"ISSUES IN THE STUDY OF ORGANIZATIONAL COGNITION"

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N° 88 / 08

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Director of Publication :

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Printed at INSEAD,
Fontainebleau, France

ABSTRACT

This paper asks whether it is meaningful and useful to study cognition at supra-individual levels, and what methodological issues this involves. We argue that organizations possess cognition in the same sense as individuals do and recommend that more effort be devoted to studying organizational cognition as opposed to individual cognition in organizations. To avoid vague analogizing, cognitive terms ought to be defined independently of a specific level of reference, and measurement of the same cognitive concept at different levels should reflect equivalent phenomena. We then review and compare aggregative and global measurement methods of organizational cognition and conclude that only global measurement methods provide for equivalence across individual and collective levels.

ISSUES IN THE STUDY OF ORGANIZATIONAL COGNITION

Organizational researchers taking a cognitive perspective use terms like beliefs, schemas, assumptions, memory, and information processing to refer to their subject matter. Because organizations can be studied at different levels (individuals, work groups, departments, organizations, interorganizational networks), the following questions arise:

1. is it meaningful to use cognitive terms in reference to supra-individual units (collectives)?
2. how useful is it to study the cognition of collectives?
3. what methodological issues arise when one does indeed study collective cognition?

Prevailing attitudes in regard to these questions appear to us rather contradictory. Our impression is that most organizational researchers would subscribe to the view that "organizations don't think". At the same time, they do not hesitate to associate the term "organizational" with all kinds of cognitive terms such as "organizational beliefs", "organizational schemata", "organizational memory", and the "thinking organization". It is rare to find a clear specification of the level to which these terms refer, and, in any event, measurement is mostly at the individual level. Lack of clear and consistent specification of levels of reference and measurement provides ample opportunity for engaging in all kinds of cross-level fallacies (Rousseau, 1985).

The objective of this paper is to address the above three questions and to derive implications for the conduct of cognitively oriented organizational research.

COGNITION AND COLLECTIVES

A construct is meaningful in reference to a unit if the unit can be described by it, i.e., if it is a feature or attribute of the unit. For example, velocity is a construct which is meaningful in reference to a gas molecule, but not to a container of gas. Inversely, temperature and pressure are meaningful in reference to a container of gas, but not for an individual gas molecule (Hofstadter, 1979: 308; Nagel, 1961). Weight, however, is a meaningful construct for both types of units.

All organizational researchers would probably agree that it is meaningful to use cognitive constructs like beliefs, schemas and thinking in reference to individuals. But one can find numerous authors who explicitly reject the application of cognitive constructs to collectives. This position is summarized by the slogan "organizations don't think, only individuals do" (see, for example, Sims et al., 1986: 1; Lehnen, 1976: 28-29), and extensions of cognitive constructs to units other than individuals are accused of anthropomorphism.

Authors who reject the application of cognitive constructs to collectives never bother to specify the defining attributes of cognition in order to examine whether these types of units can be described from a cognitive perspective. Cognition is <u>by</u>

definition linked to individuals by these authors. To go further, it is necessary to define the concept of cognition and its scope.

THE CONCEPT OF COGNITION AND ITS SCOPE

Cognitive terms refer to two general types of phenomena: cognitive (symbol) structures (e.g., beliefs, schemas, cause maps and cognitive maps) and cognitive (symbol-manipulating) processes (e.g., thinking, inference-making, sense-making and judgmental heuristics) (Nisbett and Ross, 1980; Fiske and Taylor, 1984). But a system capable of cognition must possess three more features: a memory performing the function of storing and retaining the cognitive structures; a receptor (perception) function, which creates in memory internal symbol structures that designate external stimuli; and an effector function which creates external stimuli (e.g., talking, writing, gesturing) designated by internal symbol structures (Newell and Simon, 1972).

Newell and Simon (1972) call a system which possesses these functions - a memory containing symbol structures, a processor, receptors and effectors - an information-processing system. They define the functions which are necessary for cognition abstractly, that is, without reference to the concrete physical or biological structures and mechanisms through which the functions are actually carried out. Many functionally equivalent concrete embodiments are, therefore, possible.

Whether or not a specific unit is capable of cognition is an empirical issue: it depends on whether it can be demonstrated that it possesses the above indicated functions. The capability for cognition by human individuals appears to be well established. But many other types of units can also be shown to have cognition according to the preceding definition. In cognitive psychology (Newell and Simon, 1972; Simon, 1979), the digital computer plays a prominent role as a system with cognition which allows to simulate the behavior of another system with cognition - individual humans. Newell and Simon (1972) also give the example of a system for sending and receiving Morse code. De Mey's (1982) survey of "cognitive science" points out many more instances of systems which possess cognition.

We conclude that when the concept of cognition is defined explicitly, the statement "only people think" becomes untenable. The concept of cognition which we have presented here has in fact been providing the common foundation for all varieties of "cognitive science", with applications to many types of non-human systems.

DO HUMAN COLLECTIVES POSSESS COGNITION?

Is it meaningful to use cognitive terms in reference to human collectives? Or, put differently, "do organizations think?" A simple way of testing this hypothesis would be by conducting a variation of Turing's test (see Hofstadter, 1979, Ch. 18): in this game between an individual interrogator, a computer, and an

individual via a teleprinter, originally conceived to test for cognition by a computer, one could replace the computer with a collective, e.g., a group. The task for the interrogator would consist in identifying which source is the collective and which the individual. It is unlikely that the interrogator will exceed chance levels for the right answer.

Another test could be performed by subjecting the unit, via teletype, to a series of tasks such as described in cognitive psychology textbooks (e.g., Glass et al., 1979; Solso, 1979) which would test the presence of all functions necessary for the information-processing feature, namely: memory (e.g., recognition and recall tasks) and processor functions (e.g., arithmetic tasks), with the effector and receptor functions being prerequisites for communicating with the observer and demonstrating possession of the two other functions.

If, as is likely, these tests were to lead to the conclusion that the collective indeed had all functions necessary for cognition, a psychological reductionist might argue that it was not really the group that possessed cognition, but only the individuals constituting it. But by the same logic, a biologist could deny that individuals possess cognition and attribute it only to cells, the constituent parts of individuals (see Miller, 1978; Hofstadter, 1979, for an analysis of cells from an information processing perspective).

To ask which level of a complex unit "really" possesses cognition assumes that this feature is meaningful in reference to one level only. But there are many examples of attributes which can be used to describe at the same time a complex unit, its parts, subparts, and so on. For example, the attribute "weight"

can used to describe a car, as well as its parts and subparts. Similarly, systems theory (e.g., Ackoff and Emery, 1972; Miller, 1978) is based on the assumption that concepts like purpose and feedback are applicable at many different levels of systems.

In conclusion, we argue that both human individuals and collectives possess cognition. Yes, "individuals think", but "organizations think too", and to talk about "the thinking organization" is not just a metaphor as is commonly held but refers to a demonstrable capability of organizations.

WHY STUDY ORGANIZATIONAL COGNITION?

Many of the landmark writings in the cognitive tradition of organizational research are primarily concerned with individual cognition (see, for example, Bougon, Weick and Binkhorst, 1977; Weick, 1979; Beyer, 1981; Sproull, 1981). These writings are, therefore, more accurately characterized as being about individual cognition in organizations than about organizational cognition (1).

We propose that organizational researchers interested in cognition devote more effort to the study of organizational cognition, mainly for two reasons. First, organization researchers can make a greater contribution to knowledge when they study organizational cognition as compared to individual cognition in organizations. Second, organizational cognition is more directly related to the behavior and performance of collectives than is individual cognition.

CONTRIBUTION TO KNOWLEDGE

When organization researchers study individual cognition in organizations, their subject matter overlaps with that of cognitive psychology and other disciplines studying individual decision-making. What have organization researchers contributed to the understanding of individual cognition, as compared to the contributions made by psychologists? Development of a well-founded response to this question would require tracing the origins of the major concepts, theories and empirical results appearing in organizational cognition writings. Such a study does not exist. Our guess is that it would show that the vast majority of models and systematic empirical support used in organizational cognitive writings comes from psychology.

Daft (1983) has characterized administrative research as "storytelling". When administrative researchers study individual cognition in organizations, the "story grammar" (Thorndyke, 1977) of their story comes from psychologists, their own contribution consisting mainly in filling in the names of the characters and location. Another characterization of administrative science sees it as the "social construction of truth" (Astley, 1985) by administrative researchers. Astley's characterization fits the prototypical article about cognition in organizations: first, psychological concepts and findings are presented; subsequently, examples of situations that might occur to managers in organizations are interpreted by means of these notions (examples are Kiesler and Sproull, 1982, and most of the articles in Sims et al., 1986). The main objective of these writings is to promote use of individual cognitive notions by other administrative

researchers. Even systematic empirical research on individual cognition in organizations also risks producing no more than illustrations of well-accepted findings in an organizational context, rather than creating findings that are at least "interesting" (in the sense of Davis, 1971) if not genuinely new (2). While administrative researchers are thus diligently assimilating these ideas, psychologists are already starting to question them (3).

A third interpretation of the utilization of psychological models by administrative researchers, in addition to the "storytelling" and "social construction" perspectives, is the organized anarchy or garbage-can perspective (Cohen, March and Olsen, 1972; March and Olsen, 1976). Paraphrasing Cohen, March and Olsen (1972: 3), in administrative research one often does not know what the question is until one knows the answer. In the study of individual cognition in organizations, the answer typically comes from psychologists, with administrative researchers rushing to find the question.

Although the study of individual cognition in organizations is comfortable, aided as it is by a steady flow of new ideas from psychology, the contribution to knowledge is likely to be greater in the study of organizational cognition. First, there is less competition from other disciplines. If organizational researchers are not studying organizational cognition, who will? Second, as evidenced by the widespread doubt about the very concept of organizational cognition, the field is at the emerging stage, which means that many opportunities exist to apply the concepts that lie at the foundation of cognitive science to the organizational level. Third, the study of organizational cognition

may produce concepts that are of value even for understanding individual cognition. Information processing by individuals can be conceived as a hierarchical system in which higher level processes (e.g., problem solving, concept attainment) are generated out of numerous elementary processes (Newell and Simon, 1972; Simon, 1979). The study of organizational cognition, with an analogous hierarchy of higher-level processes composed of individual processes, may provide insights that are useful for the study of how individual minds operate. Concepts developed for describing organizational cognitive processes, for example, unresolved cognitive conflict, parallel processing, less-than-perfect coordination and loose coupling, may also describe individual cognitive processes (March and Shapira, 1982: 110) and inspire a "bureaucratic model of the mind" (Kahneman, 1982: 121).

INDIVIDUAL COGNITION AND COLLECTIVE BEHAVIOR AND PERFORMANCE

Advocates of the study of individual cognition in organizations argue that individual cognition produces organizational behavior and, therefore, performance. For example, Weick (1979: 34) points out that "Whenever organizations act ... people act". Bougon, Weick and Dinkhorst (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." (see also Sproull, 1981; and Bartunek, Gordon and Weathersby, 1983). Cummings (1982: 561-2) enthusiastically claims that the 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".

If individual cognition were as central to organizational functioning as is claimed, then the most appropriate research strategy would consist in measuring individual cognition and relating it to organization level behavior and performance. What does empirical research tell us about the actual relevance of individual cognition for explaining organization level phenomena?

As advocates of individual cognition have generally avoided confronting this issue empirically, one must turn to evidence elsewhere. Small group research is the major area with relevant empirical research. What is the role of individual-level variables including cognition for explaining group behavior and performance? McGrath's (1984: 170) recent 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.

From a more general point of view, the proposition that individual cognition accounts for behavior and performance at group and higher levels goes against many other hypotheses and findings. For a start, the link between individual cognition and behavior itself poses problems: is cognition the cause of individual and organizational behavior or its consequence? Second, different individual cognitive systems or interpretations may generate similar overt behavior (Brehmer, 1976; Donnellon, Gray and Bougon, 1986). 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 organizational structure and group process (McGrath, 1984). Fourth, under the almost random, emergent process view of organizational action (e.g., March and Olsen, 1976; Pfeffer, 1982), the link between individual and organizational behaviors is attenuated by rules of access to choice opportunities and simultaneous availability. Altogether, the causal path linking individual cognition to organizational behavior has so many intermediate steps, with each connection subject to so many influences that one should be greatly surprised indeed to find any strong relationship between the two respective end points of the causal path.

An exception to this are situations where organizational behavior is strongly dominated by a single individual (Walsh and Fahey's, 1986, "limited belief structure" situation). This might be the case in owner-dominated small firms and other contexts with a dominant leader (Miller, Kets de Vries and Toulouse, 1982; Miller and Toulouse, 1986; Fiedler, 1986).

We conclude that the study of individual cognition, at this point of time, has little relevance for administrative researchers who are interested in explaining the behavior and performance of units above the individual level, in contexts where decision making is not dominated by a single individual.

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 is nearly independent of the detailed characteristics and behaviors of its component parts (Simon, 1973, 1979). Assumptions in the

administrative literature consistent with this view are those that see organizational patterns persist despite turnover of personnel and variations in the behavior of individuals (Weick, 1979).

In view of the preceding arguments, we recommend that organizational researchers with an interest both in cognition and in organization level behavior and performance study organizational instead of individual cognition. We turn now to issues arising in the conduct of research on organizational cognition.

METHODOLOGICAL ISSUES IN THE STUDY OF COLLECTIVE COGNITION

The organizational cognition program studies how organizations (or other collectives) acquire, store, transform and use knowledge or information. Our discussion concentrates on two issues that arise as a result of the multilevel nature of organizations. First, we shall discuss the potential problems due to terms with multiple levels of reference. Subsequently, we analyze issues arising from the two fundamentally different measurement strategies for collective cognition.

TERMS WITH MULTIPLE LEVELS OF REFERENCE

The terms for referring to organizational cognition - perception, beliefs, thinking, inference, schema - are usually identical to those used for other levels of reference. This is consistent with the view that cognitive concepts apply to multiple levels of analysis (as well as to many different kinds of

systems). But terms with broad scope comprise the danger of vagueness. To avoid it, precise definition is required.

One encounters two types of definitions of organization level cognitive terms: analogical and abstract. Analogical definitions or metaphors and similes (Pinder and Bourgeois, 1982) of organizational cognition are based on the assumption that the organizational referent has certain analogies with the referent at the individual level. Analogies have an important heuristic function by stimulating the transfer of knowledge across levels. Problems arise when the terms are ill-defined at the source level, when accidental features of the source level are transferred, and when no attempt is made to transform the initially vague analogy into a well-defined concept. This makes rigorous specification and testing difficult (Rousseau, 1985). Terms like organizational beliefs, organizational schemas, or organizational thinking are generally defined by analogy. But insufficient effort is made to transform the vague analogies into operational concepts.

To make progress, abstract definitions of cognitive terms are necessary. Such definitions attempt to extract the essential features of the concept in such a way that a term does not refer to a specific level but to phenomena at several levels, and to different types of systems (Miller, 1978; Rousseau, 1985). Newell and Simon's (1972) definitions of key terms in the information processing paradigm are one example. The major danger in this enterprise comes from definitions that are so broad as to include many diverse phenomena. This creates problems of construct validity (Cook and Campbell, 1979), both at one level and across levels.

The potential pitfalls of broad abstract definitions of

cognitive terms can be illustrated through the landmark multi-level study of Staw, Sandelands and Dutton (1981). In this study, the term "restriction of information" was used in reference to three levels: individual, group and organizational. After reviewing studies pertaining to each of these levels, the authors concluded that threat leads to restriction of information, at all three levels. However, the article provided little in the way of a conceptual analysis of the restriction of information construct. From the authors' use of indicators one can infer that the restriction of information construct was defined very broadly. Restriction of information could take place during each of three types of information processes: perception (i.e., search for and registering of environmental information), intermediate processing (generation of interpretations and action options) and utilization of the information to make a judgment or a decision). The problem of interest for the present discussion arises in the context of the indicators for restriction of information at the individual and the group levels. At the individual level, the indicators (attention to dominant or central cues and away from peripheral cues; and reliance upon internal hypotheses and prior expectations, p. 429) refer to perception and intermediate processing, whereas the indicator for the group level (tendency to ignore divergent solutions and to downplay the role of deviant positions, pp. 433-4) refers to the information utilization process.

Since the restriction of information construct refers to three types of processes, yet the indicators tapped only two of these (at the individual level) and one (group level), was the authors' conclusion - threat causes restriction of information at each of

these levels - warranted? Furthermore, as the referents at the individual level were different from those at the group level, was the conclusion regarding the similarity of threat effects at the two levels warranted?

The answer to these questions is positive only if it can be shown that there are strong correlations between information restriction in all three subprocesses, both at the individual and at the group level. For only in this case can it be assumed that the different indicators are equivalent indicators of the same construct across the two levels.

Although abstract, level-independent definitions of cognitive terms are not without problems, as the preceding example illustrates, they are to be preferred to the individual-level analogies which are still the rule at this time. For as long as individual-level analogical thinking prevails, organizational cognition will encounter suspicions of anthropomorphism, and remain vague analogizing.

AGGREGATIVE VERSUS GLOBAL MEASUREMENT

Two fundamental options exist for measuring collective cognition: aggregative and global measurement. 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. In a second step, the element data are aggregated to a measure of the collective. In global measurement, no mapping of the data onto members is necessary, and the data are directly assigned to the collective (Lazarsfeld and Menzel, 1961).

In order to provide some concrete background, we will first review different ways of implementing each measurement approach, before discussing the fundamental issues involved in choosing between the two approaches.

Aggregative Measurement of Collective Cognition

Aggregative measurement consists of two basic steps: first, measurement at the element level; second, aggregation. Measurement at the element level requires either a census, as in a collective unit with few members (e.g., the 19-member Utrecht Jazz Orchestra; Bougon, Weick and Binckhorst, 1977) or a sample for units with many members, as in organizational climate research (James, 1982). Measurement of absolute properties of members gives rise to analytical collective properties, whereas measurement of relations between members allows to calculate structural properties of collectives (Lazarsfeld and Menzel, 1961). Causal inferences, the basis for cognitive maps (Bougon, Weick and Binckhorst, 1977), are examples of individual properties. Measures of cognitive similarity between individuals (Dunn and Ginsberg, 1986), on the other hand, are relational in nature, and can be used to derive measures of collective cognitive structure, as they are relational.

Aggregation of element data can take various forms. Examples of aggregation procedures are: simple averaging (Bougon, Weick and Binckhorst, 1977), averaging after weighting (Walsh, Henderson and Deighton, 1986), and correlations between element data (for example, Dunn and Ginsberg, 1986, proposed to correlate the cognitive and social connectedness of members).

Global Measurement of Collective Cognition

Approaches to global measurement can be classified by the sources of data: individual members, collective products, or experts.

Global measures of collective cognition can be based on systematic observation of communication between individual members (Donnellon, Gray and Bougon, 1986), on key informants or spokesmen who report on the collective's cognition (Namenwirth, Miller and Weber, 1981), or on cognitions of a member in a special position, for example, a leadership position (Fiedler, 1986).

Collective products are a second source of data on collective cognition. Examples are annual reports (Bettman and Weitz, 1983), internal reports and minutes of meetings (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 Gallupe, 1987). Hall (1984) used a variety of collective products to develop a cognitive map of the Saturday Evening Post.

A third type of method consists in using non-member experts to assess collective cognitions. An example is Hart (1976), who used an expert panel to measure cognitive maps of nations and groups of nations.

General Methodological Issues

Aggregative measurement based on individuals is conceptually appealing, as one can fall back on an extensive measurement tradition in psychology and social psychology. This approach also appeals to researchers who claim that only individuals think.

Furthermore, it is consistent with the general position of methodological individualism which requires that collective terms be strictly definable by reference to individuals (Kaplan, 1964; Nagel, 1961). Finally, it appears to avoid the danger of creating and reifying dangerous concepts like "group mind" (Allport, 1968).

In our opinion, ease of conceptualization and measurement are the only valid arguments in favor of aggregative measures. We have argued above that collectives also think. Philosophers of science (e.g., Kaplan, 1964; Nagel, 1964) tend to reject the requirements of methodological individualism, and reification is just as much a threat for individual level as for collective level concepts. Concepts like individual beliefs and cognitive maps (just like personality traits) become "things", and these "things" are then used to "explain" observable behavior of individuals, instead of being thought of as hypothetical constructs which are inferred from and tested against observable behavior (4). Reification of individual-level cognition is facilitated because cognition takes place in a clearly identifiable physical location - a human body - and is associated with a thing-like object - a brain. In the case of collectives, no neat, one-to-one mapping of cognition to a single body and object exists. This impedes reification, but it apparently also provides an obstacle to the conceptualization of cognition at this level.

The Relationship between Aggregative and Global Measures

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 administrative 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. For example, the age of an organization will rarely be identical to the sum or average age of its participants. Should one treat these two measures as measures of the same construct and compute their respective reliabilities?

In our view, 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 the literature that compares group performance in cognitive tasks with performance as predicted by aggregating individual performance data (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, contextual-effects models (Blalock, 1984) of cognition might attempt to use collective cognition as an explanatory variable of individual cognitions.

Whether one uses aggregative or global measures, or both of them, depends on the type of research question that is being asked. To test propositions of the type "the whole is more than the sum of its parts", for example, Daft and Weick's (1984, p. 285) suggestion that the organizational interpretation process is something more than what occurs by individuals, requires both aggregative and global measures. More generally, all cross-level

(i.e., reductionist and contextual-effects) models require both types of measures. For other research questions, one or the other type of measure may be most appropriate.

Multi-level Equivalence

Regardless of whether cognitive terms used at the organizational level are defined by analogy or abstractly, they ought to refer to conceptually equivalent phenomena at other levels. By the same logic, the measurement instruments at each level ought to tap into the same factors (trait and methods variance) as measurement at other levels.

Do aggregative and global measurement offer the same degree of multi-level equivalence? Suppose, for example, that one wanted to test a multi-level theory about the relationship between characteristics of cognitive maps (e.g., their complexity) and various environmental characteristics (e.g., complexity, predictability, ...). If one decided to use a structured, questionnaire type methodology at the individual level (as in Ford and Hegarty, 1984), which measurement method at the group level would provide the best equivalence? One option would be an aggregative method (as in Bougon, Weick and Binckhorst, 1977): each individual member would have to fill out a questionnaire in isolation from the other members, and the results would be aggregated by the researcher. The global measurement option might consist in asking the group to return one questionnaire representing the group's cognitive map.

To respond to a cognitive map questionnaire an individual must make causal inferences. This task can be decomposed into two sub-processes. First, the individual retrieves instances relating

to each causal link from his long-term memory. Several relevant instances are likely to be evoked. Second, he integrates these different instances into a **single judgment** (positive, negative, or absence of causality) (see Nisbett and Ross, 1980; Hastie, 1984; and Kahneman and Miller, 1986, on inference processes).

The aggregative and global methods differ in regard to both of the subprocesses required for causal inference. In the aggregative method, retrieval from long-term memory takes place in several isolated minds, and the integration is performed by the researcher. For the global method, retrieval is interactive- instances evoked by one member trigger memories in another member's mind - and the integration into a single judgment 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 seems 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.

The preceding example was concerned with measuring cognitive structures at the individual and collective levels. What can one say about equivalent multi-level measures of cognitive processes? Thinking-aloud protocols (Ericsson and Simon, 1984; Isenberg, 1986b) are frequently used methods for inferring cognitive processes at the individual level. Would aggregation of individual thought protocols by a researcher provide an equivalent measure at a group level? We do not think so. The reasons are the same as

those indicated above. Individual cognitive processes are characterized by a complex architecture of sub-processes (e.g., different phases, higher-level executive programs and lower-level sub-routines) (Newell and Simon, 1972; Simon, 1979; 1981). Aggregating individual cognitive processes to describe the group cognitive process would be like describing a complex computer program by aggregating its sub-routines. Global measurement of group cognitive processes might consist in recording group interaction. We propose that such recordings be considered as thinking-aloud protocols of groups, equivalent to the thinking-aloud protocols of individuals.

More generally, 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 composed of equivalent and isolated sub-units subject to separate measurement and integration by a researcher.

CONCLUSIONS

In this paper, we analyzed whether it was meaningful to study cognition at supra-individual levels, whether this was useful, and what methodological issues this involved. We argued that organizations possess cognition in the same sense as individuals do and recommended that organizational researchers should devote more effort to organizational cognition and less to individual cognition in organizations. This hopefully will lead to greater contributions to knowledge and better explanations of

organizational behavior and performance.

Two major methodological issues arising in the conduct of research on organizational cognition were discussed. First, we argued that the use of identical terms at different levels of analysis requires abstract definitions of cognitive constructs. This avoids vague analogizing and allows the development and testing of multi-level theories. Second, we reviewed and compared aggregative and global measurement approaches to collective cognition and concluded that they refer to fundamentally different phenomena. We suggested that only global measurement provides for multi-level equivalence.

The possibility that aggregative measures may have no equivalent at the individual level was already noted by Lazarsfeld and Menzel (1961). Lack of level-equivalence does not matter provided the level-specificity of a given measure is clearly recognized. Unfortunately, this is not the case in the area of organizational cognition. The use of identical cognitive terms at the individual and collective levels suggests that these terms refer to equivalent phenomena. At the same time, much empirical research and theorizing at the collective level is based on aggregation, which has no equivalent at the individual level.

The contradiction between the espoused multi-level equivalence and the de facto non-equivalence may be one of the reasons why many administrative researchers are ambivalent toward the concept of organizational cognition. We hope that this paper has dispelled at least some of the suspicion and confusion surrounding this concept and provided some guidance about how to conduct valid research on organizational cognition.

FOOTNOTES

(1) The titles of these writings reveal the concern with individual cognition. For example, the titles of the articles by Bougon, Weick and Dinkhorst (1977), Beyer (1981) and Sproull (1981) all refer to cognitive phenomena "in" organizations, and not to cognitions "of" organizations.

(2) Consider the surprise value of these results of three years of field research on thinking processes of senior managers: "managers develop plausible, as opposed to necessarily accurate, models of their situation, and ... develop and efficiently use knowledge structures (stereotypes, schemas) that guide how the senior manager recognizes, explains,and plans" (Isenberg, 1986a: 241, his emphasis).

(3) For example, the schema concept is critically reviewed in Alba and Hasher (1983) and Kahneman and Miller (1986). The basic research on errors in human judgment which has inspired numerous articles in the administrative literature is questioned by Hogarth (1981) and Funder (1987).

(4) The reification of individual-based measures of cognitive maps by administrative researchers (e.g., Bougon, Weick and Binckhorst, 1977; Ford and Hegarty, 1984) provides a literal illustration of the epistemological fallacy of confusing the map with the territory (Bateson, 1972).

(5) If one were interested in studying cognitive micro-processes in groups, one would have to find a means of observing the within-individual communication during the group process. Organizational cognitive processes can be more easily studied at both macro- and micro-levels. For example, if one

defines the constituent elements of organizations as departements, macro-processes can be studied by observing between-departmental communication. Departments can be further decomposed into individuals, and cognitive micro-processes (relative to the organizational level) can be studied by observing between-individual communications.

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