analyzable" as opposed to those that are more ambiguous and uncertain. As mentioned above, group cognition may differ in terms of the degree of coverage or consensus. It might be advisable, for example, to have greater coverage when problems are ambiguous and uncertain to reflect a maximum number of possible perspectives during strategy formulation. Greater consensus might be advisable for easier and faster implementation of strategic decisions (Walsh and Ungson 1989).

Organizational level of analysis. While group-level and intergroup-level cognitive maps can be "assembled" to create organizational-level maps as done in Hall's (1984) study of the Saturday Evening Post, the question still remains as to whether the sum of the parts is greater, less than or equal to the whole. For example, the same problem or strategic issue may be seen quite differently by different departments within an organization based on differences in task, time or interpersonal orientation (Lawrence and Lorsch 1967), based on different functional experience (Dearborn and Simon 1958), or based on efforts to gain power (Pfeffer 1981). Strategic issues are also seen differently at different levels within the organization (Dutton and Jackson 1989).

Groups that are responsible for making strategic decisions are referred to as the "dominant coalition" and often serve as a proxy for organizational level decision making. However, many strategic decisions are made at this group level that are never implemented in

the organization. Complaints are often heard that there is no "strategic vision" nor direction from the top. The question becomes whether there exists in the dominant coalition a group-level cognitive structure, i.e. "strategic vision", and if so, what are the processes by which these are "communicated" and become "shared" throughout the organization? Thus the degree to which a strategic vision, for example, is "understood" and "shared" within the organization may represent organization-level cognitive structure, and the process by which that happens may serve to represent organization-level cognitive process.

Strategic plans can be thought of as cognitive structures which have been formulated by the CEO (individual level) or top management team (group level). These strategic plans interact with the administrative or bureaucratic context as well as environmental conditions such that strategies emerge that were not intended (Mintzberg 1978). Organizational-level cognitive structures could be inferred from the emergent strategies and the patterns of decisions implemented. Cognitive processes at the organizational level could be observed as information is gathered, interpreted and used to formulate responses to strategic issues (Dutton, Narayana and Fahey 1983; Schneider 1989).

Strategic behavior can also be initiated at other levels of the organization which means that local level cognition can become shared throughout the organization as well as pushed to the top (Burgelman 1984). Fiol (1989) demonstrated that new products developed within an organization may be viewed initially very differently by different departments yet over time these views converge. This study could be taken to indicate the development of an organization-level cognitive structure representing the "new product" and used to trace over time the processes by which that cognitive structure developed. In general, the study of organizational level cognition could be advanced by observing the development of new ideas and processes of innovation in organizations. Network analysis, for example, could be used to demonstrate how cognitive structures evolve at the group and/or organizational levels and the processes by which information is gathered and transmitted.

Organizational level cognition is also implicit in discussions of organizational culture. Organization culture has been defined as systems of shared meaning (Smircich 1984), shared

beliefs and values (Deal and Kennedy 1982), and even as shared ways of perceiving and thinking (Schein 1984). These definitions, in effect, could be taken to make organizational culture and cognition synonymous. Organizational stories, for example, can be taken to represent organization-level cognitive structures, e.g. scripts, which serve as prescriptions for behavior (Martin, 1983). While the contents of these structures may be similar, e.g. "unique" stories are paradoxically similar (Martin, Feldman, Hatch and Sitkin 1983) and beliefs about customer service and quality have become de rigeur, organization culture does differ in the underlying basic assumptions about people and the world which can be inferred by what the organization does versus what it says (Schneider and Shrivastava 1987). These "theories in use" vs. "espoused theories" (Argyris and Schon 1978) demonstrate organization-level cognitive structures. Also, organization cultures differ in the extent to which it is shared by individual members, i.e. the degree to which individual cognition reflects that of the organization.

Organization adaptation and learning also infers the presence of cognition at the organizational level. Learning, often demonstrated as a change in behavior, can be found in programs and routines that become institutionalized as standard operating procedures (Jelinek 1978). These can be considered as cognitive structures as they store information about what to do and can be called upon given new information. Old routines called upon in the face of new problems can result in stereotypic responses that may not be adaptive. Well-learned behavioral routines are often relied upon during crises although they may be inappropriate (Billings, Milburn, and Schaalman 1980; Staw, Sandelands and Dutton 1981). Adaptive behavior may require "unlearning" so that new routines may be learned (Hedberg 1981). Truly adaptive organizations need to be constantly self-critical and to create "learning how to learn" routines, referred to as deutero-learning (Argyris and Schon 1978). This means that the cognitive structures and processes by which organizations gather and interpret information and store and utilize information must be examined and evaluated in terms of their appropriateness to current conditions and their flexibility given the need for change.

In this section we have referred to examples of cognition in terms of structure, process and style at different levels of analysis in the organizational/managerial literature. By looking at this map of the field we can see that there are some gaps that need to be developed. Much of the discussion is at the individual level of analysis if not in theory, then in measurement. In addition, cross-level analysis is often missing. This is in part due to the lack to sufficient research, both theoretical and empirical, at the group and organizational level. In the next section we will discuss the problems of theory and measurement in developing the cognitive paradigm in organization analysis.

### Issues in Organizational Cognition Research

#### Level Bias

Many articles in the cognitive tradition of organizational research are primarily concerned with individual cognition, the key assumption being that individual cognition produces organizational behavior and, therefore, performance. For example, Bougon et al. (1977:606) suggest that "understanding the development of an organization requires a knowledge of the participants' relevant cognitions...because the individual processes involved select and control organizational activities, development and evolution." According to Cummings (1982:561-562), work on individual cognitive processing of stimuli "...comes as close as organizational behavior has come to date in understanding the processes which underlie so many of the functional relationships central to the discipline."

Empirical research on small group functioning, however, does not support the assumption that individual-level variables play a major role in explaining group behavior and performance. McGrath's (1984: 170) review of group research concluded that "task type and network type...overwhelm whatever individual differences there are in determining communication patterns, satisfaction, and task effectiveness". Similarly, Goodman, Ravlin and Schminke (1987: 135-6) suggest that the social psychological variables which dominate the groups literature may have very little impact on group performance.

The proposition that individual cognition accounts for behavior and performance at the group and higher levels goes against many other hypotheses and findings. For a start, the direction of the causal link between individual cognition and behavior itself poses problems: is cognition the cause or consequence of individual and organizational behavior? Second, different individual cognitive systems or interpretations may generate similar overt behavior. Brehmer (1976) reported the widely replicated finding that the amount of overt judgemental differences between interacting individuals remains constant over a long series of interactions, despite marked changes in the individuals' covert judgment policies. Also, in certain types of task environments, interacting individuals maintained high levels of overt agreement despite substantial differences in covert policies. Donnellon et al. (1986) analyzed a case where collective group action occurred despite differences of interpretation among individual group members. Finney and Mitroff (1986) suggest that individuals at each organizational level have no understanding of the schemas guiding the individuals at other levels. Despite this, patterned interaction took place. Third, the cognitive performance of individuals in a group context can be strongly influenced by characteristics of other group members (Hill 1982) and by the group process and the organizational structure (McGrath 1984). Fourth, under the almost random, emergent process view of organizational action (e.g. Cohen, March and Olsen 1972; March and Olsen 1976), the link between individual and organizational behaviors is attenuated by rules of access to choice opportunities and simultaneous availability.

The causal path linking individual cognition to organizational behavior is tenuous given the many intermediate steps, and as each connection is subject to many influences. An exception is situations wherein organizational behavior is strongly dominated by a single individual (Walsh and Fahey's 1986 "limited belief structure" situation) as in the case of owner-dominated firms or strong leadership (Kets de Vries and Miller 1984; Fiedler 1986). Thus the pursuit of cognition at the individual level, albeit within the organizational setting, may have limited value in developing the cognitive paradigm at the organizational level. This conclusion is consistent with the general view that social systems are hierarchically organized such that the higher systems levels are "loosely coupled" (Weick 1976) to lower levels. In such

systems, the behavior of the focal level may be nearly independent of the detailed characteristics and behaviors of its component parts (Simon 1973, 1979). This is supported by persistence of organizational patterns despite turnover of personnel and variations in the behavior of individuals (Weick 1979), and institutional theory (Zucker 1977; Scott 1987).

Fears of Anthropomorphism. To talk about cognition at the levels above individuals immediately triggers the accusation of anthropomorphism, that is, the unjustified attribution of human characteristics to other types of units. A systematic approach to this question involves the following two steps: 1) the essential features of the attribute called "cognition" must be defined; and 2) a candidate system is empirically tested to see whether it possesses these features. If possession of one human brain is defined as one essential feature of cognition, then only individuals are able to qualify. But most researchers of cognition define cognition in terms of the abilities to acquire, store, transform, and utilize information, and abstract from the specific physical and biological systems in which these abilities are embodied (e.g. Newell and Simon 1972). Under most condition, groups and organizations are able to perform tasks which demonstrate that they possess cognitive abilities. They are able to perform these tasks through widely different combinations of individuals and other elements such as external memories (e.g. data banks) and computer based decision support systems. Whether the presence of humans is at all necessary for a unit to possess cognition is the subject of intense debate in the context of artificial intelligence (see Churchland and Churchland 1990; Searle 1990).

A psychological reductionist might argue that it is not really the group or organization that possesses cognition, but only the individuals comprising it. This argument is usually based on the assumption that cognition can be attributed only to one level of analysis. However, cognition as many other abstract concepts, such as behavior and goals, can be applied at all levels of analysis (see Ackoff and Emery 1972, for a level-independent systematic development of a conceptual and terminological system). Similarly, systems theory is based on the assumption that concepts like purpose and feedback are applicable at many different levels (Miller 1978). Campbell (1974) has illustrated the logic by which properties of the basic

cognitive entities, i.e., knowledge representation (retention), and information processing (variation and selection) can be inferred from and tested against observable behavior at many different levels of analysis. Therefore, we argue that both individuals and supra-individual units (groups, organizations,...) possess cognition. Yes, "individuals think", but "organizations think too" and to talk about the "thinking organization" is not just a metaphor but refers to an empirically demonstrable capability of organizations.

Problems of Reification. It is often thought that discourse at the group and organizational level easily succumbs to reification, i.e. "to treat an abstract concept as if it referred to a thing" (Weick, 1979b:34). Terms like "organizational mind", "organizational memory" might acquire thing-like qualities when in fact they are social constructs. The threat of reification indeed always exists but is just as much alive at the individual level. For example, knowledge, memory, and information processing become "things" (just as personality traits), and these "things" are then used to "explain" observable behavior of individuals. Reification of individual-level cognitions is facilitated because they take place in a clearly identifiable physical location - our head - and are associated with a thing-like object - our brain. Reification has for example led to the misguided search to identify the precise brain locations for specific cognitive functions. In the case of groups and organizations, no neatly bounded brain-like object exists where cognition takes place which may in fact impede reification.

The tendency to reify is encouraged by prevailing measurement practices in the area of cognition. Many researchers directly question subjects about their cognition, use only this measurement method, and fail to relate the results of their measures to other variables (i.e. no nomological validation). The automatic identification of the measure with the constructs ("definitional operationalism") and the lack of nomological validation produce highly thing-like "cognitive maps", "schemas", etc. which leads to an atheoretical, reifying view of cognition. In fact, reification of individual based measures of cognitive maps provides a literal illustration of the epistemological fallacy of confusing the map with the territory (Bateson 1972).

The problem with direct measures is that the results are often questionable. For example, Blake, Hammond, and Meyer (1973) compared self reports and judgement policies with the policies inferred from subjects behavior and found substantial divergence. Subjects often lack awareness of knowledge that underlies their own behavior. Self reports are more likely to produce "espoused theories" than "theories in use" (Argyris and Schon 1978). Also, subjects may not possess any precomputed cognitive structures but construct ad hoc representations (Kahnemann and Miller 1986). Even if they possess such precomputed structures, these may not be accurately retrieved because of availability and other heuristics (Tversky and Kahnemann 1974). Finally, subjects may not be willing to disclose their true thoughts for reasons related to self justification and impression management (Chatman, Bell and Staw 1986; Tetlock 1985). The latter factor especially complicates the interpretation of public organizational statements (e.g. annual reports, reports to financial analysts, etc).

Measurement approaches which use multiple measures, maintain awareness of the inferential nature of the cognitive constructs and establish relationships with other types of variables are needed. In this way, concepts like memory and information-processing cease to be "real" objects and become hypothetical constructs. Observable behavior mainly serves to suggest (context of discovery) and test (context of verification) models of these constructs. Bowman's (1963) theory of managerial decision making, for example, is based on the idea that managers have in their minds a model of the system that they are managing which is then inferred from the actual decisions taken. Researchers in the social judgement paradigm (Hammond, Stewart, Behmer and Steinmann 1975) also infer subjects' cognitions from their behavior. Schein's (1985) iterative, inferential, and multiple methods approach to measuring organizational culture provides another good example. In the inferential approach, the measurement methods are seen as providing fallible data, the interpretation of which requires a nomological network. Studies which infer cognition from behavior also avoid the criticism that cognition is irrelevant for behavior. The major risk in an inferential approach is that alternative constructions of cognition might explain the data just as well if not better.

### Aggregative vs global measures

Two options exist for measuring collective cognition: aggregative and global (Lazarsfeld and Menzel 1961). In aggregative measurement, the data are first attributed to the members of the collective (individuals or smaller collectives than the focal unit) or to relations between them. Measurement of absolute properties of members gives rise to analytical collective properties, whereas measurement of relations between members allows the calculation of structural properties of collectives. Causal inferences, the basis for cognitive maps (Bougon et al. 1977), are examples of individual properties. Measures of cognitive similarity between individuals (Dunn and Ginsberg 1986), on the other hand, are relational in nature, thus allowing the formation of collective cognitive structure variables. In a second step, the element data are aggregated to a measure of the collective. Examples of aggregation procedures are: simple averaging (Bougon et al. 1977); averaging after weighting (Walsh et al. 1988); and correlations between element data (for example, Dunn and Ginsburg 1986, proposed to correlate the cognitive and social connectedness of individual members).

In global measurement, no mapping of the data onto members is necessary and the data are directly assigned to the collective (Lazarfeld & Menzel, 1961). Global measures of collective cognition can be based on systematic observation of communication between individual members (Donnelon et al. 1986), on key informants or spokesman who report on the collective's cognition (Hart 1976; Namenwirth, Miller and Weber 1981); or on cognitions of a member in a special position, such as a position of leadership (Fiedler 1986). Collective products are another type of source of data on collective cognition. Examples are annual reports (Bettman and Weitz, 1983), internal reports and minutes of meeting (Bartunek 1984), organizational documents that describe standard operating procedures (March and Simon 1958), group performance in cognitive tasks (Hill 1982), and cognitive structures in group decision support systems (DeSanctis and Gallup 1987). Hall (1984) used a variety of collective products to develop a cognitive map of the Saturday Evening Post.

What is the relationship between aggregative and global measurement approaches to collective cognition? Are they simply alternative methods for measuring identical constructs or

do they measure different constructs? The organizational literature does not differentiate between these two types of measures of collective cognition, so one might assume that they are intended to measure the same constructs. But one can think of situations where aggregative and global measures clearly diverge, as in the case of the age of an organization and the sum or average age of its participants.

Aggregative and global measures of collective cognition are best thought of as different, but causally related, constructs. Global measures represent emergent properties of collectives, whereas aggregative measures are models about how individual contributions combine to create emergent properties. This, for example, is how individual level data are used in studies which compare group performance in cognitive tasks with performance as predicted through the aggregation of the performance of individuals (Davis 1969; Hill 1982). The attempt to derive emerging or macro-properties from individual level or micro-data represent the general research strategy of reductionism (Kaplan 1964; Nagel 1961; Simon 1973). Inversely, in contextual effects models (Blalock 1984) collective cognition may appear as an explanatory variable of individual cognitions.

Whether one uses aggregative or global measures, or both, depends on the type of research question that is being asked and on the conceptualization of the construct which the researcher wants to measure. To test the proposition that "the whole is more than the sum of its parts" requires both. More generally, all cross level models require both types of measures. For propositions formulated at the group or organizational level, the choice depends on whether the construct is conceptualized as based on properties of each individual member or not. For example, the "consensus among the top management team" construct (Dess 1987; Woolridge and Floyd 1989) is based on cognitions of the individuals comprising the top management team and, therefore, requires aggregative measurement. However, the "comprehensiveness of strategic decision process" construct (Fredrickson 1984) which included many cognitive variables (e.g., willingness to go outside for information, breadth of outside information sources used, etc.) does not refer to attributes of each individual decision participant and requires global measurement, for example, via key informants.

**Multi-level Equivalence.** A multi-level proposition specifies that a particular relationship holds across several levels of analysis (Rousseau 1985). For example, Driver and Streufert (1969) described a model relating environmental complexity, cognitive complexity, and performance and suggested that the model holds both for individuals and groups. To test the model, the constructs and measures of complexity at the individual and group level ought to refer to conceptually equivalent phenomena. Would aggregative and global measurement offer the same degree of multilevel equivalence?

Suppose one decided to use a structured, questionnaire-type methodology at the individual level, as in Ford and Hegarty's (1984) study of the complexity of cognitive maps. Which measurement method at the group level would provide the best equivalence? One option would be an aggregative method wherein each individual member would have to fill out a questionnaire in isolation from the other members with the results aggregated by the researcher. A second option, representing a global method, consists in asking the group to return one questionnaire representing the group's cognitive map.

The aggregative and global methods differ in regard to the subprocesses required for causal inference. In the aggregative method retrieval from long term memory takes place in several isolated minds and integration is performed by the researcher. In the global method, retrieval is interactive - instances evoked by one member trigger memories in another member's mind - and the integration into a single judgement is performed by the group. When one compares the two alternative processes for generating collective cognitive maps to the processes at work at the individual level, it appears that the global method taps the same types of processes as those taking place at the individual level. By comparison, the processes which lead to an aggregative collective map (information retrieval by isolated units and information integration by the researcher) have no equivalent at the individual level, as already noted by Lazarsfeld and Menzel (1961).

Lack of equivalence does not matter provided that the level-specificity of a given construct and measure is clearly recognized which has not always been the case in

organizational cognition research. Only global measures of collective cognition offer conceptual equivalence between collective and individual levels of analysis. The basic reason for this is that individuals are usually not studied as comprising several equivalent and isolated sub-units subject to separate measurement and integration by a researcher. The contradiction between the espoused multilevel equivalence and the de facto non equivalence may be one of the reasons why many researchers are ambivalent toward the concept of organizational cognition.

### Future Research Directions

#### Cross-level research

Studies of individual cognition have most organizational relevance in the context of research involving several levels of analysis. One research direction relates group or organization-level variables to individual cognition (Calder and Schurr 1981). Examples of relevant questions are:

1) How do organizations influence the development of individual schemas (March and Simon 1958:154-158)? What is the process by which individuals within organizations acquire "the same way of seeing the world"? This raises issues with regard to hiring and socialization practices.

2) How do organizations guide the acquisition of individual expertise in different organization-relevant domains (Dearborn and Simon 1958)? Practices of rotating "high potential" individuals through different jobs, different businesses and different countries are designed to enrich the cognitive structures and promote expertise to facilitate cognitive processes. Training and socialization practices inform individuals of the types of information and the way it needs to be processed in the organization.

3) How do organizations influence the instantiation of schemas that guide both private thought and public expressions (Chatman et al. 1986; Tetlock 1985). Are there norms that encourage dissent?

Other research directions concerns the effect of individual cognitive processes on cognitive processes at higher levels of analysis. Staw et al.(1981) discussion of the threat-rigidity phenomena across levels illustrates the logic of this type of research. The research reported by Schroder et al.(1967), and by Brehmer (1976) are examples of research where characteristics of individual cognitive functioning are related to group phenomena. Yet another avenue for research are the reciprocal interactions of cognition at several levels of analysis. These interactions are probably most easily observable during periods of paradigmatic shifts in groups and organizations.

Finally, what are the relationships between cognition and performance or effectiveness? For example, Jacques (1990) recently argued that the hierarchical level in an organization must correspond to the cognitive complexity required by the task and subsequently must match the individual's level of cognitive complexity. Another example is how desirable is "like-mindedness", and what should be the norms for encouraging or discouraging deviance or for encouraging consensus vs dialectic debate in decision making? This is related to the coverage/consensus argument of Walsh et al. (1988). In more complex environments, coverage may be more important than consensus. While this may result in fragmentation and lack of unity of effort, overintegration may result in loss of distinctive competences. Therefore to what extent should we have loosely connected cognitions of individuals in groups and of groups in organization?

#### Beyond the organizational level of analysis

In this paper we have addressed cognition as it has been discussed at the individual, group and organizational levels of analysis. Recently, the increasing activity in merger and acquisitions, joint ventures and strategic alliances raises the issue of cognition at the interorganizational level of analysis. Problems may arise when there are no shared cognition between organizations and when these have to be developed over time. In the case of joint ventures, this process is more delimited to a subset of organizational members from each

organization; in the case of mergers or acquisitions the need to develop shared cognition may be more extensive.

The changing nature and configuration of industries also requires that cognitive structures (e.g. industry recipes, Spender 1989; Huff 1982) be revised. The financial service industry provides one example. Commercial banks are considering partnerships with insurance companies, credit or mortgage banks, and investment banks. Often the cognitive structures as well as the speed of processing information of the potential partners are quite different. For example, information processing speed required is greater in stock brokerage than credit risk decisions. This has led to concentration through mergers with other banks, even former rivals, rather than foreign banks or foreign industries. However, even in mergers between banks that are very similar, there is a need to learn the other's "language" and the way that issues are "understood". Changing industry configurations also challenge conceptions of who are the competitors. As supermarkets, such as Carrefour or Sears-Roebuck, begin to provide financial services, banks which have not added this "category" to their list of competitors may get caught blindsided (Porac and Thomas 1990).

The increasing internationalization or globalization of industry further highlights the issue of cognition beyond the organizational level of analysis. Differences in national cultures may result in different styles of handling information. Attention to detail vs attention to the big picture may reflect different educational practices and value systems. The types of information preferred, e.g. objective vs. subjective, gathered from personal vs. impersonal sources reflects different ways of processing information based on differences in the importance of relationships or the nature of "reality" (Schneider 1989). These differences may result in different strategic responses to similar strategic issues.

## Conclusions

By providing a framework to classify cognitive phenomenon discussed in the organizational literature, important issues are raised that need to be addressed. There is a need to carefully develop theory and measurement at the organizational level of analysis and to confront problems of reification and anthropomorphism. This means establishing conceptual equivalence between levels of analysis, developing models for understanding the interrelationship of levels of analysis, and developing the measurement capability at the focal level of analysis. Global vs. aggregate measures, as they refer to different types of phenomena, should be chosen depending on how the construct in question is conceptualized. For multi-level propositions, however, the use of global measures is necessary. Success in these endeavors requires greater efforts at conceptualizing cognitions in an organizational context, and using multiple measurement approach based on inference as well as direct self report, and where nomological validation is possible.

The cognitive approach to organizational analysis holds much promise, but a substantial reorientation of effort is needed to fulfil it. The redirection involves:

- 1) a concentration on what is organizational about individual cognition;
- 2) more study of cognition at group and organizational levels; and
- 3) more cross level research which demonstrates the relationship between cognition at different levels of analysis, including interorganizational and industry levels. The "thinking organization" need not be taken as a metaphor but as a systems' property which enables organizational learning and renewal at a time when routines, or "mindless behavior", can be ill afforded. Many organizations are facing dramatic changes in the environment which requires changing concepts of their industry, their business, and their organization. It is time to take up the challenge of discovering cognition at and across all levels of analysis. After all, if organizational analysts do not mind the store, who will?

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Table 1

A Framework for Classifying Organizational Cognition

	STRUCTURE	PROCESSES	STYLES
INDIVIDUAL	<p>beliefs (Sproull &amp; Sproull, 1981)                      cognitive maps                      (Bougon et al., 1977;                      Weick &amp; Bougon, 1986;                      Ford &amp; Hegarty, 1984)                      cause maps (Hall, 1984)                      schema(ta)                      (Weick, 1979a;                      Walsh, 1984; Schwenk, 1985)                      scripts (Gioia &amp; Poole, 1984)                      implicit theories                      (Walton, 1986; Brief &amp; Downey, 1983)                      knowledge systems (Shrivastava, 1984)                      distilled ideologies (Salancik &amp; Porac, 1986)                      taxonomic structures (Porac &amp; Thomas, 1987)</p>	<p>assimilation/accomodation (Gioia, 1986)                      attribution (Kiesler &amp; Sproull, 1982;                      Huff &amp; Schwenk, 1985)                        Biases (Tversky &amp; Kahneman, 1974;                      Hogarth &amp; Makridakis, 1981)                      limited capacity (Miller, 1978;                      Broadbent, 1950)                      simplification (Schwenk, 1984)                      justification                      retrospective rationalization (Staw, 1981)                      escalation                      (Staw, 1981; Schwenk, 1986; Whyte, 1986)</p>	<p>Myers-Briggs (1962)                      field independence (Gul, 1983)                      category width (Gul, 1985)                      locus of control (Miller et al, 1982)                      tolerance of ambiguity (Gupta, 1984)                      cognitive complexity; multidimensional thinking                      (Streufer &amp; Driver, 1969; Isenberg, 1986;                      Schroder et al., 1967)                      managerial frames of reference                      (Mitroff &amp; Shrivastava, 1983)</p>
GROUP	<p>basic assumptions (Blon, 1961)                      metaphors (Sapienza, 1985)                      ideologies (Dunbar et al., 1982)                      negotiated beliefs (Walsh &amp; Fahey, 1984;                      Walsh et al., 1986)                      coincident meaning (Gricar et al., 1984)</p>	<p>groupthink (Janis, 1972)                      strategic assumption analysis                      (Mitroff et al., 1979)</p>	<p>integrative capacity (Driver &amp; Streufert, 1966)                      functional domain (Dearborn &amp; Simon, 1958)</p>
ORGANIZATION	<p>bodies of thought (Weick, 1979a)                      cognitive systems (Weick, 1979b;                      Daft &amp; Lengel, 1986)                      cognitive maps (Weick, 1979b;                      Bougon et al., 1977)                      cause maps (Hall, 1984)                      influence diagrams (Roos &amp; Hall, 1980;                      Diefenbach, 1982)                      interpretive systems (Daft and Weick, 1984)                      ideologies (Beyer, 1981)                      mind (Sandelands &amp; Stablein, 1986)                      ruling myths (Starbuck, 1982)                      myths (Boje et al., 1978)                      symbols (Bougon et al., 1985)                      beliefs (Sproull &amp; Sproull, 1981)                      basic assumptions (Schein, 1985;                      Schneider &amp; Shrivastava,                      forthcoming)                      decision-rules (Cyert and March, 1963)</p>	<p>search-selection-retention (Weick, 1979b)                      input-throughput-output (Katz &amp; Kahn, 1966)                      information processing systems                      (Galbraith, 1974; Miller, 1978)                      multinationals as examples                      (Egelhoff, 1981; Keegan, 1972)                      sensemaking (Weick, 1979b)                      threat rigidity cycles (Staw et al., 1981)                      sets of thinking/practices (Weick, 1979a)                      attribution (Bettman &amp; Weitz, 1983)                      learning (Hedberg, 1981; Duncan &amp; Weiss, 1986;                      Fiol &amp; Lyles, 1985; Shrivastava, 1983)</p>	<p>frames of reference (Shrivastava &amp; Schneider, 1984)                      comprehensiveness (Frederickson, 1984)                      characteristic ways of                      perceiving and believing (Schein, 1985)</p>

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			<u>1990</u>		
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