Cognitive Mapping as a Tool to Elicit Managerial Cognitions: Methodology Analysed

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The existing literature shows an increasing trend into the investigation of managerial cognitions. The literature also shows an imbalance between the theoretical and empirical work in this area, in favour of the former. From a thorough review of literature, a growing need is felt for testing new methods to acquire and analyse data. More researchers are noted to adopt the technique of 'cognitive mapping' to study managerial cognitions. To what extent is cognitive mapping an appropriate tool to investigate managerial cognitions? This paper by Pawan S Budhwar is an attempt to answer this question.

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The topic of managerial cognition draws heavily from the field of cognitive science, which in turn synthesizes ideas from philosophy, neuroscience, linguistics, psychology, sociology, artificial intelligence, and anthropology (Stubbart, 1989; Laukkanen, 1994). Cognitions in general involve the mental models that people use to make sense of their world and to make decisions about what actions to take (Swan, 1995). Some people see cognitions as specific belief systems of individual decision-makers, who draw upon some subset of available knowledge in formulating expectations and in making choices about organizational strategies (Stubbart, 1989; Swan, 1995). However, in broad terms, cognitive studies refer to the investigation of individual and organizational-level phenomena, related to the acquisition, kinds, uses and implications of knowledge, beliefs or intelligence (Laukkanen, 1994).

Why Study Managerial Thinking from Cognitive Point of View

The investigation into managerial cognition has become more important in the context of present day dynamic business environment as it helps to gain an understanding of the strategy of organizations and the dynamics of industries from the managers' viewpoint. This further helps to determine organizational decisions and performance outcomes (Narayanan and Fahey, 1990; Calori et al, 1992; Swan, 1995). Moreover, such investigations indirectly or directly depict the existence of certain 'cognitive dimensions' of particular individual in an organization at micro level and in particular industry at macro level (Beyer, 1981).

Cognitive dimensions represent core beliefs and assumptions that can be used to bind people together and explain events/actions of individuals and organizations in terms of cause and effect relationships. Different writers have given different names to the concept of cognitive dimensions, such as 'dominant logic' (Prahalad and Bettis, 1987), 'myths' (Hedberg and Johnson, 1977) and 'paradigms' (Johnson, 1987). However, the degree of homogeneity within an organization is a debatable issue. A number of different terms borrowed from the cognitive science literature is used to denote the concept of cognitive dimensions, namely, belief systems, belief structure, schema, schemata, scripts (Gioia and Poole,
1984), recipes, artificial intelligence, cognitive maps, influence diagrams (Diffenbach, 1982) and mindsets (Stubbart, 1989; Huff, 1990; Sparrow, 1994; Calori et al, 1994; Swan, 1995). However, all these terms share a common denominator, i.e., they all describe mentally represented concepts and relationships among concepts that form common sense social theories, which frame and simplify problems and guide actions (Weick, 1979; Swan, 1995).

However, till late, relatively little research was undertaken into cognitions of managers in organizational settings (see for example, Stubbart, 1989; Porac and Thomas, 1989; Huff, 1990; Swan, 1995; Walsh, 1995). But, over the last 15 years or so, researchers have shown a great deal of interest to explore the relationships among mind, management, and organization (Meindl et al., 1994; Walsh, 1995). Present literature shows an emphasis on the understanding of ‘managerial sensemaking’ in the organizational set-up (see special issue of Organization Science, 1994, No 3). This emphasis is mainly due to the understanding that managers are assumed to be "information workers" as they spend most of their time in absorbing, processing, and disseminating information about organizational issues, opportunities, and problems (Walsh, 1995, p 280). Managers employ a particular set of frames of reference to represent their information world and, thus, facilitate information processing and decision-making. Researchers have agreed that "interpretations," "frames," "schemas," and "assumptions" are part of the sense making process (Meindl et al., 1994: 290).

Stubbart (1989) notes an under emphasis on research in managerial cognition which may be because most of the studies of decision-making mainly focus on producing normative models of decision-making as it ought to be, rather than descriptive models of decision-making as it actually is. Moreover, it is comparatively easier to explain how management and organizations make sense of situations and events, but it is quite challenging to actually describe the "sense" that results from process of learning and communication. Further, it may be that management researchers lack skills and correct training to pursue cognitive issues and those who have such skills (cognitive psychologists) may make little attempt to consider the nature or effects of cognitions among individuals in socially interactive organizational context (Swan, 1995).

Nevertheless, it is believed that any successful strategy begins with a "key idea," which is a product of the decision-makers' (managers) mind. Studying managers' thinking from a cognitive viewpoint then helps to gain an understanding about their relative perceptions, beliefs, ideas, notions, and different assumptions underlying their thinking about such key ideas and thereby strategic management. All these elements (ideas, views, notions, beliefs and perceptions) need to be examined in order to interpret an individual's thinking, because it is on the basis of these elements information is selected, acquired, transformed, and accordingly decisions are made (Weick, 1979; Holznner and Fisher, 1979; Srivastava and Mitroff, 1983; 1984; Schwenk, 1988; Stubbart, 1989; Porac and Thomas, 1989). Moreover, individuals' cognitions do not develop in a vacuum, but arise as a result of experiences throughout the life in various settings and through interactions with other people. However, those interactions are context specific (Swan, 1995).

Cognitive scientists view cognition as intentional, representational, and computational (Stubbart, 1989). Managers act in a rationalist way, selecting subsets of available data from which they construct their own cognitive maps and schemas so as to use them to explain and to make sense of complex problems (Weick, 1979; Huff, 1990). Therefore, it will not be wrong to state that managerial actions are based on reasons (intentions) and are programmed to respond to environmental fiat. Mental representation is central to cognitive science, because mental representations in the brain mirror reality as perceived through the senses, rendering the external world accessible by the mind (Stubbart, 1989: 330). Finally, computational rules act as the operators for encoding, locating, using, and changing mental representations. The study of managerial intentions, their representations, and computations then becomes imperative for the understanding of managerial cognitions.

Along with the present day debate (which emphasizes on the study of managerial thinking, another related debate regarding the study of 'emotions' (mainly employees) is dominant in the present literature. Like the study of managerial cognitions, the study of emotions also helps to understand human behaviour, but from a different perspective. The study of emotions deals with the understanding of 'feelings'. The right type of emotions helps employees to gain control over others, contributes to achieve organizational goals, guides to overcome emotional obstacles that impair performance and decision-making (Ellis, 1965; DiMattia et al., 1989), and helps to develop motivation programmes for employees (Izard, 1977; Sutton, 1991). A strong stream of literature shows that people (managers) interested in the areas of consumer research (Allen et al., 1992), services management (Sutton, 1991), employee training (DiMattia et al., 1989), emotive dissonance (Ashforth and Humphrey, 1993; Hochschild, 1983), conflict management (Volkema and Bergmann,
1989), and leadership studies (Barry, 1988) emphasize on the study of employees' emotive characteristics. However, the present literature shows less emphasis on the study of managerial emotions. Such an analysis can contribute to better understanding of managerial cognitions. Since managers are known to make decisions in a rationalist way (Stubbart, 1989), any irrationality on their part will result in 'emotive dissonance' (Hochschild, 1983) which can adversely influence their thinking and indirectly the decision(s).

Though the study of emotions and cognitions falls under two distinct spheres, they are very much related to each other and produce synergistic effect when it comes to the understanding of human behaviour.

Recently, work has progressed to display employees' emotions. For example, Sutton (1991) has mapped emotions of both collectors and debtors by the help of 'within site display matrix' (see Miles and Huberman, 1984) and Volkema and Bergmann (1989) have used cluster analysis to map emotive responses of employees involved in conflict management. The phenomenon of mapping emotions can, therefore, be termed as 'emotive mapping to its counterpart' cognitive mapping' which is used to map cognitions. However, as the main thrust of this paper is to analyse the suitability of cognitive mapping technique to study managerial cognitions, the discussion will now concentrate on the concept of cognitive mapping.

The existing literature shows an increase in the use of cognitive mapping technique to investigate in to the cognitions and assumptions of decision-makers (see for example, Axelrod, 1976; Eden et al, 1979; Sims and Gioia, 1986; Journal of Management Studies, 1989,1992; Organization Science, 1994; Huff, 1990; Workshops organized by the European Institute for Advanced Studies in Management; the recently created annual volume entitled Advances in Managerial Cognition and Organizational Information Processing; Walsh, 1995). The next section is devoted to the topic of cognitive mapping.

What is Cognitive Mapping?

Broadly speaking, cognitive map refers to any device used for mapping covert cognition into some overt representation format (Huff, 1990). Cognitive mapping techniques in management research have been used to gain an insight into the belief systems of managers. The term cognitive mapping was first used by Tolman (1948) in his paper entitled "Cognitive Maps in Mice and Men." But it was only in 1970s that the ideas were adopted by social and behavioural scientists (Eden, 1988). Most of the early research using cognitive maps focused upon problem solving with individuals (Ackermann et al, 1990; Cropper et al, 1990; Eden et al, 1993), where cognitive mapping was used as a 'reflective device' and it broadly came under the 'counselling paradigm' (Eden et al, 1979). Therefore, the aim of working with cognitive maps was to guide careful problem construction and help individuals to "change their mind' and do so creatively. However, both readers and researchers should realize and accept that there is no definitive way of forming a cognitive map. This is mainly due to the fact that maps are coded by following many different conventions. Therefore, maps produced by different individuals will differ according to the interpretation of the data made by each individual user. Cognitive mapping in this sense is an inexact science (Ackermann, et al, 1990; Eden and Cropper, 1992). But, what is the main source of cognitive mapping?

Necessity is the mother of invention. This very correctly applies to the development of the concept of cognitive mapping. Cognitive mapping is primarily a product of human mind, which, due to the growing complexity in organizations, felt the need to develop a technique to represent complex human abstracts, symbols, managerial vocabulary, ideas, events, and incidences in a more meaningful way so as to better understand and make sense of human behaviour (for details see Huff, 1990). Abstracting is a process that enables people to symbolize and is described as 'the continuous activity of selecting, omitting, and organizing the details of reality so that we experience the world as patterned and coherent' (Weick, 1990:2). As the differences in individuals' opinions/thoughts are existing and increasing everywhere, people in such situation need to use abstractions to smoothen such differences and to better understand each other. To do so, people develop maps to merge those disconnected abstractions into more plausible patterns. Hence, the main sources of cognitive mapping are the human perceptions, ideas, belief, notions, different assumptions, the need to represent these in a systematic and meaningful manner, the urge to understand complex human behaviour and to process information properly to make appropriate decisions.

The development of cognitive mapping as a research or modelling technique can be attributed to two recent, but different traditions. The first has its roots in documentary research in the field of political science (Axelrod, 1976), where mapping technique was devised to represent the causal assertions embedded in decision-making environment. The second tradition is intended to improve the tools originally devised by Kelly (1955) to elicit, record, and analyse the construct systems of individuals in the context of organizational problem solving. However, the aim of cognitive maps formed.
under this tradition is similar to the one proposed by Kelly, i.e. to capture the natural frames or schemata and the language used by individuals to make sense of and to explain their problems (Cropper et al., 1990).

Nonetheless, from a theoretical viewpoint, a cognitive map is an individual's internal representation of the concepts and relations among concepts that the individual uses to understand his environment. Cognitive maps are specific types of schemas for particular problem-solving domain and maintain a dynamic relationship with the actual territory that the individual is trying to make sense of. Cognitive maps which individuals use to represent and understand the territory in which they act may hold many types of relationships among concepts. Swan (1989:1257) explains such relationships as proximity (A is close to B), similarity (A is similar to B), cause and effect (A causes B), category (A is a subset of B), and continuity (A follows B).

From an empirical viewpoint, cognitive mapping methodology is a technique used to access the cognitive maps inside an individual's head and to portray them externally in some visuospatial layout. Cognitive mapping methodologies are then graphic representations that represent the content and structure of belief systems that individuals hold implicitly and locate people in relation to their environments (Fiol and Huff, 1992). Generally, statements are extracted from individuals about key concepts and relations in particular problem areas which are then portrayed in some kind of visuospatial layout (Swan, 1995). These graphic displays represent and reveal only a subset of an individual's entire complement of implicitly held schema and maps for a particular problem domain. Moreover, it is not likely that a mapping methodology could ever produce maps of an entire complex belief system of the individual and still be usable.

However, studies adopting cognitive mapping methodology cover a vast domain in terms of dominant research questions (which describe and analyse cognitions, explain and understand cognitive phenomena, examine links of cognition and action/outcome), research objectives (such as to explain dominant thinking and problem solving in organizations), levels of analysis (for example, individual level, group level, organization level or industry level) and theoretical and philosophical views (Laukkanen, 1992). Walsh (1995) divides cognitive mapping work into four broad areas. These are: work conducted at the individual level; work conducted at the group level; work conducted at the organizational level; and work conducted at the level of the industry.

A cognitive map, then, can be described as a network of pieces of text (expressed ideas/nodes/concepts) with arrows linking the concepts to form a directed graph. These arrows are equipped with plus/minus signs to indicate direct or indirect influence links. The map is derived from a subject's account which is broken into elements to form the nodes of the network. The nodes refer to constructs and phenomena, which the subjects define, see, enact, and about a particular domain and the arrows are used to show a relationship of causality between the phenomena/concepts (Cropper et al., 1990; Laukkanen, 1992). Generally, a concept at the tail of an arrow is taken to cause the concept at the arrow head. Moreover, the direction of the arrows shows how one concept may have implications for another, or shows a "means and ends" relationship. The concepts are arranged hierarchically, usually with the more important concepts to wards the top of the map. Typically, a concept which has implication (out-arrows) is referred to as a 'head' and a concept which has no in-arrows is referred to as a 'tail' (Eden et al., 1992). The meaning of each concept can be understood most significantly from its context within the map and from its relationships with other concepts (Barr, 1994). Figure 1 presents a good example of a cognitive map. In brief, a cognitive map is a pictorial presentation, a logical array of arrow-linked concepts, referring, for instance, to a social system's constituent elements and the causal relationships between them, as they appear to exist in the mind of the subject (Laukkanen, 1990: 202). Maps of managerial cognition take many graphic forms.

Broadly speaking, they can be of four types. The first type of maps focuses exclusively on the causal inferences embedded in managers' thinking. Such a map was developed by Bouganeffl./ (1977). The second type of maps is not explicitly causal in nature (see, for example, Walton, 1986). The third type of maps demonstrates how managers classify their firms as one of a subset of firms of the same general category. The study by Porac et al. (1987) is a classic example of such maps. Finally, the fourth type of maps is based on a series of action research projects, undertaken by Eden and associates to study the ongoing needs of managers and to understand the ways in which they interact with their environment (Fiol and Huff, 1992).

However, the existing literature shows causal maps (which show cause and effect relations) as the most commonly used form of cognitive mapping (Huff, 1990; Eden, et al., 1992; Laukkanen, 1992; Swan, 1995). This is mainly due to the fact that some manual and software tools are available that make causal relationships amenable to research. Further, the assumption that people's beliefs about the causes and effects of past events create expectations about the likely outcomes of future events.
and, therefore, guide their decision-making process and force researchers to adopt this type of mapping (Swan, 1995). Moreover, there are very few studies of other types of relationships among concepts that may be important in decision-makers' belief systems (such as the ones which highlight similarity, proximity or contiguity).

Validity and Reliability of Cognitive Maps

The issues related to the validity and reliability of any mapping methodology are serious. Though the revealed maps are assumed to capture the most important beliefs in an individual's entire belief system, nevertheless, researchers should carefully ensure that revealed maps reveal the most important concepts and relations and not just artefacts of the particular approach taken (Swan, 1995). Moreover, there is always a danger of alteration in the composition of a revealed map due to changes in the cognitions of the researcher and the respondent during the investigation process.

Laukkanen (1992:22) suggests that issues related to reliability in cognitive mapping are less problematic. He defines reliability in cognitive mapping as a high level of consistency, uniformity, and stability in data production over the subjects or other units of observation that are compared. However, at least in principle, data should be replicable by other researchers with similar resources.

The standard definition of validity states that the evidence and measures used should faithfully reflect the examined reality or the underlying theoretic constructs (Baker, 1988). Laukkanen (1992:23) suggests four levels of validity, which researchers should try to achieve depending on the need of their research. Under Validity 1, he discusses the issue of authenticity or sincerity of the raw data. Validity 2 demands that the causal expressions of the subjects are true or accurate in terms of the referent phenomena (i.e., things in the real world closely conform to the knowledge or beliefs elicited). Validity 3 thrives to tap the substance comprehensively so that its pragmatically relevant aspects and elements will be surfaced. However,
Discussing cognitive maps of interviewees can help point. Perhaps their organization's behavior at some later time. Our, and also in some sense predict the actors' or perhaps their organization's behavior at some later time point.

Practically speaking, it is impossible to have 100 percent authenticity, mainly due to the fact that managers seldom talk about everything they know or assume to know even if they feel it is quite safe to do so (Eden, 1992). However, one best way of validating cognitive maps is by taking them back to subjects and getting the maps validated from the subjects (Cossette and Audet, 1992; Langfield-Smith, 1992; Laukkanen, 1992; Eden, 1992). Moreover, out of the possible methods of soliciting cognitive maps, one-to-one interviews are supposed to be the best in getting a more valid picture of the phenomena under study (Cossette and Audet, 1992; Laukkanen, 1992, 1994; Eden et al, 1993; Barr, 1993).

Benefits of Using Cognitive Mapping Technique

1. Researchers in the field of cognition usually want to describe and understand the behavior of actors or social system, analyzing action units or broad action techniques. In light of this, a cognitive map helps to provide a rough approximation or sometimes as a simulation tool, with regard to the thinking patterns and bases that are assumed to underlie managerial decision-making.

2. Cognitive maps pack in more information and can help to capture more richness and subtlety of what is said than would be possible from conventional notes.

3. Cognitive mapping can help to structure peoples' muddled thoughts in a more meaningful way. And once thoughts are structured correctly, mapping helps to distinguish between goals, options, or central ideas and peripheral ideas (Barr, 1993: 2).

4. Discussing cognitive maps of interviewees can help to explore and develop the argumentation beyond the often superficial points initially made. Moreover, researchers found cognitive maps more easier to grasp than, for example, a matrix or some mathematical notation (Laukkanen, 1992).

5. Cognitive maps are seen as tools which provide more useful ways to examine and improve managerial judgement. The graphic representation helps to simplify ideas and facilitate the transmission of complex ideas from individual to individual and organization to organization. This helps managers to make sense of complex organizational issues.

6. Maps can help to highlight priorities, especially when the decision-maker has too much of information. On the other hand, if there is less available information, then, on the basis of the existing patterns, maps can provide missing information which can facilitate decision-making.

7. Cognitive maps are used to give feedback to individuals; such a procedure facilitates self-examination and leads the individual to modify his attitudes and behavior (Cossette and Audet, 1992; Calori et al, 1992). Managers could use it as a blackboard on which critical system elements (of employees) and their influence links can be jointly recorded and revealed for analysis and discussion. Therefore, cognitive mapping can also function as a communication or training aid.

Limitations of Cognitive Maps

It is difficult to represent normative beliefs or operative maxims in terms of cognitive map, i.e., what it is or what should be done. In this regard, a cognitive map is indeterminate, as it is not possible to read such assertions directly from a map and further use them to accurately describe or predict behavior of organizational actors (Laukkanen, 1990). Therefore, cognitive mapping technique may not be appropriate if an accurate prediction of outcomes or of the dynamics of action is important. Moreover, in terms of labor (efforts) and economics (costs), cognitive maps are usually more costlier to produce than to cover roughly the same area with a set of sentences. Further, if the data and the resulting volume of cognitive detail to be represented and analysed are inherently large, the adoption of a computer based programme becomes imperative, which is not only very time consuming but demands an expert's handling. Moreover, the analysis of cognitive maps is challenging as there are not many prescribed ways of doing it.

Present Scenario

At present, a number of techniques exists which can be adopted to extract and analyze statements made by individuals and to produce cognitive maps. However, discussion on the techniques of cognitive mapping adopted by different researchers is beyond the scope of this paper and forms the basis of another paper. Briefly, these include: repertory grid techniques (Kelly, 1955; Smith, 1986; Reger, 1990); content analysis (Holsti, 1969; Erdener and Dunn, 1990); systematic coding of causal relationships revealed in text and transcribed statements.
(Axelrod, 1976; Miles and Huberman, 1984); 'self-Q' technique (technique of mapping arguments used in decision-making), in which participants question themselves in order to expose concepts and relationships (Bougan, 1983; Fletcher and Huff, 1990); matrices and matrix multiplication techniques to examine causal relationships among key concepts (Bougan et al., 1977; Ford and Hegarty, 1984); computer software to produce models of causal relationships between concepts; semiotic analysis (a technique borrowed from linguistics that reveals hidden meaning and underlying beliefs from surface manifestations of narrative text (Fiol, 1990; Laukkanen, 1992, 1994). Details of most of these techniques are explained in a book edited by Huff (1990).

Most of these techniques are quite complex and time consuming, as a result of which they are less appropriate for the use of practitioners. However, managerial cognitions cannot be explored by separating them from their organizational context.

Conclusions
The number of studies concerning managerial and organizational cognitions has increased in recent years. However, there is some lack of balance between the theoretical and empirical work, in the favour of the former. This demands more empirical work, especially which can contribute to practical applications. A parallel phenomenon observed is the growing demand to develop and test methods to acquire and analyse data. Cognitive mapping as a technique to elicit managerial cognitions is therefore analysed and recommended.

Cognitive mapping involves some process of reflecting on what has gone before which may alter present and future beliefs. However, it can be problematic when cognitive maps are seen as models of cognition that allow description and prediction of thinking. Researchers can avoid such a problem if a somewhat weaker view of cognitive mapping is taken, i.e., maps represent subjective data in a meaningful way and are, therefore, useful tools for facilitating negotiation and decision-making within organizations. Moreover, it will not be sensible to expect any long-term predictive ability of cognitive representations such as cognitive maps.

Therefore, cognitive mapping can be seen as a picture or visual aid in comprehending the mappers' understanding of particular and selective elements of thoughts (rather than 'whole' thinking) of an individual, group or organization. Hence, it should be seen as a device which displays, through the use of a map-like diagram, a collection of items that are taken as elements of thinking at a given time.

References


