

Developments in Business Simulation & Experiential Exercises, Volume 15, 1988

THE ROLE OF EXPERIENTIAL KNOWLEDGE AND HUMAN INFORMATION PROCESSING IN DECISION MAKING

Donna F. Davis, University of Mississippi
Donald L. Davis, University of Mississippi

ABSTRACT

This paper examines the role of experiential knowledge in HIP via a model which is a synthesis of models of human information processing, human associative memory and attention. Using the model the decision making process is described in terms of Simon's phases of decision making. The differential effect of experiential knowledge is explored in each phase, i.e. intelligence, design, and choice. An example of the overall process is developed and suggestions for empirical research are presented.

INTRODUCTION

The rational model of decision making implies that the decision maker actively survey the environment to identify new situations calling for action, develop all possible alternatives, and choose among them based on the decision maker's utility for the alternative payoffs.

Researchers have long known that human cognitive limitations preclude the application of the rational model except for those situations in which the goal state is well specified so all alternatives can be identified.

A number of studies have attempted to describe the manner in which decision makers approach tasks in which the rational approach is not feasible (Allison, 1971). Steimbruner (1974) identifies two approaches in addition to the rational, the cybernetic and the cognitive. These differ in the manner in which they attempt to deal with environment induced on certainty.

Inherent in all the approaches to complex decision making is the concept of learned patterns of data (cues from the environment and solutions) or strategies (groups of elementary operations to be used in a particular type of situation (Posner & McLeod, 1982). Here one finds the foundation for the role of experiential knowledge along with that of human information processing in decision making.

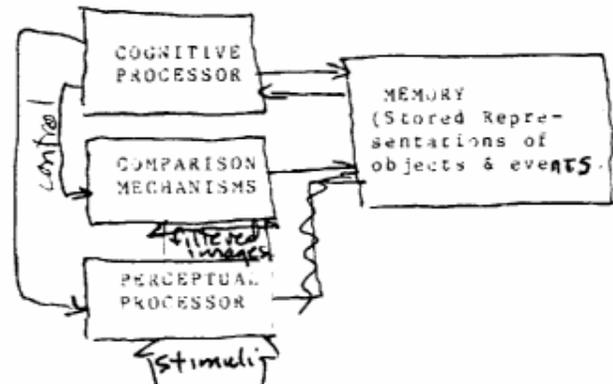
THE SYNTHESIS OF THE PROCESSES

The role of these stored experiential knowledge structures can be examined with the use of models of human information processing (Harmon and King, 1985), human associative memory (Anderson and Bower, 1971), and of attention (Glass and Holyoak, 1986). Figure 1 is a synthesis of these models.

The perceptual subsystem is the interface between the decision maker and the environment. It constructs a representation of the reality in the environment under the control of the cognitive processor. The cognitive processor focuses attention on some object or event according to some

plan active in the cognitive processor.

FIGURE 1
HUMAN INFORMATION PROCESSING



The description of the event or object is passed to the comparison mechanism, which searches memory for a stored representation that matches the one perceived from the environment. The cognitive processor influences the comparison process by generating the criteria level for a match (i.e., must all perceived features match or does a match based on simple features signal the recognition of the input perception).

The cognitive processor is guided by strategies for developing a problem solution. These strategies may have been developed during a previous decision making episode and activated in response to recognition of the similarities in the previous and current episodes. If no template, or pattern of cues, exists in memory a unique strategy, or combination of elementary operations will have to be constructed. This new strategy will then be associated with the current episode's features and added to long term memory.

There are a number of descriptions of the phases of decision making (Simon, 1977; Harrison, 1987; Wide, 1972; Janis, 1963), all of which include the notion of surveying the environment, determining possible alternatives and choosing among the alternatives. The several parts of the human information processing model would be sorely used during different phases of decision making.

The Intelligence Phase

Experiential knowledge (stored representations of experiential learning) has a pervasive influence throughout the decision making process. During the

Developments in Business Simulation & Experiential Exercises, Volume 15, 1988

intelligence phase, the perceptual and comparison mechanisms would be most used. If the cognitive processor has resident a strategy which calls for a very detailed analysis of the perceived event before recognizing it, or accepting its category a great deal of effort will be expended by the perceptual and comparison mechanisms. If, however, a single cue serves to activate a matching category from memory, little effort is necessary on the part of the perceiving and comparison mechanisms.

The Design Phase

In the design phase that one also observes the pervasive influence of experiential knowledge. Those data items which survive the screening of the perceptual subsystem are given meaning by associating them with a higher category of previously stored knowledge. They become specific instances of a more general case. Thus the interpretation of an event can be influenced by how it is categorized (Smith & Medlin, 1981).

Recognition of the problem category based on the initial cues activates other knowledge associated with the categories (Hinsley, Hayes and Simon, 1971) and thus facilitates further formulation of the problem. An inability to recognize the category of the perceived event has a negative effect on the completion of the decision making task, as "when perception organizes the data in a way unsuited to the current task even simple problems become nearly unsolvable" (Pentland, 1977).

Activation of an inappropriate category (schema, LMS, script) may further hinder effective decision making. Anderson (1971) found that if observations do not fit those expected by the activated category they will be distorted by the decision makers so that they do not fit. This lends support to those who hypothesize that decision makers make a choice and then justify.

The categories are not mental boxes into which situations must fit, but rather are 'coherent statements about a concept... contains relations to other concepts... a concept described from different points of view (Clancey, 1985).

The problem solver (decision maker) is attempting to associate data from the environment with a concept. These associations can be of several kinds: experience such as persons are predisposed to diseases; casual, as symptoms are related to faults; and preference as a larger market share is preferred.

If one considers the number of stored concepts minus all the possible associations they have both to data representations and among themselves, the need to reduce the possible search space becomes obvious. Every situation is unique to some degree, so some means must be used to manage the complexity generated by this uniqueness.

One way to limit the search for appropriate concepts (categories) to identify is to recognize the situation as belonging to a category which precludes a number of other categories (Glass & Holyoak, 1986). Knowing what kind of a situation or event is observed also gives us knowledge about what event is not.

Another powerful tool for reducing demand on the cognitive processor is the use of heuristic associations. These

heuristics link commonly available data, observations of the environment, with interpretations of their meanings. For example, certain characteristics of persons could be linked with a set of possible diseases.

The heuristics come about as a result of the decision makers' experience with the type or situations associated with those heuristics. The heuristics constrain the search for solution categories by reducing the possible categories to be searched and by eliminating consideration of intervening and often invariant concepts. The heuristics, or rules-of-thumb, often but not always lead to solution (Anderson, 1971).

The Choice Phase

It is in the choice phase of decision making that the various models of HI? provide little guidance. Some authors (Remus, 1977; Simon, 1977) view choice as choosing among the previously analyzed alternatives using some type of decision rule.

The HIP model uses categorical, rather than probabilistic judgments. On complex situations, characterized by a great deal of uncertainty and seemingly random data, decision makers will attempt to simplify the categorization process by such processes as analogy and blocking of input not consistent with the currently accepted categorization of the situation. (Steinbruner, 1974, p 116)

Thus, choice becomes not the outcome of some rational evaluation of all alternatives, but some course of action, a solution, associated with the category of situation to which the input data is perceived to belong. The categorization process may lead to either a preferred action, or to a rule for determining the appropriate action given the category of the situation.

Part of the basis for determining the preferred action might be a set of attitudes attached to the category concept. These attitudes are "learned predispositions to respond in a consistently favorable or unfavorable manner with respect to a given object" (Gerstberger & Allen, 1977).

AN EXAMPLE

As an example, the selection of a production manager for a firm is used as a framework to view the influence of experiential knowledge in decision making. Although selection processes differ depending upon the type of position being filled, the basic process consists of four steps:

1. Selection of criteria;
2. Completion and evaluation of an application form (biodata);
3. Employment Interview;
4. Testing.

The selection process usually begins with the development of a knowledge base concerning the vacant position which includes the duties, responsibilities, skills and qualifications necessary to perform the

Developments in Business Simulation & Experiential Exercises, Volume 15, 1988

job in a satisfactory manner. Generally, the information is collected via a job analysis. The resulting knowledge base contains a job description which identifies the duties and tasks involved in job performance for the position, and a job specification which identifies the qualifications an applicant must possess for job performance. The job description assists the human resources department in effectively matching the position with an applicant (Milkovich and Newman, 1987). It is this position/applicant match that will determine the success of the selection process (Yoder and Staudohar, 1982) and the effectiveness of the 'total Human resource system' (Burack and Smith, 1982). Even though this is the proper method of identifying selection criteria, Jam and Murry (1984) argue that this part of the process is largely ignored.

The initial contact between an applicant and the organization is the application form, which includes the applicant's biographical data. Based on the data included in the applications Form the human resource staff performs a preliminary screening. The initial screening seeks to eliminate grossly unqualified applicants by using biographical data (biodata) (Pannone, 1984). Although the rise of biodata in selection is on the rise and preliminary validity studies look promising (Makin and Robertson, 1986; Pannone, 1984), biodata's validity lies in identifying tire applicants to be rejected and does not offer any assistance in identifying applicants that will perform successfully. Based on the results of the initial screening, one or more of the applicants are invited for an interview and are administered various measurement instruments (psychological, physiological, intelligence, personality, etc.).

The personal interview continues to be the most popular selection tool (Arvey, 1979; Arvey and Campion, 1982; Glueck, 1982; Makin and Robertson, 1986) despite repeated studies citing the interview as the least reliable and valid predictor of employee performance (Arvey, 1979; Hunter and Hunter, 1984; Jam and Murry, 1984; Makin and Robertson, 1986; Nadler, et al., 1983). In addition to the interview's low reliability and validity it has also been found to be costly and time consuming (Nadler, et al., 1983).

Personality and aptitude tests were developed to assist in the selection process. However, Herriot (1985), Ghiselli (1973), Reilly and Choa (1982), and Schmitt, et al. (1984) have reported negative findings on the ability of personality tests to predict future performance. Although some research has concluded that psychological tests are valid predictors of future success (Makin and Robertson, 1986) the research is inconclusive.

At each stage of the selection process the decision makers are attempting to classify data based on a comparison of their perceptions or objects and events to stored representations, or prototypes, of other objects and events. These prototypes will serve to filter incoming perceptions and to guide the decision making process.

In determining criteria, the job applicants may only be inferred to be part of the selection process and thus the job is classified. The evaluation of the application form may also serve to classify the applicant and thus allow inferences as to unobserved characteristics, e.g., the applicant has a degree from a name university, therefore must

be intelligent. The interview allows further classification of the job applicant based on observed traits and inferences from the traits. A well known example of this is the currently popular "body language".

So we see the decision maker attempting to match the problem, a vacant production manager position, with some alternatives, applicants for the position. This matching is a case of successive attempts to classify the applicants into categories which are compatible with the category of job into which the decision makers have placed 'production manager'. The classification process is guided at every step by our stored representations, or experiential knowledge.

CONCLUSION

This paper has explored the role of experiential knowledge in decision making in part as a call for more research on this extremely important topic. There is evidence of the effect in the literature (Kahneman and Tversky, 1982). Neale, et al (1987) confirmed the effects of role and task on the decision process. However, there is considerable empirical research effort needed before we can fully understand this important role of experiential learning. For example, how does the decision maker classify the experiences? What sort of networks are formed? Are all the network structures time same? How are the associations actually made?

REFERENCES

- Allison, G. T. 1971. The Essence of Decision, Boston: Little Brown and Company.
- Anderson, J. R. 1971. The Grammar of Case, Cambridge, Massachusetts: The University Press.
- Anderson, J. R. and Bower, C. H. 1973. Human Associative Memory, New York: John Wiley and Sons.
- Arvey, R. O. 1979. Unfair Discrimination in the employment interview: Legal and psychological aspects. Psychological Bulletin, 86:736-765.
- Arvey, R. D. and Campion, J. E. 1982. The employment interview: A summary and review of recent research. Personnel Psychology, 35:281-322.
- Burack, E. H. and Smith, R. D. 1982. Personnel Management: of Human Resources Systems Approach, New York: John Wiley and Sons.
- Clancey, W. J. 1985. Heuristic classification. Artificial Intelligence, 2(4): 289-350.
- Ghiselli, E. E. 1973. The validity of aptitude tests in personnel selection. Personnel Psychology, 26:461-477.
- Glass, A. H. and Holyoak, K. J. 1986. Cognition, New York: Random House.
- Glueck, W. F. 1982. Personnel: A diagnostic approach.

Developments in Business Simulation & Experiential Exercises, Volume 15, 1988

- 3rd ed. Plano, Texas: Business Publications.
- Harmon, P. and King, O. 1985. Artificial Intelligence in Business, New York: John Wiley and Sons.
- Harrison, E. F. 1987. The Managerial Decision-Making Process, Boston: Houghton Mifflin Company.
- Herriot, P. 1985. Give and take in graduate selection. Personnel Management. 17:33-35.
- Hunter, J. E. and Hunter, R. R. 1984. The validity and utility of alternative predictors of job performance. Psychological Bulletin. 96:72-79.
- Jam, H. and Murry, V. 1984. Why the human resource management function fails. California Management Review, 26(4): 95-110.
- Janis, I. L. 1968. Stages in the decision-making process. in Theories of Cognitive Consistency: A Source Book. Abelson, R. P., et al. eds. New York: Rand-McNally.
- Kahneman, D. and Tversky, A. 1973. On the psychology of prediction. Psychological Review. 80:237-251.
- Makin, P. and Robertson, I. 1986. Selecting the best selection techniques. Personnel Management. 18:38-40.
- Milkovich, G. T. and Newman, J. M. 1987. Compensation. 2nd ed. Plano, Texas: Business Publications.
- Nadler, O. A., Hackman, R. J., & Lawler, E. E. III. 1983. Staffing organizations. In behavior in organizations. 2d ed. Hackman, J. R. Lawler, E. E., & Porter, L. W. eds. New York: McGraw-Hill
- Pannone, R. D. 1984. Predicting test performance: A content valid approach to screening applicants. Personnel Psychology. 37: 507-517.
- Posner, M. I. and McLeod, P. Information processing models - In search of elementary operations. Annual Review of Psychology. 33:477-514.
- Reilly, R. R. and Chao, G. T. 1982. Validity and fairness of some alternative employee selection procedures. Personnel Psychology. 35:1-62.
- Remus, W. F. 1977. Bias and variance in Bowman's managerial coefficient theory. OMEGA. 5(3):349-351.
- Schmitt, N., Gooding, R. Z., Noe, R. A. and Kirsh, M. 1984. Meta Analysis of validity studies published between 1964 and 1982. Personnel Psychology. 37:407-422.
- Simon, H. A. 1977. The New Science of Management Decision, Englewood Cliffs, N.J.: Prentice-Hall.
- Smith, I. F. and Medlin, E. L. 1981, Categories and Concepts, Cambridge, Massachusetts: Harvard University Press.
- Steinbruner, J. D. 1974. The Cybernetic Theory of Decision, New Dimensions of Political Analysis. Princeton, NJ: Princeton University Press.
- Weale, H. A., Huber, V. L. and Northcraft, C. B. 1987. The framing of negotiations: Contextual versus task frames. Organizational Behavior and Human Decision Processes. 39:228-241.
- Witte, E. 1972. Field research on complex decision-making processes - The phase theorem. International Studies of Management and Organization. Summer: 156-182.
- Yoder, D. and Staudohar, P. D. 1982. Personnel Management and Industrial Relations. Englewood Cliffs, New Jersey: Prentice-Hall.