

**ORGANIZATIONAL CHANGE PHENOMENA,
MANAGERIAL COGNITION, AND ARCHIVAL MEASURES:
RECONCEPTUALIZATION AND NEW EMPIRICAL EVIDENCE**

by

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ABSTRACT**

How do managers construe organizational phenomena from archival data? A study of 218 managers in 53 organizations over two decades reveals that managers are able to project from a limited set of archival measures and construct complex organizational events. They seem to do so through a process of five stages: projection, elucidation, integration, sensemaking, and action.

INTRODUCTION

Organization scientists have long been challenged by how managers view their task and how they frame and construe their work environment (James and James, 1989; Colori, Johnson, & Sarnim, 1994; Maruyama, 1994; Hill and Levenhagen, 1995). In three distinct yet corollary areas of research there has been an accumulated volume of studies that explored these issues. The first area focused on change phenomena in organizations, how managers plan and how they react to changes (Harris, 1962; Golembiewski, 1986; Cleary and Packard, 1992). A second area of research involved issues of measurement: how to effectively and accurately measure such complex organizational phenomena of change and organizational transformations, and the way managers construe these phenomena in their minds, with effects on their behavior (Price, 1972; Pennings, 1973; Geisler, 1979; Walsh, 1988; Geisler, 1995).

In recent years there has been a growing interest in managerial and organizational cognitions. Meindl, Stubbart, and Porac (1994) have suggested that the growth in this area is due to advances in cognitive science, early work in organization theory, and diffusion of social constructionism. They broadly defined the area as the study of ". . . the relationships among mind, management, and organization" (p. 289).

The current paper reports findings from a study that began almost two decades ago (Geisler, 1979). The study intersects the three research areas listed above, in that it explored the way managers at different levels frame in their minds organizational change phenomena by solely using archival indicators of the structure and processes of their organizations. The study investigated the following research questions: (1) Can managers frame complex organizational change phenomena by using only existing archival information?; (2) How many data items are sufficient to frame such phenomena?; and (3) Are there differences among managers in the framing of these phenomena?

RESEARCH BACKGROUND

The study of organizational change is one area of investigation in which cognition research has been interested, among such areas as decision making and environmental sensemaking (Keisler and Sproull, 1982; Gioia, 1986; Weick and Bougon, 1986). The intersect of research in how change phenomena are construed and managed, with how they are measured is a crucial issue in our quest for understanding how managers reason and behave in changing work conditions. This issue has become even more critical with the continuing and dramatic transformations work organizations have been experiencing as a result of structural, process, and technological changes and advances. Managers participate in the planning and execution of such change efforts, and they also react to them in various modes, thus affecting the strategy, progress and viability of their organizations (Larwood *et al.*, 1995; Polley, 1997).

If we can fill the gap between what we know about how managers deal with changes in their work organizations and how they frame these changes in their minds, we can thus substantially increase our understanding of why managers behave in certain fashions. Further, if we can penetrate the action of framing of such phenomena by managers, and identify the information tools they use to do so, we shall be able to add to our understanding of cognitive phenomena.

Measuring Change Phenomena

In their critical review of the organizational change literature, Palmer and Dunford (1996) have argued that researchers use metaphors in different ways, so that they ". . . reflect deeper divisions within organization theory about the application of metaphors" (p. 692). They further described conflicts in the use of metaphors, classifying them as ontological and epistemological, and propose the reflexive approach. This approach considers a critical view of the assumptions researchers use in applying metaphors. In particular are the issues of representation, enunciation, separation, and routinization (Weick and Daft, 1983; Daft and Weick, 1984; Tsoukas, 1991).

In addition to the issues of metaphors to represent change phenomena, organization researchers normally measure change by the use of both archival and perceptual measures (Geisler, 1997). These are measures constructed for general application in organization research. Collins, Hage, and Hull (1988) studied change in automaticity and measured such change as percent of change in the plant's manufacturing-equipment automaticity score, developed by Amber and Amber (1962), which ". . . indicates the extent to which machines replace human energy, dexterity, diligence, judgment, and evaluation of the manufacturing process" (Collins, Hage, and Hull, 1988, p. 542). Similarly, Meyer and Goes (1988) measured the assimilation of medical innovations, but used a measure which was constructed from content analyses of interviews with key informants.

Retrospectively, informants reconstructed the process of assimilation within the framework of the capital-budget flow diagram.

As in other organizational phenomena, empirical research on change utilizes measures that are generated by the researchers, then tested for validity (Campbell and Fiske, 1959). This invariably leads to different measures, which may or may not converge, and to conflicts in use, as those described by Palmer and Dunford (1996).

Managerial and Organizational Cognition

Research on managerial and organizational cognition has concentrated primarily on the structure of knowledge and its implications on the organization (Gioia and Manz, 1985; La Roche, 1995). In his review of the cognition literature, Walsh (1995) has concluded that the field is diversified, and many frameworks used are disciplinary in nature. His compilation of approaches to the study of cognition was classified by whether the subject was aware or unaware of behavior assessment. Most approaches were self reports (e.g., mental models and frames of reference) and interactive reports (e.g., grounded theory ethnography, and organizational knowledge structures). He identified several approaches using archival data analysis, such as cognitive maps. By exploring a synthesized research agenda, Walsh argued that "If a knowledge structure is a simplified representation of an information domain by definition, administrative scientists need to discover the nature of useful simplicity. That is, we need to discover how simple this representation can become before it loses its functional utility" (p. 303).

Walsh's argument for simplicity may not have been the key component of his review, but it offers a design criterion for a field in which models and methods are widely scattered. Much of the extant literature is composed of two basic streams of research: (1) what are the content and the attributes of knowledge structures?, and (2) how does such knowledge affect processes and outcomes of managers and their organizations?

If we limit this discussion to the level of the individual manager, the first stream includes (in Walsh's terminology) representation, development, and use. Representation is a broad term for mental models and frames of reference. This subfield attempts to explain the knowledge structure of individual managers. Shrivastava and Mitroff (1983) continued the research on metaphors that began with the space program. Cohen and Baldayan (1994) explored the role of procedural versus declarative memory. They concluded that

individuals store organizational routines in procedural memory, i.e., ". . . memory for how things are done that is relatively automatic and inarticulate, and it encompasses cognitive as well as motor activities" (p. 559).

Mental models and frames of reference are another research approach for exploring both representation and development. The latter focused on the effects of tenure, experience, hierarchical position, and other organizational variables that impact the manager's frame of reference (Hoffman and Maier, 1961; Conner, Kinicki, and Keats, 1994).

Representation at the individual level focused on the content of mental framing of organizational phenomena by managers. Based on earlier research on interpretation (Geisler, 1979; Bogozzi and Phillips, 1982; Blackburn and Cummings, 1987), Isabella (1990) explored how managers construe events over time. She concluded that the framing of events consists of percentages. In the first stage, anticipation, managers ". . . assemble rumors and other tidbits of information into an in-progress frame of reference" (p. 14). During the stage of confirmation, managers compare their information with past events, then in the stage of culmination they look for symbolic meaning, and finally, in the aftermath, they assess the outcomes of the event they had interpreted.

Isabella's methodology used "key events" described to respondents during interviews, followed by an inductive analysis of their descriptions. This technique facilitates a more concise understanding of the framing of key organizational phenomena (Geisler, 1979).

Cognition researchers were also interested in the relation of knowledge structures to performance and strategic management of the organization. Meindl, Stubbart, and Porac (1994) have complained in the editorial in their special issue on cognition that the bulk of manuscripts they had received focused on strategy and organizational sensemaking. Dutton, Dukerich, and Harquail (1994) explored the relation between construed external image and organizational members identification and concluded that they affect patterns of social interaction, and, by implication, organizational performance through the concepts of commitment and attachment to the organization.

Thomas, Shankster, and Mathieu (1994) have concluded that managers ". . . are guided in their choices as to what is important and why it is important by the interaction of the categories of issues they confront, their own experiences, and the natures of the team and organization to which they belong" (p. 1279). Their study examined the strategic interpretations of organizational issues by top managers.

Similarly, Melone (1994) studied the reasoning processes of top managers and concluded that in performing the strategic task of deciding on candidates for acquisition of other companies, top managers' representation of knowledge facilitated the generation of missing values. Melone also found that top managers tend to share knowledge at the organizational level, evoking such knowledge from memory (Squire, 1987).

Articulation of Gaps and Limitations

As Walsh (1995) and Rolley (1997) have indicated, the diversity in theoretical constructs and methodologies in the cognition literature seems to hinder synthesis. A more crucial gap is in the tendency of researchers in this field to link psychological and sociological frameworks with managerial and organizational problem areas such as performance and strategic management. Thus, the impetus has been to relate knowledge structures of individuals and groups to ultimate goals desired by competitive organizations. In an extension of Angyris (1980), this led to limitations in the measurement of cognitive structures and of how managers *formulate* their knowledge. The emphasis has been on the *contents* and *structures* of such knowledge, so that with the lack of consensus among researchers and, due in part to the multi-disciplinary contributions to the research agenda and methodologies, a varied assortment of methods and measures has emerged.

Formulation or formation of knowledge in the minds of managers as they interpret organizational phenomena is an antecedent stage in the research frameworks of such authors as Thomas, Shankster, and Mathieu (1994), as they construct strategic/political forms, and Isabella (1990) in determining the reality managers construe. The emerging research concern thus becomes: how do managers frame their knowledge in the form of interpretation of organizational events (reality)? Perhaps by understanding this process we will be better able to shed some light on the different, sometimes conflicting, findings in the cognition literature.

Archival Measures

The third dimension of the literature review relevant to the study reported in this paper is research using archival measures. Webb *et al.* (1966) have commented that too few studies have utilized records to test theoretical principles. They also noted that archival data are a generally untapped source of potentially valuable means of measurement in organizational research. Although there are restrictions to their use, Webb *et al.* cite the Chinese proverb: "The palest ink is clearer than the best memory" (p. 111).

Paucity of studies utilizing archival data in general, and in cognitive research in particular, is still very much the norm three decades after Webb *et al.* (1966) and Webb and Weick (1979). There are emerging conceptual directions which make the measurement by archival data a necessary and welcome development. Hassard (1994) discussed postmodern organization analysis and, among other concepts, emphasized "representation" as the first theme of a postmodern approach to knowledge. Representation means that knowledge is constructed as representing reality, thus replacing its factual accuracy.

When translated into organizational phenomena and managerial cognition, this argument calls for a method that will link factual reality with that which is construed by representation. Clearly, such factual reality may be captured by archival data (Hughes, Price, and Marrs, 1986).

The main constraints in using archival data are instrument decay, selective judgment of the recorder, discontinuity in recording activity, discontinuity of method of recording,

change in archival practices, and issues of translation and interpretation. Conversely, archival data are relatively inexpensive, accessible, manipulable, and offer an excellent pool of information for longitudinal research, without such threats to validity as mortality and otherwise absence of respondents (Campbell and Fiske, 1959; Webb *et al.*, 1966).

The study reported here is an attempt to systematically explore the way archival data were used by managers to elicit representations of organizational change phenomena. This novel approach consisted of examining "knowledge formation" as antecedent to research that explored "knowledge structures."

Two basic assumptions underlie the research questions of the study. The first assumption is that managers are able to construe organizational events with solely the use of archival, quantitative data. The second assumption is that a small set of such measures is sufficient for managers to construe complex organizational change phenomena, as they already possess templates of what happens in the organization (Gioia, 1986; Cleary and Packard, 1992; Hill and Levenhagen, 1995).

METHODS

Samples

The study reported here began with the testing and the conduct of the research in a NASA laboratory (Geisler, 1979), based on a method originally developed in Geisler and Radnor (1976). An expanded sample was then developed over the period 1980-1997, which contained 53 organizations, with 29 in the financial services sector (55%), 12 in manufacturing (22.5%) and 12 in the health care sector (25%).

In these organizations entry was provided through the research and consulting activities of the principal investigator. In each organization structured interviews were conducted with at least two executives, with an average of four executives per organization, and a total of 218 valid respondents. Table 1 shows the distribution of respondents by various categories.

TABLE 1

DISTRIBUTION OF RESPONDENTS BY INDIVIDUAL AND ORGANIZATIONAL CATEGORIES

(N = 218)

1. Level Of Education	5. Position in Organization
High School - 46 (21%)	Senior executive - 69 (32%)
Bachelors degree - 82 (38%)	Middle manager - 83 (38%)
Masters degree - 86 (39%)	First line supervisor - 66

Doctorate - 4 (2%)	(30%)
2. Years with Organization 1-3 years - 21 (10%) 3-6 years - 48 (22%) over 6 years - 149 (68%)	6. Specialization in Position General management - 71 (32%) Functional management - 147 (68%) (e.g., finance, R&D)
3. Years in Position Under 1 year - 9 (4%) 1-3 years - 17 (8%) Over 3 years - 192 (88%)	7. Gender (in management positions) Male - 197 (90%) Female - 21 (10%)
4. Years of Work Experience 1-3 years - 72 (33%) 3-10 years - 113 (52%) Over 10 years - 33 (15%)	8. Number of organizations in which was employed during career. 1-3 organizations - 114 (52%) Over 3 - 104 (48%)

In each organization at least one senior executive was interviewed, with a title of: president/CEO, administrator, executive vice-president, president of the division, and chief operating officer.

Procedures

The strategy employed in this research was designed to elicit from respondents their interpretation of change phenomena, based on a limited number of actual key measures, extracted from archival data of their respective organization. To this end the research consisted of two sequential steps. The first step was to gather archival data on selected data items (measures).

The procedure to extract the archival data was based on an elaborate hierarchical delineation of indicators of organizational dimensions, selected from the extant literature (Geisler, 1979). Four dimensions were selected: structure, internal processes, resources management, and interaction with the environment. For each dimension, 3-5 indicators were selected. For each indicator an actual measure was extracted from the organization's records (Phillips, 1981).

Measures were extracted for the 5-year period prior to the actual interviews with respondents. The choice of the five-year period was arbitrary, yet it was sufficient to capture organizational change phenomena, and to avoid purging of some data which a longer time period would have created. Although about 10% of respondents joined the organization during or after the occurrence of the phenomena measured by the indicators, it was assumed that they would have absorbed information through the socialization process in the organization (Isabella, 1990). Table 2 shows the dimensions, indicators, and measures employed in the study.

TABLE 2

DIMENSIONS, INDICATORS,⁽¹⁾ AND MEASURES⁽²⁾ EMPLOYED IN THE STUDY

<p>A. STRUCTURE</p> <p><i>1. Task Characteristics</i></p> <p>(1) No. of hierarchical levels</p> <p>(2) Ratio of outsourcing</p> <p><i>2. Structural Design</i></p> <p>Formalization</p> <p>(3) Number of forms</p> <p>(4) Number of divisions</p> <p>(5) Size (# of employees)</p> <p>Control</p> <p>(6) # supervisors per employee</p> <p><i>3. Authority</i></p> <p>(7) Autonomy (expenditures limit of middle managers)</p> <p>(8) Conflict system (number of complaints to corporate management)</p> <p>(9) Punishment (number of administrative actions)</p> <p>2. INTERNAL PROCESSES</p> <p><i>1. Communications</i></p> <p>(10) No. of reports generated per year</p> <p>(11) Number of official meetings</p> <p>(12) Expenditures on telephones, faxes, e-mail: capital and current.</p> <p><i>2. Human Resource Management</i></p> <p>(13) Training (person hours/year)</p> <p>(14) Vertical mobility (# of promotions)</p> <p>(15) Spending on internal work environment</p> <p>(16) # of accidents/year</p> <p>Institutional Attraction</p>	<p>Reengineering</p> <p>(20) Rate of employees "downsized"</p> <p>(21) Rate of retirees</p> <p>(22) Age composition (average age of employees)</p> <p>(23) Gender composition (ratio male/female)</p> <p>(24) Ethnic composition (ratio minorities/workforce)</p> <p>C. RESOURCES MANAGEMENT</p> <p>Financial Resources</p> <p>(25) Expenditures for professional development of employees</p> <p>(26) Expenditures on new technology</p> <p>(27) Expenditures for maintenance and upgrading of technological systems</p> <p>(28) Distribution of workforce by level of education</p> <p>D. INTERACTION WITH ENVIRONMENT</p> <p>(29) # of employees engaged solely in external relations</p> <p>(30) # of consortia and strategic alliances</p> <p>(31) # of visitors, guests, exchange people from other organizations who spent over 30 days in the focal organization.</p> <p>Community Interaction</p> <p>(32) # of employees who teach in local colleges, or</p>
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(17) Rate of absenteeism (18) Rate of transfers (19) Rate of resignations and early retirements	perform other noted services.
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- (1) Indicators are the subdivision of a dimension, e.g., task characteristics, formalization, size, etc.
- (2) Measures are actual numbers or ratios of the indicator.

As shown in Table 2, the indicators and measures used in the study were not the usual economic descriptors of the organization (such as sales and profits), but solely *organizational* indicators and measures.

To extract the data, the researcher was assisted by the management of the organizations under study, which graciously assigned worker assistance to go through the records and to extract the needed information. Such assistance was invaluable to the conduct of the research.

Once the indicators and measures were extracted, they were then prepared in the form of graphic presentation for each measure. The graphic presentation showed the 5-year history of the specific measure.

Step 2: Structured Interviews

The purpose of the interviews was to learn how managers interpret the measures drawn from archival data. Thus, the 32 measures shown in Table 2 were divided into two sets of measures, each containing 16 measures opportunistically selected across dimensions. This meant that each set contained measures of structure, internal processes, resource management, and interaction with environment.

An interview protocol was developed and pre-tested, which was named: "Analysis, Interpretation, and Grouping." The protocol was designed to collect personal data on the interviewee, and to provide the interviewee with a set of 16 "charts" of measures (with data over the five-year period preceding the interview). Each interview lasted one to two hours. About 1/2 of the interviewees asked to "take the instrument home" and to mail it later. Of those, 82% returned the instrument within two weeks, and 11% returned the instrument after follow-up calls.

The respondents were requested to group the measures into meaningful "change phenomena" in the organization and to describe how they arrived at such "grouping." In addition, respondents were asked to explain what the phenomenon they identified represents to the status of the organization (improvement, decline, problem, danger sign), and whether the phenomenon requires the attention of senior management. Respondents

were also asked to specify which actions they would take to deal with the phenomena they identified. Finally, respondents were asked to propose other measures that would facilitate their interpretation and to comment on their experience with the instrument (Blalock, 1971; Seider, 1974). Table 3 shows the sets of measures used in the interviews and the number of respondents for each. The main reason for using two sets was to avoid the effect of the selected set on responses. Since the sample of interviewees was large enough, it allowed for two sets of measures. Caution was applied to administer the same set to respondents from the same organization.

TABLE 3

SETS OF MEASURES* AND RESPONDENTS

Set 1 Number of Respondents: 106 (49%) Charts: (1); (3); (6); (7); (9); (10); (12); (13); (15); (17); (20); (23); (25); (29); (30); (31);
Set 2 Number of Respondents: 112 (51%) Charts: (2); (4); (5); (8); (11); (14); (16); (18); (19); (21); (22); (24); (26); (27); (28); (32).

* **From Table 2**

ANALYSIS

Respondents were asked to group the measures into meaningful change phenomena, and also to provide a "name" for each phenomenon they identified. The general reaction to the instrument was positive. For example, the executive vice-president of a financial services organization:

"This is a challenging questionnaire. It made me think and examine my company in a different light."

The president of a division in a manufacturing company commented:

"This research is about what we do all the time; we look at data and draw conclusions. But we do it instinctively. Perhaps this will help you to discover how our instincts work."

The interviews were designed to make respondents create mental frames of change phenomena, based on a small set of measures, derived from their archives. The results from the interviews were codified and comparisons made between the sets and with relation to personal and organizational characteristics of the respondents. The data were then analyzed to extract patterns and to construct the mechanism by which respondents

formulated the change phenomena. The analysis consisted of qualitative content analysis and some statistical relations (Blalock, 1971; Bogozzi and Philips, 1982).

RESULTS

The data from the study show that the findings of the process by which managers interpret and group archival measures to form organizational change phenomena is an antecedent to the processes identified by such authors as Isabella (1990) and Thomas Shankster, and Mathieu (1994). Isabella (1990) showed how organizational members interpret key events through the stages of anticipation, confirmation, culmination, and aftermath. In that study the key events have already happened and respondents were asked to provide some sensemaking about them. In the research reported here, managers were asked to formulate the events themselves, via synthetic rather than analytic reasoning, as was the case in Isabella (1990).

In Thomas, Shankster, and Mathieu (1994), respondents were also asked to interpret six issues deemed important to higher education, and to suggest whether the issues were strategic and political. Again, the study reported here offers an antecedent to such interpretations.

Formulation of Events or Phenomena

The findings from this study show that managers are able to formulate mental images or projections of events that occurred in their organizations over time. By using "synthetic reasoning" they project, from a limited set of data items, complex organizational phenomena (Frank, 1939). This they do in a way perhaps similar to projections from ink blots (Frank, 1939) or analysis of photographs (Dougherty and Kunda, 1991).

The uniqueness of the method and the findings of this study is the simplicity with which managers transform a limited set of singular data elements into a complex organizational event (Miller, Lant, Milliken, and Korn, 1996). The process by which managers make this transformation into a mental image of the event and the resultant events are the main results from this study.

Managers construed a variety of phenomena or events which, in their view, emerged from the 16 measures they reviewed over a 5-year period prior to the interview. Managers formulated two levels of events. The first or lower level consisted of formation of "groups" which roughly correspond to "events." The second level consisted of "grouping the groups," or grouping the events into "categories," roughly corresponding to dimensions of organizational analysis.

Forming the Groups

The average number of measures per group was four, the highest was 10 and the lowest was one measure. The average number of groups was five. Table 4 provides illustrations of groups formed and the labels given them by respondents.

TABLE 4

ILLUSTRATIVE GROUPS FORMED BY RESPONDENTS AND THEIR LABELS

SET 1*	SET 2*
(1) "Quality of Work Environment" (Measures: 3,6,7,9,20)	(1) "We are reorganizing!" (Measures: 2,5,19,21,22)
(2) "Administrative Control" (Measures: 3,7,10,25)	(2) "Following the industry." (Measures: 4,18,24,26,32)
(3) "Corporate Outline" (Measures: 3,9,10,29,30)	(3) "Increased uncertainty and insecurity" (Measures: 2,11,14,16,21)
(4) "Corporate Stagnation" (Measures: 15,20,23,25,31)	(4) "We have been through rough times." (Measures: 8,14,19,21,27)
(5) "How Attractive is This Organization as a Workplace?" (Measures: 3,6,15,20,31)	(5) "Only the best survive" (Measures: 16, 19,2 1, 27,32)

***From Table 3.**

Respondents made the following illustrative comments:

"This company did what it was supposed to do to stay above water and survive, and it shows in these measures: we reduced our size, carefully rehired, expanded our external liaisons. It's all right here. . . ."

Another respondent, an administrator of a health care organization commented:

"I don't need a bunch of measures to tell me where we stand and where we are going. We are stagnating, we don't spend on our people, we don't bring in new blood, we just cruise along. You captured it perfectly in these charts."

Forming Categories

The next step was for respondents to "group the groups" and to form categories of a higher level of abstraction. By aggregating the measures into meaningful groups,

respondents have ascribed conceptual meaning to the groups with labels such as "quality of work environment" and "administrative control." In forming even higher-level categories respondents are demonstrating their ability to project organizational phenomena over time and in the sense of the entire organization (rather than a single unit or functional perspective). Table 5 illustrates some categories formed by respondents.

TABLE 5
ILLUSTRATIVE HIGHER LEVEL CATEGORIES FORMED BY
RESPONDENTS

CATEGORY*	ILLUSTRATIVE GROUPS USED**
1. Power	Administrative control; corporate decline; survival factors; change processes.
2. Survival	Following the industry; only the best survive; reengineering and reconstruction.
3. Alienation	How attractive is this organization as a workplace; motivation and performance; who's next?
4. Growth	We are reorganizing!; innovation is our business; only the best survive; efficiency leads to performance.
5. Leadership	We have been through rough times; competition dictates; changes in our industry; tough decisions.

*Labels were assigned by respondents.

**From Table 4. Labels were assigned by respondents

The average number of categories formed was two, the highest was four, and the lowest was one category. Respondents were also able to discuss the relation of the groups and the categories with the way they used to form these projections. There were no significant differences observed in the formation of groups and categories between respondents who examined set 1 and those with set 2 of measures. It should also be emphasized that respondents were not shown the labels of the dimensions and indicators in Table 2. Respondents were only shown the graphic display of the 5-year data and the label of the measure (e.g., number of complaints to corporate management, or rate of transfers).

Importance and Action

In response to questions in the interview protocol, respondents were asked to relate the groups they had formed to actual organizational problems and to suggest the degree of importance of the events they had identified to corporate management. Finally, respondents were asked to propose recommended actions to solve such problems.

Perhaps due to the composition of the sample of respondents (see Table 1), many of the groups and problems identified may be classified as "strategic" (Melone, 1994; Thomas,

Shankster, and Mathieu, 1994). Although only 32% of the respondents were senior executives, even middle managers and first line supervisors were able to identify strategic groups.

Table 6 shows illustrative organizational problems identified with the grouping of the measures, and recommended actions in their wake.

**TABLE 6
ILLUSTRATIVE FACTORS GENERATED BY CHANGES OVER PAST 5
YEARS AS ELICITED FROM THE GROUPINGS OF THE MEASURES BY
RESPONDENTS**

Groups (Phenomena) Identified by Respondents*	Organizational Problems Generated by These Phenomena**	Recommended Action**
Quality of work environment	"Decline in motivation and potential decline in productivity"	"Improve internal relations and more focused investments in human resources."

Following the industry	"Loss of leadership position to be followed by loss of market share."	"Improve conditions for innovation."
How attractive is this organization?	"Competent and creative managers see the company as a springboard to other opportunities."	"Improve hiring practices and follow through with internal opportunities for growth."
Only the best survive	"Loss of trust, increased internal tension among managers and workers."	"Institute an 'after-change' program to diffuse internal strife."

*From Table 4.

**Labels assigned by respondents.

The findings illustrated in Figure 6 indicate the link that managers made between their projection from the archival measures and their perception of organizational phenomena. Boyd, Den, and Rasheed (1993) studied the methodological aspects of measuring the organizational environment, and in this context have concluded that differences between archival and perceptual measures stem from the level of analysis and mediating filters. Although departing from different assumptions and with a different method, the findings reported here lead to a different conclusion. In this study the results show that the process of projecting archival measures into meaningful groups and sensemaking events or phenomena includes *convergence* of archival and perceptual measures. This is described in the following section.

Process of Formulation of Organizational Phenomena

Content analysis of notes from interviews and respondents' replies to the interview protocol show that there are five distinct stages in the manager's construction of reality from a limited set of archival measures. These stages are: projection, elucidation, integration, sensemaking, and action. It is proposed in this paper that perhaps this is the process by which managers routinely interpret and project data to formulate a mental image of what transpires in their organization. Such a process would therefore precede other forms of *a posteriori* interpretation of events (Isabella, 1990).

Projection

This stage of the process consists of putting together divergent data items (measures) with the guiding principle of "how they connect." This stage involves perhaps a mechanism of first approximation of seeing a picture out of fragmented and presumably unrelated components. Managers have commented that they look for some connecting principle or linking pin that would make them want to extract specific measures and to group them. This stage seems to be primarily methodical rather than a step in constructing reality.

Elucidation

This is the stage where managers piece together the distinct data items into a mental picture that begins to make sense. A senior executive of an insurance company commented:

"It's like a puzzle, where you put the pieces together and something appears. The picture is starting to make sense in the corporate context. I can make out something out of these charts."

Managers in the study have commented that they piece together the data items in the charts in sub-sets of 2-3 items, adding data items as they go along—until a reasonable picture appears. This stage is similar to the anticipation stage identified by Isabella (1990) and to the process cited in Melone (1994).

However, the picture that emerges in this stage is not yet clear enough to represent an organizational phenomenon. Managers seem to link this stage to the next stage of integration in which they focus their mental picture.

Integration

This stage seems to merge with the previous stage of elucidation, and through content analysis of respondents' comments and replies to interview questions. Is it possible to distinguish between the two stages? Once a mental picture (as unfocused as it might be) begins to emerge from the archival data, managers tend to integrate it with a *template* of their views of the organization. This construct is analogous to belief structure (Walsh, 1988) and role/experience-based expertise (Melone, 1994). It is also similar to concepts discussed by Polley (1997).

In summary, the *template* is the manager's conceptualization of the organization, based on experience (overall and in the focal organization), expertise, education, and hierarchical position. Into this template the manager now introduces the mental picture that emerged from the data elements (charts). A composite of comments by respondents follows:

"In light of what this company has been through in the past decade, these events show that we are in decline. . ."

"I knew the company and I can see that what these trends mean is that the industry is changing hard and fast, and we are changing with it. . ."

How managers integrate their mental image from the archival data with the template is unknown. The resulting outcome is a reality they form in their mind of an organizational phenomenon of the change in the organization in the past five years. How much of this resultant picture is from projection of the archival data and how much is in the template? Findings in this study have not revealed such a composition (Boyd *et al.*, 1993).

What emerges from the integration stage is a coherent and well focused picture of what managers now consider the reality of change in the past five years—as it ties with other events, data, and occurrence before and during the said five-year period.

Sensemaking

Managers are now able to transcend the groupings and to rise to higher abstraction levels. Groups of archival data are collected in a form that makes sense in the organizational context of broad phenomena. In parallel, managers also manipulate the construed reality that emerged from the integration stage so that it now "makes sense" not only as an organizational phenomenon, but as a "real" problem.

Sensemaking is a stage in which managers endorse their construed reality with the mantle of *actual* issues and problems. Such an investiture marries the emergent reality they had construed from the archival data to the current "reality" of the organization. They do so by relating their emergent reality to one or more actual problems that managers usually face at their level of administration. Said a senior manager in a manufacturing company:

"This information doesn't make any sense until I can see a problem that we have to deal with. After all, you have here five years worth of trends that clearly show what we have done and what remains to be solved."

The sensemaking stage is also a measure of success in the way managers convert the archival data to a focused construed reality. Perhaps this is the routine process by which they project and transform data into meaningful phenomena, which then are used to formulate executive problems (Melone, 1994; Palmer and Dunford, 1991).

Action

The final stage in the process involves translating the problem identified in the previous stage into an actionable category in the manager's construed reality of the phenomenon. Judgments by the manager become a subjective interpretation of the definition and degree of severity of the problem (Tsui *et al.*, 1995). By assigning to the construed phenomenon actionable alternatives for resolution, the managers close the loop in securing a grounded

position for the picture of reality generated by archival data in the midst of organizational life.

IMPLICATIONS

Findings from this study may impact five areas of organizational research. Organization design and architecture may benefit, in that this study demonstrated that managers construe complex phenomena from a linked set of archival data. Therefore, the architecture of organizational dimensions may be tailored to the needs of managers and to their ability to absorb archival information. Different configurations of design and of information structuring may also benefit from additional research into how different archival data configurations form different dominant realities in organizations.

A second area is organizational learning. Managerial formation of complex phenomena from a small set of archival data suggests several applications for learning. How do managers transfer their construed reality and phenomena they had generated to other members, superiors, and subordinates? This topic is crucial in understanding issues of implementation of strategies (Phillips, 1981; Calori, Johnson, and Sarnin, 1994).

Results from this study have indicated that there is simplicity and elegance in the process by which managers construe complex organizational phenomena, even to the highest order of abstraction. Further research should explore the criteria used by managers in the selection of archival measures and in their transformation into abstract phenomena. Yet, our lack of detailed understanding of the process notwithstanding, it appears from this study that knowledge may be created by managers in a simple yet highly effective manner (Miller *et al.*, 1996). Managers seem to absorb a limited set of quantitative data and to configure these seemingly unrelated pieces into a meaningful construct. There are implications for research as the methodology employed in this study may be replicated and improved for further use in managerial cognition.

The fourth area in which results from this study may have applications is in the design of monitoring systems for organizational change (Geisler, 1979). If indeed a small set of quantitative archival measures is sufficient to represent complex phenomena, such measures may form the nucleus for an organizational system that would alert managers against dangerous trends by producing early-warning signals.

Finally, results from this research may have implications on the formation of a typology of mindscapes, in those organizations where multicultures prevail (Maruyama, 1994). Such applications may be welcome in international and transnational organizations. Creation of knowledge and managerial cognition should also be studied further in light of cultural differences.

CONCLUSIONS

The mechanisms by which managers create knowledge that makes sense of organizational change phenomena are still largely unknown. As we are increasingly concerned with managerial cognition and with organizations as knowledge-transforming

entities, it is even more pressing for organization scholars to understand how managers absorb available data and transform them into meaningful realities.

This study provided some initial insights into how managers formulate complex change phenomena from a small set of archival measures. Perhaps the stage-process described in this study is part of the mechanism by which seemingly unrelated pieces of data are combined with the manager's *template* and other information to create sensemaking phenomena. The findings from this study are perhaps a leap from the psychology of cognition (Frank, 1939; Calori, Johnson, and Sarnin, 1994) to managerial and organizational cognition.

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