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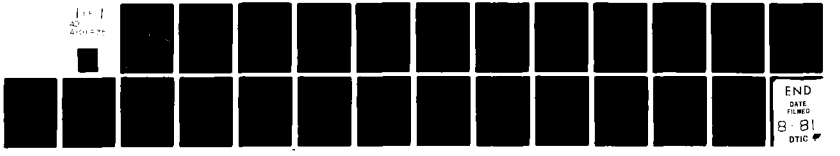

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A FRAMEWORK

FOR

DECISION ANALYSIS AND CRITIQUE

L. L. Cummings

University of Wisconsin-Madison

Technical Report Number 1-1-6

July 1981

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Introduction

This paper serves three purposes:

1) It develops a framework for comparing and integrating models of decision making.

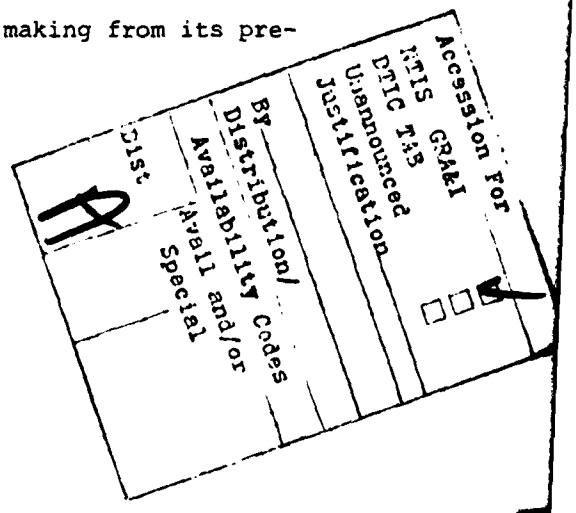
2) It evaluates the following three papers which are to appear in New Directions in Decision Making: An Interdisciplinary Approach to the Study of Organizations, Gerardo R. Ungson and Daniel N. Braunstein (Eds.), Kent Publishing Company, Boston, MA, 1982.

   a) "Behavioral Decision Theory: Processes of Judgment and Choice" by Hillel J. Einhorn and Robin M. Hogarth.

   b) "Issues in Protocol" Analysis by John R. Hayes.

   c) "Behavioral Decision Theory and Organizational Decision Theory" by James G. March and Zur Shapira.

3) It identifies several research issues which, if addressed, would unfreeze the study of decision making from its present sterile posture.



An Integrating Framework

To compare, contrast, and integrate the three papers, we will first develop an integrating framework. This framework poses two dimensions for both the description and evaluation of the three manuscripts. The first of these dimensions focuses upon the level of analysis at which one might attempt to describe and prescribe decision processes. This dimension is reflected in Figure 1 on the vertical axis and is composed of four subelements: 1) the individual, 2) the group, 3) the organization, and 4) the environment. The second dimension in Figure 1 focuses upon the stages of analysis through which one might attempt to analyze a decision process. This dimension is reflected on the horizontal axis and is composed of three elements: 1) the determinants or inputs into a decision process, 2) the processes through which these inputs are claimed to operate, and 3) the effects or outcomes achieved by these inputs via these processes.

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Insert Figure 1 about here.
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Levels of Analysis

Decision systems can be described and analyzed at one or more of the four levels of analysis depicted in Figure 1. Some analysts focus upon individual determinants or processes and outcomes as central to understanding decision making both at the individual level of analysis per se and in organizational contexts. Typically, this tradition has

been associated with psychology, and particularly with experimental and cognitive psychology. Other analysts focus upon the centrality of groups in most organizational realities and, therefore, attempt to examine determinants, processes, and outcomes as if they were each phenomenologically group characteristics. Of course, this perspective has traditionally been the domain of social psychologists, some working from psychological perspectives and others working from sociological perspectives. A third approach to analyzing decision systems assumes that meaningful decisions can only be made and understood when conceptualized as organizational phenomena. While analysts using the organizational perspective typically do not deny the existence of individual and group variations, they do, however, argue that a complete understanding of important real world decisions necessitates an organizational perspective. This approach to decision analysis has typically been the province of analysts coming from sociology, economics, and management theory. More recently, scholars approaching decision making from the perspectives of information system design and decision support systems have typified this perspective. Finally, at the most macro perspective, some analysts assume that to fully understand decision processes and their application an inter-organizational or environmental perspective is most appropriate. Typically scholars approaching decision analysis from this perspective have backgrounds in sociology, political science, and, in a few cases, history and anthropology. Currently, there is within organization theory a popular stream of analysis which focuses upon this perspective to understanding decision systems. This perspective has been variously labeled

as population ecology, exchange analysis, and network structures.

It is extremely rare to find a single analysis utilizing each of these perspectives in understanding a decision system. Typically, decision theorists have taken a limited perspective in order to facilitate analysis and application. Thus, one of the issues that we will address in this paper is to what degree do the three contributions by Professors Einhorn and Hogarth, Hayes,and March and Shapira reflect one or more of these levels of analysis in their approaches to decision making.

Stages of Decision Analysis

As indicated on the horizontal axis of Figure 1, decisions can be analyzed across three stages. First, one can examine decision models,at whatever level of analysis or aggregation,in terms of the determinants that are specified for decision making. Our analysis here will focus on three dimensions of these determinants or inputs. First, what does the model being analyzed specify concerning the complexity of stimuli that impact the decision maker, the group, the organization, or the decisional environment. This dimension can be thought of as ranging from a focus upon extremely simple stimuli, as in many studies of engineering psychology, to more complex stimuli which impact decision systems, as in the case of environmental turbulence or uncertainty in the analysis of complex organizational decisions.

A second dimension of determinants would focus upon a situation in which the stimuli impacting a decision maker are complex and then would proceed to ask questions concerning the form of combination or aggregation which is assumed to take place across stimuli. This is primarily the

question of ascertaining the form through which cues or stimuli are combined in order to make information storage and retrieval possible under complex stimulus environments. Of course, many decision models make and/or criticize assumptions about the ability of humans to deal with complex stimuli through simplifying mechanisms of combination and aggregation.

A third dimension of decision analytic determinants focuses upon the assumed threshold values which are necessary in order to engage the decision-making process itself. This dimension focuses a model's attention upon the magnitude and configuration of stimuli, either complex or simple, that are needed in order to cause a system to engage in a conscious, explicit process of decision making. Thus, this particular dimension of determinants in decision analysis centers on the question of problem recognition or decision opportunity recognition at the level of consciousness on the part of the decision-making unit.

The second dimension important in analyzing decision stages is the process or processes through which decision determinants are thought to influence decision outcomes. Models of decision making can be analyzed on a number of characteristics which articulate this dimension. For example, one can ask whether the processes assumed to be operating to link determinants and effects are primarily cognitive, emotional, or volitional. Most decision models implicitly assume that decision making is primarily a cognitive process and is best understood through elaboration of cognitive abilities and characteristics of decision-making systems. Generally, it is the case that emotional and motivational characteristics of decision systems are given relatively less emphasis in describing and

prescribing effective decision systems.

A second issue centering on decision processes deals with the degree to which a decision model assumes that decision-making processes can best be described as within the consciousness of decision units. Phrased alternatively, this is the issue of the degree to which conscious articulation of decision processes is a necessary condition for decision making to occur and for the study of such decision making. Recent evidence and theory in social psychology suggest that it may well be that individuals are severely constrained in their ability to bring to consciousness the most important factors that influence the formation of attitudes and that moderate the relationship between attitudes and behavior (Nisbett and Ross, 1980). To the extent that such evidence pertains to decision-making situations, it is possible that an exclusive or even primary focus upon conscious decision-making processes causes us to overlook significant underlying processes which influence decision outcomes and which are important in a thorough analysis of a decision system. Such a posture toward the study of decision making would represent a rather radical departure from most current themes and developments in the decision literature.

Even within the domain of conscious and explicit articulation of decision processes, there remains the question of the degree to which a decision model assumes that the processes operating are purposive or rational or intendedly rational in nature. In general, there are trends in the organizational behavior literature suggesting that many decision systems engage in rationalization and post facto justification to a far greater extent and with far greater sophistication than they do processes of rationality (Staw, 1980).

So the three central issues underlying the process stage of decision analysis are:

1) The degree to which a balance of psychological processes across cognitive, emotional, and volitional characteristics are emphasized in the model.
2) The degree to which a decision model assumes consciousness or explicit awareness as a necessary condition for the operation of decisional processes.
3) Given an assumption of the conscious nature of decision making, the degree to which purpose is to be positioned as an a priori or as a post facto construct in imputing rationality into the decision-making system.

A third dimension along which decision analysis stages should be analyzed and which has received relatively little attention centers on the nature of effects produced by decision making over time. There are two subquestions that are relevant here. The first of these raises the issue of the appropriate time lags for effects of decisions to be manifest. The second asks over what time horizon are the effects of decisions to be monitored and possibly evaluated if one is operating in a context where organizational effectiveness is of concern.

The first question, that is the question of time lags for effects, is essentially a question of research design or the relevant time series within which managerial decisions should become available for legitimate evaluation. This is, in its most fundamental sense, a question of how long does it take for a decision system to produce manifest outcomes which then may be subject to evaluation. The second question above, that is the

time horizon for evaluation, assumes the presence of a tangible effect or effects in the decision system environment. It then moves to the evaluative issue of over what time horizon should these effects be assessed and these assessments be accumulated before an evaluation is made. It is obvious that the two time effects questions are interrelated but a sophisticated decision analysis should separate the questions into the question of a) the time lag for effects to appear, and b) the time horizon over which such effects are to be accumulated and evaluated by relevant parties.

The paper now moves to a description and an evaluation of the three contributions by Professors Einhorn and Hogarth, Hayes, and March and Shapira within the context of the framework that has been established.

An Interpretation of the Conference Papers

The Einhorn and Hogarth Paper

Einhorn and Hogarth essentially focus upon two of the cells in the framework presented in Figure 1. Their review centers on issues and unresolved research problems at the intersection of the individual level of analysis and the determinants and processes implicit in individual decision making. To a lesser extent, they are concerned with the group and environmental contexts of decision determinants and processes.

Einhorn and Hogarth virtually exclude the organization as a relevant level of analysis in understanding decision processes. They do not present evidence suggesting the importance of organizational structure, information flows, and political systems for the formulation of decision problems or for the formulation of processes through which decisions are either made or implemented. In addition, Einhorn and Hogarth virtually exclude an analysis of the effects produced by the design of decision systems.

In particular, they do not examine the effects that are produced by variations in organizational and environmental designs as these relate to outcomes such as organizational performance or individual and group productivity.

What Einhorn and Hogarth have offered us is an insightful review and an establishment of an important research agenda for further understanding of the phases of individual decision making. Their focus upon the importance of the strategies and mechanisms of judgment and choice as well as the phases of decision evaluation and the roles of feedback and learning in individual decision making are central to a research agenda for the 1980s.

One of the themes implicit in the Einhorn and Hogarth paper is that we know far more about the constraints upon normative and rational decision making than we do about the issues surrounding such concerns as a) how individuals recognize the need for choice or decision, b) the distinction between choice as a tangible,finite,time-bound human act and the processes of human judgment as a sequential and partially intuitive representation of human intelligence, c) the issues of problem formulation and information-seeking strategies, and d) the roles of models of learning other than simple reinforcement paradigms in understanding human judgment. In regard to this last point, the Einhorn and Hogarth paper represents a rather conservative position in that it does not elaborate and review the important work on social modeling and social learning as that pertains to the processes through which individuals come to understand the need for choice, the search for alternatives, and the resolution of uncertainty in choice situations.

Einhorn and Hogarth do not interpret the literature they review in a fashion that allows us to infer contributions to the input stage of the framework in Figure 1. While the authors do spend considerable time discussing issues involving the limitations of human beings as decision makers, they do not organize this literature in a fashion that allows us to easily extend that literature. In terms of the dimensions of determinants as depicted in Figure 1, Einhorn and Hogarth do not speak to the three explicit issues of the complexity of stimuli, the forms of combination and aggregation of stimuli, and the threshhold values of stimuli necessary to engage either the decision to choose or the decision to search for relevant alternatives or the decision to terminate choice behavior.

Einhorn and Hogarth do take explicit positions regarding the state of scholarship on individual decision making as that pertains to the processes of Figure 1. That is, they clearly state that the present literature suggests that most studies of individual decision processes have focused on cognitive processes to the near exclusion of emotional and affective components. To a lesser extent, they do point toward some research on the motivational processes that may underlie the usage of less than optimal decision strategies by individuals. The remaining two issues of process--that is, conscious versus unconscious and purposive versus random--are not given explicit attention by Einhorn and Hogarth. In many ways, this is indeed a likely reflection of the current state of the literature on these processes. On the other hand, it is unfortunate that more attention was not given to the need to generate sophisticated theory and derivative research programs centering on the nature of these two important processes.

The Hayes Paper

Hayes make an explicit, outright prescriptive appeal for the use of protocol analysis in understanding individual decision processes. His contribution is clearly positioned at the intersection of individuals and processes in Figure 1. Hayes does claim that to understand individual decision processes, and in particular to utilize protocol analysis and process-tracing techniques, it is important to understand both the outcomes that an individual is attempting to achieve in a decision task and the inputs that that individual brings to that task. Beyond merely mentioning the assumed importance of inputs and outcomes to understanding decision processes, Hayes does not elaborate or provide a framework for the articulation of the roles of these inputs and outcomes.

The Hayes paper does provide us with a well-reasoned appeal for the use of protocol analysis. It does go beyond a mere attempt to point toward the advantages of protocol analysis. It does this by suggesting a number of constraints that operate in using protocol analysis effectively. The paper also warns us concerning the importance of reliability and validity checks in utilizing what is essentially a subjective technique for understanding process analysis.

Hayes does not entertain ideas concerning the impact of other levels of analysis, beyond the individual, upon the utilization and interpretation of decision protocols. This is unfortunate in that there is a good deal known concerning the impact of group and organizational contexts upon the sense-making capabilities of both decision makers and interpreters of decisions(Pfeffer, 1981). Since protocol analysis essentially places the decision analyst in the role of an interpreter of the phenomenology of an

individual subject, it would seem central that the users of protocol analysis take explicit awareness of the importance of group and organizational contexts in the creation of meaning. Since a decision protocol essentially provides a description of an individual's map of a situation and since this map is subject to multiple interpretations by not only the individual decision maker but by analysts of that decision as well, it would seem crucial for the users and promotors of protocol analysis to embed the technique within what is known about the social and organizational contexts of interpretation.

It is not clear that the primary contribution of protocol analysis will be to an understanding of decision processes. Hayes' description of the technique and his illustrations can be interpreted equally as well as presenting process analysis as a technique for interpreting the results of a description of a decision or of the behavioral and verbal cues admitted by decision makers. This positioning of protocol analysis as a technique for interpretation, after the fact, rather than as a technique for detailed understanding of internal cognitive processes, may be a contribution in its own right. However, the use of protocol analysis as an interpretive technique as opposed to a process-discovering technique may lead one to conclude at some point in the future that protocol analysis tells us more about decision analysts and their processes than it tells us about decision makers. A similar conclusion has frequently been reached concerning the use of decision models in a related area in behavioral research. The specific reference here is to our attempts to understand the performance appraisal process. Our present understanding, after twenty-five years of research aimed at

predicting performance appraisal outcomes, is that most of that research tells us more about appraisers than it does about performance or about appraisee performance in particular (Landy and Farr, 1980). It would seem that Hayes' description of protocol analysis and the conditions necessary for significant research using protocols may lead to a similar conclusion.

The March and Shapira paper

In terms of our framework presented in Figure 1, the March and Shapira paper, by title, would appear to fit a number of cells across levels of analysis. That is, the paper promises to speak in terms of both behavioral decision theory at the individual level and organizational decision analysis at the organizational and, perhaps, at the environmental level. However, the case will be made here that the paper is essentially a dual description, using different terminologies, of individual decision making.

March and Shapira present an abbreviated review of what they refer to as behavioral decision theory. This review is, of course, not the primary purpose of their paper. Thus, the fact that it is a quite incomplete and unelaborated relative to the Einhorn and Hogarth paper is not of central concern here. On the other hand, the description of individual decision making, its limitations, its constraints, and the behavioral theories which have been developed to depict decision making does set the stage for what ends up to be an artificial comparison between behavioral decision theory and organizational analysis.

The description of organizational decision theory puts strong emphasis on the uncertain, the unpredictable, the sometimes random and always confusing nature of organizational decision making. It becomes apparent

in March and Shapira's description of organizational decision theory that they are actually talking about individual decision making within an organizational context. In fact, most of the material in the center part of the paper under the rubric of organizational decision theory can easily be translated into individual decision analysis merely by substituting the word "individual" for "organizational." The similarity between the description that emerges from such a substitution and that as described in the Einhorn and Hogarth paper is, indeed, striking. That is, we come to discover that individuals considered as such and individuals within the organizational context (i.e., the March and Shapira description) are, indeed, best described using similar kinds of psychological constructs. Particular emphasis in both treatments is given to the cognitive limitations and the resulting coping strategies used by individuals to make and implement decisions in organizations.

The essential point here is that there is very little discussion and elaboration of organizational decision theory in the March and Shapira paper. It is not clear that including the organizational context in the March and Shapira analysis would make any difference in the kinds of conclusions one comes to concerning research agendas, central problems, or questions of evaluation of individual decision processes. Thus, in one sense, it is heartening to know that behavioral decision theorists have, in fact, tapped most of the central concerns in individual decision making that are of interest to persons speaking from an organizational perspective. But this organizational perspective, in March and Shapira's analysis is, in fact, no more than a context for individual decision making. The level of analysis has not changed in any central way and the complexities

of organizational structure, organizational growth and decline, and, let alone, the interrelationships among organizations, are not dealt with in the March and Shapira paper. This is particularly the case as these phenomena might relate to changes in the underlying description of, analysis of, and research on individual decision making.

The March and Shapira paper does speak to several processes at the individual level of analysis. There is explicit inclusion of emotional and motivational processes in understanding decision making. Thus, the March and Shapira analysis does go beyond the rather restrictive focus upon cognitive processing as in the Einhorn and Hogarth paper. It is also the case that March and Shapira include the possibility of unconscious processes operating in choice phenomena at the individual level with rationalization becoming as central as rationality in understanding individual decision making.

As with the previous two papers, there is no attention given to the effects of different types of decision-making strategies or the effects at the individual or organizational level in terms of productivity of the decision-making process as described by March and Shapira. Again, as in the case of Einhorn and Hogarth, the roles of time and temporal dimensions in describing decision effects are largely ignored.

March and Shapira have provided us with a useful description of what they consider to be two separate paradigms for studying decision making. As noted above, the distinction between the paradigms is grossly overdrawn. In the latter part of their paper, however, they have drawn several important implications for each of the paradigms, assuming that

there is some central difference between them. The underlying theme of March and Shapira's discussion of these implications seems to be that constructs included in one paradigm should be included in the other. That is, they proceed to illustrate that issues central to behavioral decision theory can be used in organizational decision theory to bear fruit of analysis. Likewise, the reverse flow would also appear to be fruitful. However, the underlying issue that still remains is the degree to which this is merely a translation of terminology from one paradigm to the other. It is unclear that the added effect produced by this translation amounts to very much.

March and Shapira do draw interesting implications for the design and engineering of decision systems. This portion of the paper is significant in that it speaks to the implications of the two paradigms considered collectively for decision engineering. The paper does end on the note of how decision sciences and the design of decision analytic systems and decision support systems would be different if we took seriously the commonalities that exist between behavioral decision theory and organizational decision theory.

Important Unresolved Issues

As noted earlier, March and Shapira have strained to create a contrast between decision models at the individual and organization levels of analysis. The strain apparent in their argument may well signify that formulating the central issue as one of contrast and similarity between behavioral decision theory and organizational decision theory is not the issue that would provide the best leverage for further work on decision making.

The retranslations that are provided by March and Shapira between behavioral decision theory and organizational decision theory, and which are implied by much of Einhorn and Hogarth's review, are sufficient to draw parallels, if not identities, between individual and organizational level phenomena. This parallelism is also a current theme in theorizing about other forms of individual behavior within organizations. The centrality of cognitions in understanding not only decision making but processes of motivation, learning, change, leadership, and influence and socialization are appearing as one of the current themes in organizational behavior (Naylor, Pritchard, Ilgen, 1980).

This translation and exchange between levels of analysis does not diminish the fact that the unresolved issues in decision analysis remain the same whether one takes an individual, group, or organizational perspective. Three examples will suffice to make the point. First, most decision theorists, regardless of the level of analysis from which they draw their perspective, argue that the evolution of viable explanations of decision processes in the face of complexity and uncertainty is central to advancing the decision sciences. This barrier of lack of sufficient models that capture the reality of decision processes is a frequently mentioned constraint by nearly all decision scholars. Second, regardless of level of analysis, there remains the frequently cited need to balance the study of decision opportunities and constraints with the study of the development, perhaps subsequent to action, of preferences. This notion of the missing theory of preferences in decision sciences is, of course, emphasized by March and Shapira. It is also reflected in the noted lack of attention paid to emotional and motivational issues in the behavioral

research on decision making at the individual level of analysis. Third, there is a common recognition that we do not yet understand the roles of organizations as an aid or as a hindrance to individual decision making and decision implementation.

To elaborate that point, one need only express general agreement with Einhorn and Hogarth's argument that persistent dysfunctional decision behavior is not inconsistent with evolutionary concepts. That is, there is no necessary functional evolutionary outcome associated with the development of individual decision making competence across time. However, given the existence and the possible rationality of such an apparent inconsistency, then one must ask, what are the implications of such for the relationship between individual decision makers and their organizational contexts. This, of course, leads to a number of questions which remain unresolved and which are shared by scholars approaching decision making from both an individual and an organizational perspective. Such questions are:

1. Do organizations reduce or do they increase dysfunctionality? That is, are organizations error-generating and amplifying in their effects or do they serve as correcting mechanisms? It is, of course, likely that organizations can and do play both roles. That perspective shifts the theory and research agenda to articulating the constraints and conditions under which organizations facilitate versus hamper individual decision making in an instrumental sense.

2. Does the possibility of the parallel existence of dysfunctional behavior in the short run and yet the evolution of effective decision systems over time change the basic nature (that is the kind versus degree) of errors and biases that decision processes are subject to? Under the parallel existence of dysfunctional and evolutionary processes,

> deviations from normality or from normative models provide an important and necessary input into natural selection processes. Without the tolerance and encouragement of such deviations, which in the short-run might be viewed as dysfunctional, evolutionary processes are impossible. Selection requires variance around normality.

But even these questions emphasize the similarity rather than the differences between models of decision making at varying levels of analysis.

All of this tempts one to conclude that the similarities are of such magnitude that the study of decision making possesses very few significant or crucial themes which can engender theoretical insight and conflicting paradigms. One might, in fact, be inclined to conclude that the entirety of decision theoretic research and scholarship consists of variations on a set of very few and highly similar themes. This conclusion, however, would seem to leave unanswered, or perhaps even unasked, more central questions that concern the basic nature of management systems and philosophical perspectives on the nature of decision making and influence.

It may well be that the most central issue confronting decision scholars and the designers of decision systems in this decade will be the degree to which decision making is thought of as a component in a system which is managed by information versus one which is managed by ideology. The central distinction between these two approaches to influence and the management of organizations centers upon the classical distinction made by Simon (1976) between premises based upon values and premises based upon facts. Management by ideology assumes that the central foci of management, that is the thing to be managed, are value premises. Within this perspective, decision support systems and information systems are designed to influence, inculcate, and stabilize

values. The stabilization is crucial for other organizational design and decision support system design principles to operate, e.g., decentralization, participation, and lower participant involvement. Within this perspective, many of the dysfunctions and limitations exhibited by individual decision makers become advantageous. They become opportunities to be utilized in the design of systems which operate primarily through values and only secondarily through facts.

On the other hand, management and decision systems that operate primarily upon information assume that the central premise of management and influence is the development, the communication, and the accurate interpretation of facts. This is, of course, the reason that so little attention has been given to preference formation and preference expression, as noted by both March and Shapira as well as Einhorn and Hogarth, in traditional behavioral decision theory and organizational decision theory. Individual biases and so-called errors in decision making become disadvantages in the predictable and stable management of organizational systems. Decision supports and aids are designed to either counter these individual limitations or designed to prevent and constrain decisions such that these limitations are least likely to exhibit their effects.

One cannot help but wonder what interpretation a group of traditionally socialized and trained Japanese managers would place upon the contents of many of the papers included in this volume. It is easy to suspect that they would certainly not be concerned about the competitive threat posed by the practical implications of much of what we have to say in the decision sciences today. In fact, they might argue that

much of the Western approaches to understanding decision making misses the central point. Alternative formulations of management through ideology imply quite different constructs and processes as central to understanding and enhancing choice in organizations. The relative lack of attention to preference solicitation and techniques for generating commonality of preferences around organizational and cultural norms would be mystifying to these Japanese managers. They would likely suggest that if we truly want to understand effective decision systems, we need a much more generic or robust distinction among paradigms than that implied by behavioral decision theory on the one hand and organization decision theory on the other. These paradigms are just too similar to generate the intellectual spark that comes from considering conflicting, underlying approaches to theories of choice and theories of change in organizations.

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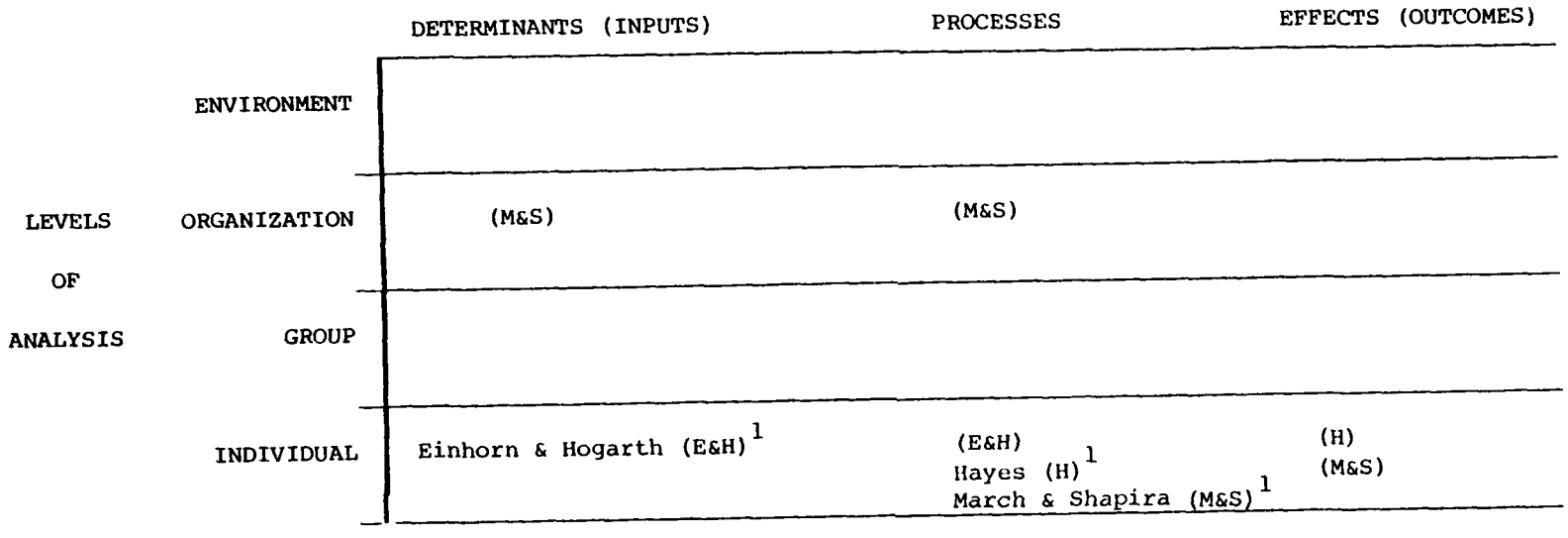
FIGURE 1

A FRAMEWORK FOR DISSECTING DECISION ANALYSES



[1]Complete spelling of names indicates cells of major emphasis.
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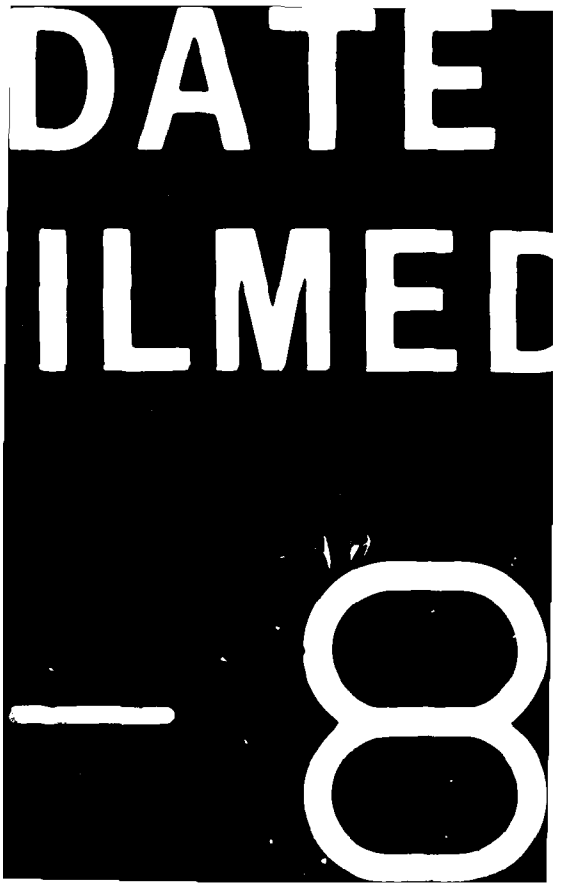
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