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SELECTIVITY AND SELECTIVE PERCEPTION: AN INVESTIGATION OF MANAGERS' BELIEF STRUCTURES AND INFORMATION PROCESSING

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Dearborn and Simon's evidence of departmental bias in problem identification has prompted a scholarly concern about managers' information-processing capabilities. Through measures of managers' entire work histories, their belief structures, and three indexes of information processing in an ill-structured decision situation, the present research conceptually replicated and extended Dearborn and Simon's early work. Contrary to prevailing belief about managers' information-processing limitations, the managers in this investigation did not emerge as simple-minded information processors.

Managers routinely confront ill-structured, complex problems that challenge their cognitive capacities (Ackhoff, 1974; Mason & Mitroff, 1981; Mintzberg, Raisinghani, & Theoret, 1976; Schwenk, 1984; Ungson, Braunstein, & Hall, 1981). They must meet such challenges with limited information-processing capabilities (Miller, 1956). Previous research has suggested that in the interest of cognitive economy (Mischel, 1981; Taylor, 1975), managers construct belief structures that are simplified representations of their world (March & Simon, 1958; O'Reilly, 1983; Simon, 1955). These belief structures are considered indispensible to any decision maker, for without them, individuals would be overwhelmed by an information world of staggering complexity (Daft & Weick, 1984).

The simplified mental representations individuals employ to give their information environments form and meaning have been variously called implicit theories, cognitive maps, assumptions, schemata, and belief structures. The term "belief structure" seems to be the most accurate descriptor and, as such, was used throughout this research. Fiske and Taylor defined a belief structure as a "cognitive structure that represents organized knowledge about a given concept or type of stimulus. . . . It contains both the attributes of the concept and the relationships among the attributes" (1984:

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140). A belief structure reduces information-processing demands and renders information worlds manageable by structuring experience (Bower, Black, & Turner, 1979), by facilitating information acquisition and retrieval (Cantor & Mischel, 1977), and by providing a basis for inference (Snyder & Uranowitz, 1978). In short, a belief structure acts as a guide to an information domain.

Scholars have expressed concern, however, that belief structures can limit a manager's ability to understand an information domain. Weick, for example, pointed out that the unfortunate by-product of such simplified representations is that managers often must act on "impoverished views of the world" (1979: 68). In fact, a number of organizational disasters have been attributed to top managers' cognitive shortcomings. Starbuck and Hedberg's (1977) analysis of the Facit Corporation, Wyden's (1979) look at the Bay of Pigs invasion, Wilensky's (1967) examination of the saturation bombing of Europe in World War II, Shlaim's (1976) study of the third Arab-Israeli war, and Yates's (1983) investigation of the U.S. automobile industry have all attributed negative outcomes to the cognitive limitations of key decision makers. It is not known, however, if such attributions only serve to scapegoat decision makers or if they accurately depict the decision makers' cognitive limitations and their effects on organizational performance.

With the exception of some recent work by Jolly, Reynolds, and Slocum (1988), Walker (1985), and Walton (1986), there is little empirical evidence beyond the case studies cited concerning managers' information-processing capabilities. Nonetheless, management scholars have been pessimistic about managers' abilities to process information effectively. For the past 30 years, the management community has been warned about widespread problems of selective perception (Dearborn & Simon, 1958), perceptual screens (Cyert & March, 1963), personal bias (Stagner, 1969), collective blindness (Turner, 1976), tunnel vision (Mason & Mitroff 1981), functional fixedness (Katz, 1982), strategic myopia (Lorsch, 1985), and contested belief structures (Walsh & Fahey, 1986) among its decision makers. The concern shared by the scholars cited is that managers unknowingly may fall prey to suboptimal information-processing strategies. Moreover, recent social psychological work in the area of schematic information processing suggests that managers' decisions may be compromised by their information-processing limitations (Brewer & Nakamura, 1984; Taylor & Crocker, 1981).

The early work of Dearborn and Simon continues to be cited as evidence that managers suffer from systematic information-processing shortcomings. The thrust of their argument is that exposure to the goals and reinforcements of a particular department in an organization promotes a viewpoint that inclines a manager to attend only to certain information in a situation that relates specifically to the activities of that department. Dearborn and Simon's evidence for selective perception in the identification of company problems was cited in the management literature 60 times in a recent ten-year period (1978–87).

The intent of the present research was to conceptually replicate and extend Dearborn and Simon's work. They assessed both the departmental

position of each of their managers and the content of the problems the managers identified in an ill-structured decision situation. The present research extended that effort by recording the entire work history for each manager studied, by assessing the content of each individual's belief structure, and by noting the effects of that belief structure not only on problem identification, but also on use of information and requests for additional information. With actual measures of the managers' belief structures, it was possible to examine just how selective their perception was.

RESEARCH ISSUES

The Content of the Managers' Belief Structures

Individuals hold many different belief structures about many different information domains. In order to examine the effects of a belief structure on managerial information processing, its broad content must be established. The research task is to select and assess a type of belief structure relevant to the information-processing task at hand. It seems likely that managers hold belief structures organized around attributes they believe characterize a successful organization. Although Dearborn and Simon (1958) did not speculate about the nature of each manager's hypothesized viewpoint, it is reasonable to argue that exposure to a department's goals and activities is likely to shape a manager's conception of organizational success. The observations of a number of theorists support that hypothesis. Srivastva, for example, argued that managers mentally create "an image of a desired future organizational state that can serve as a guide to interim strategies, decisions, and behavior" (1983: 2). Quinn asserted that "managers keep a clear vision in mind of where they would like to go and use all the valid analytical data they can as they guide their organizations toward a new strategy" (1980: 192). Dearborn and Simon's (1958) logic of departmental identification suggests that such visions may be organized by function in managers' minds.

Examining managers' belief structures concerning the characteristics of a successful organization finds theoretical precedent in Cohen's (1981) notion of a judgment goal. In her review of the literature, she found support for the proposition that peoples' goal orientations shape their definition of an information domain and guide information processing with respect to it. I assumed that managers attend to stimuli as they relate to their notions of organizational success, which in this research served as their judgment goal.

Hypotheses

The cornerstone of Dearborn and Simon's (1958) argument is that by virtue of the time spent in a particular department or function, managers develop a viewpoint that is consistent with the activities and goals of that department or particular function. Their logic is based on a simple exposure effect: exposure to the activities and goals of a department fosters a readiness in individuals to view their broader organizational worlds in a special light.

Thus, managers' functional work histories are likely to be represented in the specific content of their belief structures.

> *Hypothesis 1: A manager with a belief structure focused on a single functional domain is likely to have worked in that domain.*

The predicted information-processing effects of holding a particular belief structure are straightforward. Given that belief structures define individuals' domains of attention (Cohen & Ebbesen, 1979) and structure experience (Bower, Blank, & Turner, 1979), managers' problem identification in an ill-structured decision situation should occur within the bounds of their belief structures' content. That hypothesis, of course, attempts to replicate the logic and findings of Dearborn and Simon's research.

> *Hypothesis 2: In ill-structured decision situations, managers are only likely to identify problems that are from the same functional domain as the content of their belief structures.*

In addition to shaping the scope of problem identification, a belief structure should also affect the scope of information use in a decision-making process. Previous researchers have thought that, functionally, belief structures guide information acquisition and retrieval (Cantor & Mischel, 1977; Ross & Sicoly, 1979). Specifically, managers are only likely to use present information and seek out additional information in a manner consistent with the content of their belief structures.

> *Hypothesis 3: In ill-structured decision situations, managers are only likely to use information that is from the same functional domain as the content of their belief structures.*

> *Hypothesis 4: In ill-structured decision situations, managers are only likely to seek additional information that is from the same functional domain as the content of their belief structures.*

METHODS

Respondents and Procedures

The data for this study were collected from 121 midcareer managers enrolled in a two-year, part-time executive master's degree program at a large university. These individuals were either middle-level managers who were recognized by their employing organization as having senior-management potential or senior-level managers seeking to improve their management skills. The average respondent was 38 years old. Of the 121 individuals, 91 were men and 30 were women. At the time of data collection (1983), 97 of the respondents earned less than $50,000 per year and 24 earned more.

The director of the degree program informed the approximately 240 enrollees of the opportunity to take part voluntarily in a "research project on managerial decision making." Groups of no more than 30 individuals were asked to report to a large classroom at a prearranged time. They completed a sorting task and a case analysis.

Sorting task. Each manager was given a randomly ordered deck of 50 three-by-five-inch cards. Each card was labeled with one of 50 factors thought to be broadly related to the success of organizations. The factors were drawn from among Hambrick's (1981) functional areas, Miles's (1980) strategic constituencies, and the Profit Impact of Market Strategies variables (PIMS; Buzzell, Gale, & Sultan, 1975). The intent of this research-based selection procedure was to create a pool of items that might reasonably encompass all the managers' notions of organizational success. Moreover, I chose items that might represent the kind of departmental bias that Dearborn and Simon (1958) inferred existed. Although items such as "working hard" or "perseverence" may be suitable for investigation in another context, they would not enable assessment of departmental identification. Table 1 lists the items that were presented to the managers.

The managers were instructed to sort through the deck of cards to create two piles—one containing the factors that they thought were important to

TABLE 1
Items Employed in the Sorting Task

Profitability	Fixed & variable costs
Economy of scale	Sophistication of technology
Employee morale	Equal employment opportunity
Legal expertise	Public relations
Market share	Responsibility to government
Responsibility to stockholders	Skillful sales force
Internal R&D capability	Product research
CEO leadership	Depth of management
Debt/Equity ratio	Inventory planning
Quality control	Vertical integration
Unionization	Responsibility to customers
Responsibility to creditors	Personnel turnover
Lobbying capabilities	Macroeconomic environment
Product line	Market growth rate
External R&D accessibility	Process research
Management flexibility	Coordination among functions
Stock price	Responsibility to yourself
Responsibility to community	Investment intensity
New products	Patent advantages
Employee recruitment	Career ladders
Number of customers	Regulation environment
Brand recognition	Market segmentation
Consultants	Responsibility to suppliers
Responsibility to employees	Basic research
Strategic planning	Shared corporate culture

organizational success and one containing factors they thought relatively unimportant to success. Next, the managers were instructed to look through their pile of important factors and sort it into smaller piles of related factors. They were free to create as many piles as they wished. They were then asked to rank the piles in terms of the importance of the sets of related factors. The entire procedure took about 25 minutes.

Case analysis. A second 25-minute period was devoted to reading and analyzing a three-page case history developed expressly for this research. The Arbor Company case, which is available from the author, was designed to embody an ill-structured situation and to raise possible issues across a number of functional domains. The case portrays a company, with a mature product line, that is challenged by the advent of private-label and generic competition. After reading and underlining useful information in the case, the managers were asked to respond in writing to two open-ended questions. They were asked (1) to identify the problem or problems facing the Arbor Company and (2) to indicate what additional information they would need to assess the company's situation thoroughly. At the conclusion of the session, the managers were debriefed about the nature of the project and asked not to discuss their experience with others.

Measurements

Belief structures. The use of a sorting procedure to measure belief structures was borrowed from personality research. Rosenberg (1982) reviewed sorting methodology, which is demonstrated by the sorting procedure described in the previous section, and its application to psychological research, tracing that history back to Bruner, Goodnow, and Austin (1956). Such a procedure has three strengths: (1) It allows subjects to categorize a set of stimuli that are independent of an experimenter's own category system. (2) The output of the sorting procedure can be used as input for a number of multivariate analytic techniques, including multidimensional scaling. (3) It is a less cumbersome technique for estimating psychological distance between objects than Torgerson's (1958) method, which requires subjects to rate all pairwise similarities in a stimulus set. In this study, there were 50 stimuli in the set. Had the managers been asked to rate all pairwise similarities, they would have had to make 1,225 judgments [$N(N-1)/2$]. Rosenberg, Nelson, and Vivekananthan (1968) first used the sorting procedure with multidimensional scaling in their study of implicit personality theory. Subsequentially, Rosenberg and Olshan (1970), Schmidt (1972), and most recently, Sternberg (1985) and Walsh, Henderson, and Deighton (1988) have employed similar methodological strategies.

All the sorted piles of factors were rank-ordered by the managers in terms of importance to organizational success. The ranked groupings, which provided distance measures among the factors, were used as inputs to Takane's (1982a) individual-differences multidimensional scaling program. A discussion of that program and its role in belief-structure identification appears in the Results section.

Work history. Complete work histories of 107 of the 121 managers were drawn from the background information each had given the university administration. Only current job titles were available for the remaining 14 managers. The Appendix gives the information drawn from the university files.

Following Hirschman (1964), I computed a measure of functional diversity for each of the 107 managers as $\sqrt{\Sigma(X_i / X)^2}$, where X_i = number of years worked in a particular function and X = total number of years of work experience. Values for this statistic ranged from near zero, representing extreme functional diversity, to one, representing an entire career spent in one function. The mean for this group of managers was .84, with a standard deviation of .16.

Problem identification. The method employed here was similar to the one used by Dearborn and Simon (1958). In their study, managers with diverse backgrounds were asked to read a case and then write a brief description of what they considered to be the most important problem facing the company. I asked the managers in this research to identify the most important problem or problems facing the Arbor Company. The managers' responses were coded into five categories: accounting-finance, human relations, marketing, internal management, and external management. Dearborn and Simon classified their managers' responses into a set of only three departmental categories: sales, production, and accounting. In this research, the accounting-finance and marketing categories captured the function-specific information relevant to each domain. The human relations category encompassed such factors as the age and job tenure of particular managers and such issues as recruiting and turnover patterns. Internal management referred to problems related to timely and appropriate decision making on matters of intraorganizational concern. It captured the action orientation of the hypothetical management in the case. External management captured the same action orientation but focused on organization-environment issues. The internal and external management categories were added to the traditional functional categories to address scholarly interest in such orientations (Pearce, 1983).

Two research assistants were hired and trained to code the open-ended responses to the case analysis using the classification scheme just described. Each assistant coded all 121 cases on her own, and then the two met to resolve any differences and to reach an overall agreement for each respondent. Table 2 presents the interrater reliability indices for the problem-definition coding results. In line with the procedures established by Staw, McKechnie, and Puffer (1983), these reliability statistics represent the Pearson product-moment correlations between the proportions of problems identified by each coder in each of the five categories out of the total number of problems identified in the case analysis. The coding agreed on by the two research assistants was used in all subsequent analyses; use of the compromise coding follows Bettman and Weitz (1983). All the correlations are highly signifi-

cant and of a magnitude to be expected in a fairly ambiguous task like this one.

Information use. Information use was measured as follows: managers were asked to underline any information in the case that was useful to them in identifying the problems facing the Arbor Company. The underlined information was coded as falling into one of the five areas identified in the preceding section. Each sentence in the case contained information that might be relevant to any of the five categories, so that as managers underlined case information that they considered diagnostically relevant, they were underlying information that fell into one or more of five coding categories. The information-use measure is simply the number of times a respondent underlined information contained in each of the five categories.[1] Since this coding procedure was an unambiguous mechanical task, one person coded the data.

Requests for additional information. Managers were also asked what additional information they would need in order to assess the Arbor Company's situation thoroughly. Following the same procedure used in the problem identification coding, the two research assistants coded responses to this open-ended question into the five areas. Table 2 presents the interrater reliability indexes for the coding results, again using the proportion of requests in each category as input for the correlations. All the correlations are large and highly significant and again allow confidence in the reliability of the measurement.

RESULTS

The Content of the Managers' Belief Structures

To identify the content of the managers' belief structures, I employed individual differences multidimensional scaling. As Schiffman, Reynolds, and Young noted, multidimensional scaling "recovers underlying structure among stimuli which is 'hidden' in the data" (1981: 7). I used the individual differences scaling algorithm developed by Carroll and Chang (1970) and amended by Takane (1982a,b) for use with sorting data because it identifies

[1] The following two sentences from the Arbor Company case illustrate the coding scheme that was employed. The sentences are bracketed into fragments to illustrate how the coding procedure captured the information embedded in the case:

> [The results of Ashford's transformation from a small-time operator in a big-time company to a big-time operator in a small company] [became apparent this past year.] [After a spate of acquisitions] [of unrelated products and services,] [including some far afield from the company's traditional strength in supermarket products,] [Ashford had pushed Arbor's sales to $1.1 billion in 1982 from $105 at the time of the spin-off.]

If a respondent underlined information within the first bracket, he or she was coded as attending to human relations issues. Underlining in the second bracket was coded as attention to internal management concerns. The remaining brackets captured external management, marketing, marketing, and accounting-finance issues, respectively. The case and coding scheme are available from the author upon request.

TABLE 2
Interrater Reliability

Analyses	Correlations[a]		
	Rater 1–Rater 2	Rater 1–Agree	Rater 2–Agree
Problem identification			
Human relations	.69	.65	.82
Accounting-finance	.37	.56	.77
Marketing	.50	.69	.71
Internal management	.67	.73	.81
External management	.39	.57	.73
Additional information requests			
Human relations	.88	.92	.92
Accounting-finance	.77	.83	.90
Marketing	.62	.76	.87
Internal management	.75	.83	.88
External management	.46	.65	.80

[a] "Agree" represents a compromise coding that was used in all subsequent analyses in this study. All correlations are significant at $p < .001$.

differences among individuals as well as among stimuli, determining the weight, or relative importance, each person ascribes to each dimension. Takane's adaptation, which is called IDSORT, assumes that individuals perceive stimuli along a common set of dimensions, but that the importance or weight of each of those dimensions will vary across individuals. In fact, IDSORT allows an individual to give a weight of zero to a dimension.

A ten-dimensional solution best fit the data—in the aggregate, the belief structure representative of all the managers studied can be identified with this set of ten common dimensions. Such a solution is known as a group trait space, which represents a common set of dimensions along which individuals are thought to perceive stimuli. It is important to remember that the weight given to each dimension varies across individuals. The solution accounted for 30 percent of the variance.

It might be helpful to explain what a variance-explained statistic means in the context of multidimensional scaling. The sorting procedure established dissimilarity judgments among all the items in the stimulus set. Distances among those items were then estimated. Any IDSORT scaling solution would have defined precise distances among the items. The program passes repeatedly through various solutions to determine the one in which the distances among the items best match the distances estimated from the original dissimilarity judgments. The variance-explained statistic embodies the degree to which the interitem distances in the final IDSORT solution and the interitem distances estimated from the original dissimilarity judgments are similar, assessing the quality of this match. The 30 percent of variance explained in this research is generally consistent with typical individual-differences scaling results. For example, the values for variance explained in

the solutions reported by Passer, Kelley, and Michela (1978), Takane (1982b), and Wish, Deutsch, and Biener (1972) were 35, 41, and 22 percent, respectively.

Table 3 shows the eigenvalues, scaling solutions, and loadings for each of the ten dimensions. Clusters of stimuli anchor the ends of each dimensions and thus define it. For example, dimension 5 is clearly marketing oriented. The polar opposite clusters labeled product development and product delivery indicate that managers think of marketing at least partially in terms of developing and delivering products to the marketplace. Similarly, each of the clusters of stimuli define the emergent perceptual dimensions that compose organizational success in the minds of these managers. As the table shows, I gave summary labels to each of the clusters.

Some of the factors load on more than one dimension and, as a result, some dimensions appear to overlap. Such results are common in attempts to represent complex information domains (Smith & Siegel, 1967). Dimensions 4 and 5, for example, share some marketing factors, which reflects the fact that in the respondents' minds, marketing issues such as market share, market growth rate, and sales force management are related to internal product development as well as to external environment. Similarly, the first four dimensions reflect the perception that an external orientation, related to each of four distinct internal concerns, is important to organizational success. The overlaps were not problematic for carrying out the remainder of the analyses.

An examination of the individual weights for each of the ten dimensions in the group trait space indicated how the managers differed in their views of organizational success, allowing assessment of Dearborn and Simon's (1958) hypothetical construct, the viewpoint. It was possible to determine who viewed organizational success along narrow functional lines. For example, the belief structure of a manager who gave a very high weight to dimension 3 and perhaps 6 and low weights to the other eight dimensions was dominated by financial concerns. A human-relations-oriented belief structure would have dimensions 1 and perhaps 8 weighted heavily; a marketing-oriented belief structure would evidence high weight on dimension 4 and perhaps 5 or 7; a manufacturing-oriented belief structure would show high weight on dimension 9 and perhaps 5 or 7; a leadership-oriented belief structure would be marked by high weights on dimensions 2 or 10 and perhaps 6 or 8; and finally, a generalist, a manager whose orientation to organizational success is not narrow and functionally specific, would have high weights on dimensions that crossed any of these five boundaries.

With .60 taken as the threshold for a high individual weight, the breakdown of managerial belief structures by type was as follows: human relations, $N = 12$; accounting finance, $N = 6$; marketing, $N = 7$; leadership, $N = 4$; manufacturing, $N = 3$; generalist, $N = 59$; other (no weight $> .60$), $N = 30$. In light of the relatively narrow work histories of the group as a whole (mean functional diversity = .84), it was interesting to see so many generalists. The logic of Dearborn and Simon (1958), of course, would predict far fewer

TABLE 3
The Ten-Dimensional IDSORT Scaling Solution[a]

	Positive Polarity		Negative Polarity	
Dimensions[b]	**Scaling Solutions**	**Loadings**	**Scaling Solutions**	**Loadings**
Dimension 1	Externalities		Human resource management	
(.564)	Legal expertise	.09	Employee morale	−.47
	Responsibility to government	.09	Responsibility to employees	−.44
	Lobbying capabilities	.09	Employee recruitment	−.39
	Economy of scale	.09	Employee turnover	−.35
	Investment intensity	.09	Career ladders	−.28
Dimension 2	Leadership		Externalities	
(.449)	CEO leadership	.46	Unionization	−.08
	Management flexibility	.46	Equal employment opprotunity	−.08
	Depth of management	.43	Lobbying capabilities	−.08
	Coordination among functions	.38	Patent advantages	−.07
	Strategic planning	.31	Number of customers	−.07
			Employee recruitment	−.07
Dimension 3	Finance		Externalities	
(.422)	Profitability	.61	Quality control	−.11
	Responsibility to stockholders	.44	Legal expertise	−.09
	Debt/equity ratio	.37	Lobbying capabilities	−.09
	Stock price	.35	Consultants	−.08
			Vertical integration	−.08
			Patent advantages	−.08
Dimension 4	Externalities		Marketing	
(.363)	Legal expertise	.14	Market share	−.42
	Responsibility to government	.13	Market growth rate	−.33
	Lobbying capabilities	.13	Product line	−.31
	Unionization	.11	Market segmentation	−.31
	Consultants	.11	Skillful sales force	−.28
	Regulation of environment	.11		
Dimension 5	Product development		Product delivery	
(.329)	Product research	.48	Market growth rate	−.11
	Internal R&D capability	.45	Number of customers	−.11
	New products	.33	Skillful sales force	−.10
	Sophistication of technology	.33	Market share	−.10
	Basic research	.30	Lobbying capabilities	−.10
Dimension 6	Responsibility to stockholders		Cost containment	
(.249)	Responsibility to creditors	.50	Economy of scale	−.11
	Responsibility to suppliers	.47	Costs	−.11
	Responsibility to customers	.43	Debt/equity ratio	−.10
	Responsibility to stockholders	.28	Stock price	−.10
	Responsibility to community	.27	Market share	−.09
Dimension 7	Marketing		Manufacturing	
(.214)	Market growth rate	.10	Inventory planning	−.61
	Market segmentation	.10	Quality control	−.57
	Market share	.09	Costs	−.39
	Lobbying capabilities	.09	Profitability	−.15
	Consultants	.09	Coordinating among functions	−.15
	Legal expertise	.09		

TABLE 3 (continued)

Dimensions[b]	Positive Polarity		Negative Polarity	
	Scaling Solutions	Loadings	Scaling Solutions	Loadings
Dimension 8	Responsibility to yourself		Responsibility to employees	
(.196)	Responsibility to yourself	.99	Employee morale	−.08
			Employee recruitment	−.08
Dimension 9	Economic environment		Production/engineering	
(.184)	Regulation environment	.82	Economy of scale	−.07
	Macroeconomic environment	.58	Process research	−.07
			External R&D accessibility	−.06
			Consultants	−.06
			Vertical integration	−.06
Dimension 10	Ensuring resource acquisitions		Public relations	
(.159)	Responsibility to suppliers	.10	Public relations	−.78
	Vertical integration	.08	Responsibility to community	−.48
	Consultants	.08	Responsibility to customers	−.31
	Economy of scale	.08		
	Investment intensity	.07		
	Responsibility to creditors	.07		

[a] Convergence reached in 27 iterations; variance explained = .30; $N = 121$.
[b] Eigenvalues for each dimension are in parentheses.

generalists. In addition, there were 30 managers in the "other" category, indicating no dimension weights of .60 or above. Those managers exhibited no firmly held orientation to organizational success, at least as reflected by this measurement procedure.

It should be noted that there is little guidance in the multidimensional scaling literature for establishing a high individual weight (Shiffman, Reynolds, & Young, 1981). I chose the criterion of .60 somewhat arbitrarily, using the conservative precedent established in the factor analytic tradition for what constitutes a significant factor loading. The mean individual weight of all those individual weights above the .60 criterion is .75, with a standard deviation of .11. The mean of those weights below this criterion is .21, with a standard deviation of .18.

Belief-structure Origins

The Appendix reports the job titles and work experience of all the managers in the five pure-type belief-structure groups (human relations, accounting-finance, marketing, leadership, and manufacturing). Contrary to what might be expected from Dearborn and Simon's results, no simple link emerged between work experience and the content of belief structures. To be sure, all the managers in the human relations group either worked in the personnel function or managed employees, and four of the seven managers in the marketing group had spent their entire careers in marketing. Nevertheless, there were enough anomalies in this qualitative analysis to suggest that the results did not replicate those of Dearborn and Simon.

A *t*-test compared the functional diversity statistic (described in the Measurements section above) for managers in the pure-type groups with the diversity statistic of the generalists. Hypothesis 1 predicted that the generalists (mean = 85.3; N = 55) would show more functionally diverse work experience than their peers in the pure-type groups (mean = 87.2; N = 25). Although the means are in the predicted direction, the difference is not statistically significant, so the data do not support Hypothesis 1.

The Effects of Belief Structures on Information Processing

To test the effects of the content of belief structures on information processing, I examined the responses of managers in four of the content groups: human relations, accounting-finance, marketing, and generalists. The leadership and manufacturing groups were dropped from the analysis because they were very small.

Table 4 presents the means and standard deviations for the three information-processing variables by the four content groups and the results of the analyses of variance testing the effects of content-group membership on the information-processing variables. Although it is not noted explicitly in Table 4, on the average managers identified 7.12 problems facing the Arbor Company, using 25.09 pieces of data in the case to arrive at this diagnosis, and requested an average 4.63 pieces of additional information to supplement their assessments. Thus, the average manager does not emerge as a parochial information processor.

In the study's test of Hypothesis 2, the four belief-structure content groups served as independent variables for a series of one-way ANOVAs testing for differences on the number of problems identified in each of the five areas of management. The four groups differed only with respect to identifying external management problems. A multiple range test using the least-significant difference (LSD) procedure established that the marketing group saw more external management problems (means = 2.57) than the human relations group (mean = 1.55) and the generalist group (mean = 1.74) at the .05 level of significance. These results offer some marginal support for Hypothesis 2.

A similar set of one-way ANOVAs was performed to test the hypothesis that the content groups would only use information from the same domain as their belief structures' content. As there were no significant differences between the four groups on their use of information in the case, Hypothesis 3 was not supported.

Hypothesis 4, which stated that managers would search for additional information that was from the same domain as their belief structures' content, received limited support in this investigation. ANOVAs were performed to test for differences in additional information requests within each of the four groups. Multiple range tests established that the accounting-finance group requested more accounting-finance information (mean = 1.67) than the marketing group (mean = .33), the human relations group (mean = .73), and the

TABLE 4
The Effects of Belief-Structure Content on Managerial Information Processing

Belief-Structure Content Group	Areas of Management: Human Relations	Accounting-Finance	Marketing	Internal Management	External Management
(a) Problem Identification					
Human relations (N = 11)					
Mean	1.09	1.09	2.73	1.46	1.55[a]
s.d.	1.05	1.14	2.05	0.69	0.69
Accounting-finance (N = 6)					
Mean	0.83	1.17	1.83	1.83	2.17
s.d.	0.41	1.17	1.17	0.75	1.17
Marketing (N = 7)					
Mean	1.14	1.00	3.00	1.00	**2.57**
s.d.	1.07	1.16	1.29	0.82	1.13
Generalist (N = 58)					
Mean	1.00	0.97	2.00	1.45	1.74[a]
s.d.	1.06	0.79	1.06	1.03	1.04
F (3,78)	0.12	0.13	2.24	0.83	1.90
(b) Information Use					
Human relations (N = 12)					
Mean	4.00	6.50	4.08	3.92	5.33
s.d.	3.39	3.53	3.03	4.14	3.63
Accounting-finance (N = 6)					
Mean	4.83	4.33	3.67	5.00	5.17
s.d.	1.72	2.42	2.58	2.45	4.36
Marketing (N = 7)					
Mean	3.14	8.86	3.43	3.86	6.00
s.d.	1.35	2.61	1.51	1.35	2.77
Generalist (N = 59)					
Mean	4.32	6.73	4.39	4.86	4.78
s.d.	2.78	4.43	2.50	3.14	3.01
F (3,80)	0.51	1.33	0.43	0.48	0.38
(c) Information Requests					
Human relations (N = 11)					
Mean	0.36	0.73[a]	1.46	1.00	1.00[a]
s.d.	0.67	1.01	1.37	0.78	0.78
Accounting-finance (N = 6)					
Mean	0.50	**1.67**	2.50	1.17	1.50
s.d.	0.55	0.82	2.26	1.17	1.38
Marketing (N = 6)					
Mean	0.00	0.33[a]	2.33	0.33	**2.50**
s.d.	0.00	0.52	1.86	0.52	2.35
Generalist (N = 58)					
Mean	0.38	0.86[a]	1.55	0.62	1.09[a]
s.d.	0.59	0.91	1.16	0.86	0.88
F (3,77)	0.92	2.40†	1.51	1.59	3.48*

[a] This mean is significantly different from means shown boldface by .05 or more.
†$p < .10$
*$p < .05$

generalist group (mean = .86) at the .05 level of significance. Additionally, the marketing group requested more external management information (mean = 2.50) than the human relations group (mean = 1.00) and the generalist group (mean = 1.09) at the .01 level of significance.

Finally, a more narrowly focused MANOVA was performed to test Dearborn and Simon's (1958) hypothesized departmental viewpoint effect on problem identification. Results for the effects of belief-structure content on problem identification within the information domains of human relations, accounting/finance, and marketing were not significant.

DISCUSSION

Organizational scholars have widely assumed that the belief structures managers use to deal with ill-structured problems, however necessary, have detrimental effects on their decision making. The results of this research on managerial information processing challenge that assumption. Although the managers studied were not asked to make actual decisions, the belief structures they brought to bear on the problems in this study were not particularly simplistic. Moreover, the dominant dimensions of their belief structures did not appear to significantly constrain their information processing. These managers did not seem to suffer from impoverished worldviews or parochial information use.

One goal of this research was to identify managerial belief structures empirically. Contrary to what Dearborn and Simon reported 30 years ago, few managers viewed their organizational worlds along narrow functional criteria. Three-quarters of this group either had strong conceptions of success that crossed functional lines or had no firmly held dominant conception of success. The selectivity of managers' perceptions may not be as constrained as Dearborn and Simon (1958) thought.

Axelrod (1976) concluded from his work that decision makers may hold more beliefs than they can handle. These results both support and challenge his conclusion. Managers may view organizational success on as many as ten dimensions. That finding supports Cyert and March (1963), Posner and Schmidt (1984), and Stagner (1969), all of whom argued that managers are concerned with a number of goals beyond simple profit maximization. However, among managers holding one or more dimensions of organizational success as very important, the average number of dimensions held to be important was only 2.34. What was the status of the other, lesser-weighted 7.66 dimensions? Are they the implicit beliefs that Axelrod felt decision makers should work to uncover? Or are they somehow less valued but nevertheless available for use if the occasion arises? Given the broad scope of information processing evident in these results, it would seem that the less important dimensions that cover the full ten-dimensional conceptual terrain of organizational success are available for use.

The lack of a strong correspondence between work experiences and the content of belief structures is intriguing. Hypothesis 1 would suggest that

managers with a strong functional-area orientation within their belief structure would be working in that same area. However, in this research a chief financial officer, a vice president of marketing, and an assistant director of finance all shared a human relations belief structure. Similarly, there was a chief financial officer with a manufacturing belief structure, an assistant marketing manager with an accounting-finance belief structure, and a supervisory engineer with a marketing belief structure. Perhaps these managers are in the wrong jobs or work in companies with strong cultures that have supplanted the traditional functional orientations of their jobs; perhaps they have been exposed to a number of functional areas during their careers or have been paying close attention in their executive development classes. Nevertheless, it is entirely reasonable to imagine that a chief financial officer, for example, knows something about human resource management or might even feel that such practices are critical to organizational success, even if he or she has never worked in a personnel department.

The most striking finding to emerge from this research was the general lack of support for Hypotheses 2, 3, and 4. There was little evidence of parochial information processing. As Table 4 indicates, the average manager was able to identify problems and use information across the five domains. This is not to say that there was no support for the information-processing hypotheses, for some support emerged. Managers with a marketing belief structure identified more external management problems and requested more external management information than managers in the human relations and generalist groups, and the accounting-finance group sought out more accounting and finance information than the other groups. Nevertheless, even as those groups attended, and perhaps overattended, to their own areas of concern, they did not overlook the other domains. The marketing group identified 2.57 external management problems and also identified 6.14 other problems. Similarly, the accounting-finance group requested 1.67 pieces of additional accounting-finance information and also requested 5.67 pieces of additional information outside that domain. Perhaps those findings reflect the influence of the lesser-weighted belief-structure dimensions on information processing? Although the managers may not see those dimensions as of paramount importance to success, the evidence suggests that if an ill-structured problem triggers a concern in those areas, an executive decision maker may be able to employ them.

An Explicit Comparison with Dearborn and Simon

Since the results of this investigation appear to contrast sharply with the often-cited results of Dearborn and Simon's (1958) study, it is important to take note of the explicit similarities and differences between the two. Respondents, procedures, and results can be meaningfully compared.

The respondents in Dearborn and Simon's research were 23 middle managers, representing a single manufacturing company, who were attending a company-sponsored executive training program. This research included 121 middle- to upper-level managers, representing a variety of companies,

who were attending a university-based executive master's degree program. The major differences, then, were the group sizes and the numbers of companies represented in each group. The present research benefited from greater diversity. The two groups were roughly equivalent in terms of occupational responsibility and interest in executive development. Unfortunately, we cannot compare the scope of educational experiences between the two.

The procedures employed in the two studies differed somewhat. First, the length of the cases varied. Although both cases were descriptive, not evaluative, the case in this research was about 1,000 words in length; the Castengo Steel Company case employed by Dearborn and Simon was about 10,000 words long. It is possible that managers can be more rigorous in their analysis of a short case. Second, Dearborn and Simon's managers were only asked to define the most important problem facing the company—although some defined as many as three problems. In contrast, the managers in the present study were asked to identify one or more problems facing the company, to share the information they used in this diagnosis, and to indicate what additional information they would need to be certain of their diagnosis. Thus, the present research offers a better assessment of information processing. In sum, Dearborn and Simon collected a small amount of information-processing evidence from the analysis of a fairly rich case, and the managers in this study provided us with a good deal of information-processing evidence from a thinner case. Given that the information-processing evidence subsumes the kind of evidence Dearborn and Simon collected, these differences are not problematic, but they should be noted just the same.

Finally, a review of Dearborn and Simon's results may indicate more similarity than dissimilarity to the present results. They published an appendix that reproduced the actual responses they received from their managers. A careful reading of those responses indicates that the sales managers identified sales, marketing, and organizational problems; the production managers identified organizational and sales problems; and the accounting managers identified problems in accounting, marketing, and organization. Ironically, it is not at all clear that Dearborn and Simon's data support their conclusion—the conclusion cited by so many subsequent researchers—that managers suffer from selective perception. Although the results of this conceptual replication of Dearborn and Simon's work largely contradict their own and everyone else's interpretation of their results, the actual results of the two studies do not appear to be contradictory.

Limitations and Future Research Needs

Several limitations of this investigation must be acknowledged. One limitation may be related to the content of the belief structure investigated. Although it is quite reasonable to propose the existence of a goal-oriented belief structure for organizational success, there may be other belief structures worthy of investigation. For example, studies could be conducted that would examine belief structures for organizational survival or organizational

growth. The fact that 30 managers gave no individual dimension a weight greater than .60 and thus did not exhibit any firmly held orientation toward organizational success suggests that this study did not capture a relevant belief structure for those individuals.

In addition, the group-trait-space solution that emerged explained only 30 percent of the variance. It may be that the managers with no high dimension weights did hold a firm orientation to organizational success but that group-trait-space solution did not accurately represent their dissimilarity judgments. Future researchers should work to boost this variance-explained statistic to clarify whether respondents actually hold a particular belief structure.

Third, the participants in this study were all very successful managers selected by their organizations to earn an advanced degree in management. The results suggesting that these managers do not hold narrow belief structures or show evidence of simple-minded information processing may not generalize to managers with more modest accomplishments.

Fourth, the setting for the data collection triggers a number of concerns. Would the results hold in a pressured business environment? It may be that the tranquility and the demand characteristics possibly inherent in a university setting prompted the managers to engage in more exhaustive information processing than normal. Moreover, their ability to invoke a cross-functional perspective may reflect the fact that they learned their lessons well in the classroom. Away from the university setting, pressures of various kinds may produce a "threat-rigidity" response (Staw, Sandelands, & Dutton, 1981: 502) in which managers act only on the most dominant dimensions of their belief structures. Finally, both Dearborn and Simon and I assumed that exposure to the activities of a particular department or function promotes the development of a belief structure or viewpoint that systematically affects managerial information processing. As I have speculated, many different kinds of exposure may promote such development, including direct and vicarious exposure and classroom experiences. The present evidence indicates that managers hold rather broadly focused belief structures, but it may be that political realities or other motivations may prompt a manager to act on a narrower, more self-interested set of dimensions. Although Dearborn and Simon's (1958) work is similarly limited, future research must examine the effects of managers' belief structures on information processing and decision making in field settings.

Additional research is also needed to examine the origins of belief structures and their relationship to decision environments. We need to know much more about how belief structures develop and change. The inconclusive relationships between direct work experience and belief-structure content reported here only fuel interest in this topic. Does vicarious learning contribute to the development of belief structures? Do groups and organizations instantiate belief structures, as Calder and Schurr (1981) suggested? Investigators need to pursue a line of research begun by Walsh, Henderson, and Deighton (1988) to learn much more about how the aggregation of belief

structures in a group setting affects group-level information processing and decision making. Moreover, what are the roles of individual differences in belief-structure development and change? By examining only midcareer managers, the present investigation suffered from restriction of range. Future research, then, should also trace the development of work-related belief structures from childhood to retirement.

Finally, we need to direct our attention to the relationships between managers' belief structures, their decision environments, and their organization's effectiveness. Researchers need to move to the field to examine managers' belief structures, their fit or misfit with their decision environments, and the effects of such fit on the decisions they make. Precisely what are impoverished belief structures? How do they develop? The appropriate research question may not be if managers hold impoverished belief structures, but rather, when are their belief structures impoverished. An understanding of both a belief structure and the decision environment it represents is needed before a belief structure can be pronounced impoverished. And perhaps most important, how do belief structures affect strategy making? Do strategy makers' belief structures shape strategy formation? Do belief structures influence their response to strategic opportunities and threats? Are belief structures, in fact, sometimes responsible for the kinds of organizational disasters reported by Starbuck and Hedberg (1977), Wilensky (1967), and others?

CONCLUSIONS

The fact that Dearborn and Simon's (1958) evidence of selective perception is still so often cited reflects a good deal of concern about the effects of cognitive simplification on the practice of management. Although the case-study documentation of failures caused by managers acting on what Weick might consider to be "impoverished views of the world" (1979: 68) is impressive, the present research suggests that concern in the management community may be fueled by what Tversky and Kahneman (1973) would call an availability heuristic. The vividness of the examples of decision-making blunders that come so easily to mind might be causing researchers to overestimate the frequency of their occurrence. In fact, Christensen-Szalanski and Beach found that psychologists cite evidence of poor information-processing performance six times more often than they cite evidence of good performance. They argued that this citation bias fuels our perception of the "hopelessness of human judgment and decision performance" (1984: 75).

Perhaps we have been too quick to attribute organizational maladies to the cognitive shortcomings of organizational decision makers. Defying scholarly concern about cognitive limitations and decision failures, the managers in this study did not emerge as simple-minded information processors. Nevertheless, it is still an open question whether or not such information processors can make simple-minded mistakes. The present research called attention to these issues, challenged researchers' perhaps simple-minded view of the simple-minded manager, suggested a set of refined research questions, and offered an accessible methodology for examining these issues in subsequent investigations.

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APPENDIX

Job Titles and Known Work Experience of Managers by Functional Belief Structures

Human-Relations Belief-Structure Group

Assistant director of finance; director of development; attorney (and C.P.A.) with 7 years as tax attorney; director of staff development and continuing education; personnel manager with 4 years as a labor negotiator and 9 years in current job; associate director of international and field systems; vice president and head of a municipal-bonds trading department; executive vice president, plant operations, with 3 years as shop foreman, 3 years as designer and purchasing agent, 1 year as production control manager, 3 years as plant superintendent, and 10 years in current job; director of building engineering with 9 years in that department leading to the current job; manager, financial planning and analysis, with 2 years as accountant trainee, 2 years in the military, 1 year as traveling internal auditor, 2 years as staff accountant, 1 year as internal corporate auditor, 2 months as budget forecasting manager, 1 year as general manager, and 9 years in current job; director of engineering with 6 years as consulting engineer, 3 years as project manager (engineering), 1 year as department head (engineering), 1 year as project manager (engineering), and 2 years in current job (included responsibility for production, marketing, and finance); vice president, marketing, with 8½ years in systems and 8½ years in marketing leading to current job.

Marketing Belief-Structure Group

President and hotel general manager with 3 years planning and coordinating hotel renovation and 4 years in current job; manager of corporate planning with 3 years as market research analyst, 3 years as market research manager, and 3 years in current job; controller with 8 years as bookkeeper and charge card supervisor, 3 years as assistant controller, and 7 years in current job; senior product manager with 10 years as salesman (became district sales manager), 2 years as product manager, and 2 years in current job; supervisory engineer with 3 years as engineer in the field, 5 years as staff engineer, and 6 years in current job; area sales manager with 14 years in marketing function leading to current job; vice president, merchandising, with 1 year as assistant factory manager, 1 year as product manager, 1 year as director of marketing, 3 years as buyer, 3 years as vice president in merchandise replenishment, and 2 years in current job.

Accounting-Finance Belief-Structure Group

Assistant marketing manager with 1½ years as newspaper correspondent, 4 years as magazine editor, 1 year as trade journal editor, and 1 year in current job; associate to the president, health care, with 3 years as health-care planning associate, 3 years as health-care executive assistant, and 4 years in current job; manager supermarket field sales with 3 years in management training program, 1 year as grocery department manager, 2 years as store manager, 3 years as regional supervisor, and 1 year in current job; managing director, shops, with 6 years as railroad engineer, 4 years as railroad mechanic, 4 years as regional mechanical supervisor, 7 years as equipment engineering director, 3 years as vice president fleet management, and 3 years in current job; buyer; regional manager with 4 years as advertising salesman and 7 years as advertising manager, now regional manager.

Leadership Belief-Structure Group

Manager, corporate internal audit, with 9 years as public accountant and 2 years in current job; library director with 4 years in current job; data processing manager with 9 years as systems engineer and 5 years in current job; television news reporter with 13 years in current job.

Manufacturing Belief-Structure Group

Senior research technologist; associate director of hospital volunteer service with 2 years as health-care administrative assistant and 10 years in current job; chief financial officer, hospital, with 6 years as public accountant and audit manager and 9 years as director of finance, leading to current job.

James P. Walsh earned his Ph.D. degree at Northwestern University; he is currently an assistant professor of organizational behavior in the Amos Tuck School of Business Administration at Dartmouth College. His current research efforts focus on understanding cognition in organizations, executive succession, and the strategic human-resource-management implications of mergers and acquisitions.