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THE SUBJECTIVE SIDE OF THE DECISION SUPPORT SYSTEM
A PITFALL FOR THE PANACEA

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ABSTRACT

The expansion of computer technology and, in particular, the development of decision support *systems* have generally been perceived as contributing to improved decision making. There is, however, another side to *this* observation which suggests that there are several caveats to consider when embracing OSS. These seem particularly important to note when exposing the novice to the capabilities of DOS for the first time. Playing the "devil's advocate" pose several arguments to bring attention to some of the potential pitfalls of uncritical acceptance of the OSS.

INTRODUCTION

Since the advent of the computer revolution a number of decades ago society's ability to process information has increased greatly. Over the years, technological advancements have aided the development of machines, systems, and software packages which are simple enough to be used by most individuals and sophisticated enough to provide substantial decision support. Relatedly, the cost of many computer systems has declined so dramatically that small businesses, individuals, and same industrious youngsters can afford to enjoy the benefits of the revolution (Business Week 1983, pp. 134-138).

A notable feature of the computer revolution has been the evolution of systems which are created with specific decision-makers' needs in mind. These decision support systems (OSS) make it possible for one to access the computer through a flexible, friendly, and adaptive structure. The popularity of such systems is easily documented; numerous books and journal articles concerning the topic can be found describing how the technology is being applied in the marketplace (Pdter 1980; Klein 1982; Keen and Scott-Morton 1978; Keen and Wagner 1979; Scott and Souglas 1981; Lodish, 1982). As an example, Klein (1982) suggests that 85% of America's largest firms employ some form of computer-based financial modeling, most frequently within the strategic planning area. Indeed, numerous other OSS applications can be found throughout a variety of firms and businesses.

For example, OSS are being used to provide the simulation of alternative investment portfolios for trust managers in banks, to provide information on available seating for airline companies and to gauge the effect of proposed price or advertising expenditure changes by marketing departments. In each of these cases, the OSS user needs only to quantify his/her request and enter it in a specified form to the computer -- previous modeling by the user or (more frequently) other knowledgeable persons have created the "intelligence" upon which is based the computer's response. The resulting output generated by the user's request is then available for analysis and ultimately used as a basis for decisive action.

Decision support systems, then, may have an impact upon decisions where there is enough structure for analytical aids to be of value, but where judgement is also involved. They are tools under the user's control, which can extend the range of one's capabilities as a decision-maker and improve their effectiveness (Wyrine 1982). Essentially, OSS build management awareness of conditions, issues, trends, opportunities, etc. and may facilitate planning and policy formulation (Menkus 1983).

However, from an admittedly critical point of view, the notion of employing a machine to address elaborate and complex problems and expecting reasonable responses from it seems almost too good to be true. Despite remarkable sophistication of many of the decision support systems, managers often find problems which require equally sophisticated information in the system's output. This fact, in addition to the growing throng of computer users, brings to mind several crucial questions. For example, are there any potential problems with the proliferation of OSS, and could there be sane possible drawbacks when applying such systems to complex problem solving? Relatedly, given the rapid growth of computer technology, should users be expected to understand fully the possible limitations of implementing quantitatively based OSS models which are necessarily designed to represent qualitative variables? Similar questions were posed by Pickett, Grove, and Ripley (1984). Unfortunately, these questions still seem to be generally overlooked, particularly when imparting DSS knowledge in the classroom setting. Perhaps investigating these issues can result in a better understanding of the power of these analytical tools and aid in more effective utilization of their potential.

Fortunately, our lack of background with respect to OSS allows us to ask such questions and feel relatively unembarrassed. The thrust of this article is to address these issues, articulating some potential concerns. Before these concerns are further specified, however, a more thorough review of OSS' potential uses and considerations is offered.

THE NUMEROUS DIMENSIONS OF OSS

One method for classifying OSS applications is offered by Keen and Scott-Morton (1978, p. 87). Essentially, they view OSS as addressing three types of decisions or tasks: structured, semi-structured, or unstructured. In addition, they suggest that the management activity (management level) necessary to meet the tasks falls into three categories: opentional (lower level), management controlled (middle to upper management), or strategic (upper management). The combination of type of task and level of management variables results in a nine cell table

within which 055 uses may be located. For example, a semi-structured/management controlled task may be one such as the setting of marketing budgets for consumer products; a structured/strategic task might involve determining a plant location; and an unstructured/ operations task might concern the selection of a magazine covet. While the boundaries among the various levels of management activity and types of tasks may not always be clear, such a classification system provides a way of capturing the various dimensions of DSS applicability.

It has been suggested, however, that decision support systems may be more valuable in some circumstances then others. For example, Keen and Scott-Morton (1978), as well as others (Atler 1981; Keen and Wagner, 1979) argue that a 055 may be most helpful in a "semi-structured" decision situation. The basis for this argument is quite intuitive. "Structured" decisions involve circumstances in which the decision to be made is understood well enough to be delegated to non-management personnel or to be completely automated on the computer; little (if any) decision- making is required of the manager and the information needed to complete the process is generally complete and reliable.

"Unstructured" decisions, on the other band, involve circumstances in which the manage or others' back- ground is insufficient to adequately specify relationships objectively, or where the context in which the decision is necessary is not conducive to effective structuring. For example, in marketing, managers' sales projections concerning truly innovative products are consistently reduced to little more than rough estimates. Forecasts concerning such products often require information that is not available from managers who have a poor or incomplete understanding of the environmental forces operating upon the new product's introduction. In similar circumstances, Keen and Scott-Morton (1978) suggest that one's intuition and judgement may be more important than the information generated through a OSS.

Decisions described as "semi-structured" are, as the term implies, a cross between the informational certainty of the structured decision and the informational uncertainty of the unstructured decision. A DSS designed to aid such decisions involve both objective and incomplete informational components. Yet, some information, albeit subjective, is available. The primary difference, then, between a problem which is unstructured and one which is semi-structured is largely a matter of degree.

FIGURE 1

DECISION TYPE/TASK MATRIX

Type of Decision/ Task	Management Activity: Operational Control	Management Control	Strategic Planning	Support Needed
	1	4	7	
Structured	Inventory reordering	Linear programming for manufac-turing	Plant location	Clerical EDP or MS models
	2	5	8	
Semi-structured	Bond trading	Setting market budgets for consumer products	Capital acquisition	DSS
	3	6	9	
Unstruc-tured	Selecting a cover for Time magazine	Hiring managers	R&D portfolio development	Human intuition

Source: Keen and Scott-Morton, 1978, p. 87.

To illustrate this point, the corporate executive who is faced with the task of determining what should be included in a firm's portfolio five years in the future is engaged in an "unstructured" decision. He/she may secure guidance for the portfolio strategy by employing constructs of the Boston Consulting Group market growth/market share matrix or the General Electric market attractiveness matrix, or other such devices, yet, any modeling of this very subjective decision is a dubious undertaking, since all the necessary information must be generated through managerial judgement.

A "semi-structured" decision may also require managerial judgements as crucial information; for instance, an advertising budgeting problem which necessitates the delineation of a sales response function and the specification of relationships between other variables and sales. However, the difference in this case is that management's knowledge of these relationships is deemed sufficient to objectively model the interactions. In addition, this knowledge is supplemented by management's analysis of past data and its relationship to the sales variable. It is interesting to note that a OSS called "Brandaid" which is used in just this manner has been developed by J.D.C. Little (1979). A more elaborate description of this system can be found in Keen and Scott-Morton (1978), pp. 138-43.

In both instances, the strategic portfolio decision and the advertising/ marketing mix decision, subjective judgements were necessary. However, since there are varying degrees of certainty associated with the judgmental information for each situation, one is defined capable of being structured and modeled and the other is not. Consequently, one problem is viewed as a prime candidate for a decision support system while the other is not.

But, exactly what is it that is so different about these examples? Surely, Keen and Scott-Morton (1978) are not arguing that when a OSS is employed, human intuition would be removed from the decision. To be sure, OSS are depicted as tools under the user's power which do not attempt "to automate the entire decision process, predefine objectives, or impose solutions" (Wynne 1982, p. 89). An often repeated benefit of OSS is its capacity to encourage the manager to become more involved in the decision process, not less involved. In the examples above the type of information necessary to fulfill the requirements of the decision is quite similar. In both cases at least some portion of the information is based on subjective judgement. Perhaps, then, the difference lies in how the users approach human intuition or judgement. For instance, human intuition in unstructured situations is treated as an educated guess, which is in line with the definition of intuition as a perception of truth that connotes uncertainty. As such, an "unstructured" decision terms to be much more tentative than its "structured" counterpart. A "semi-structured" decision which is implemented through a computerized OSS, quantifies and enters human judgement into a model which imposes a certain structure on the judgement. Consequently, once entered, the judgement loses a measure of flexibility (both philosophically and operationally) which existed before the "intuition" was adapted for the computer. Nevertheless, by "objectifying" the judgement, OSS are capable - hypothetically speaking

- of delivering "better" solutions to problems since subjective factors affecting a decision have been systematically included in the decision process via the computer. Essentially, a data base administrator has defined subjective factors in objective terms to meet the informational needs of the decision maker and incorporated than in a model designed to facilitate user interaction.

Based upon this reasoning, it seems to follow that the critical component of decision support systems targeted to "unstructured problems" (those identified in Keen and Scott-Morgan's semi-structured and unstructured categories) lies in the process of requiring the user to specify the relationships evident: in their subjective judgements, rather than the end result of a quantification process.

This perspective is shared by many people in the decision sciences field. In discussing the value of models, for example, Hayes and Holan (1974, p. 110) suggest that the real value "comes not from just using it, but from creating it." Similarly, Alter (1980, p. 84) argues that ".. .an important part of the benefits of such a model (representational model) comes from the increased understanding that is gained by trying to develop explicit relationships describing how part of the business environment works." Relatedly, in the sales management area, sales executives often require managers to establish quotas based on judgement, even though mathematical models exist which have given more accurate results (Churchill, Ford, and Walker 1981). These executives feel that such a task offers a value that is measured, not only in terms of produced results, but also in terms of the creative process involved. In short, these examples demonstrate that a quality of subjectivity enters into the structure of the DSS through the identification of critical inherent relationships.

The final step in the development of a model for OSS often involves subjectivity in another manner --through the quantification of a subjective variable. To be sure, the value of that variable is specified for any interested party's inspection, yet - and of major concern - the reasoning, experience, and qualitative insights that went into its delineation may not be clear to all potential users of the model. While there is some argument for employing and/or developing information specialists to work with OSS (Davis, 1983) to help rectify such circumstances, the fact of the matter is that this is not always accomplished.

If such is the case, the lack of understanding which accompanies a variable whose subjectivity has been negated is, and should be, a concern for OSS users. Again, this is a particularly critical consideration when imparting DSS uses and capabilities to the novice.

FOUR POTENTIAL PROBLEMS

While recognizing that the following discussion may violate the sanctity of professional convention, an attempt has been made to identify several potential problems with OSS. Essentially, it is suggested these problems and issues may exist in many organizations which employ OSS today. Contributing to these problems are two factors: (1) the notion that the diffusion of computer technology has greatly out-paced the diffusion of knowledge necessary to appropriately use its power, and (2) the idea that the fundamental nature of DSS encourages the modeling of subjective information.

Emerging from these two propositions, we identify four problematic issues surrounding decision support systems. They are discussed below as: (1) An unexamined cost of model implementation; (2) "what you see is what you get"; (3) "you get what you deserve" and (4) "jumping on the bandwagon."

An Unexamined Cost of Model Implementation

As suggested above, many scholars note that the principle benefit derived from OSS for "unstructured" problems lies in the process necessary to model the relationships under investigation. However, there is a negative aspect associated with such reasoning; specifically, it is offered that once a model has been implemented, a substantial portion of its value to the user may be lost. As a necessary by-product of the modeling process, the multi-faceted nature of the component variables has been reduced to a specific operationalization, leaving behind potentially relevant aspects. This loss may become particularly acute if the OSS is utilized by individuals other than the modeler. In such an event, the user may uncritically accept the model and/or fail to fully understand its assumptions, rationale, or relationships.

"What You See Is What You Get"

The tendency to rely upon incomplete or inadequate information when making critical decisions has been a problem long before DSS were suggested. OSS supposedly address this issue; however, due to its emphasis upon quantification of subjective judgements, the likelihood that a poor guess will influence action is not always improved. Moreover, the process of assigning numerical values to intuitions or subjective judgements and using these to produce supposedly "concrete" estimates for sales, returns, profitability, etc., may have the moot effect of moving a user's attention away from underlying assumptions to generated results. In other words, the value of the results a model produces is only as great as the accuracy of the relationships upon which they' re based, and there may be sons serious reservations about the operationalization of those relationships for reasons already noted. While such a circumstance is not necessarily given, its probability is great enough to warrant more widespread disclosure and attention.

"You Get What You Deserve"

A third and related issue worth noting deals with the uncritical acceptance of information generated by computers in general and decision support systems in particular. Just as information coming from authority figures such as doctors or lawyers is automatically assumed to be more accurate and/or objective than similar observations derived from other sources, the output of a computer is often viewed as beyond reproach. Because of their access to "privileged" information a doctor's diagnosis or a lawyer's legal advice is seldom closely scrutinized or questioned, and the "output" of people holding these positions is legitimate from the public's point of view. In a similar sense, it seems that because a computer is able to integrate hard and soft (subjective) data and produce information in black and white, an aura of legitimacy surrounds it and its output. However, just as the diagnoses of doctors and the advice from lawyers are sometimes in error, and should therefore be critically examined, the information produced by a computer should not go unquestioned simply because of the level of sophistication associated with the source. If one fails to exercise a measure of caution and prudent examination with respect to a DSS

and its output, then any problems ensuing from associated shortcomings are probably deserved.

The use of decision support systems for instructional purposes is one setting in which the occurrence of the "you get what you deserve" syndrome is so evident. Two of the authors utilize an interactive computer forecasting system in a business and marketing forecasting course. The forecasting system will take about any set of time series data, fit a model to it, and provide a forecast for any member of periods ahead. Consequently, the challenge in this course shifts away from the technical aspects of exactly how a given forecasting method works to something far more difficult--the teaching of when certain forecasting techniques apply, when they are inappropriate, and the necessity of understanding the forecast variable and the forecast situation. Otherwise, the tendency among students to uncritically accept whatever the computer gives then is undeniable. Fortunately, the classroom setting is one situation where students do get what they deserve without the price being too high.

"Jumping on the Bandwagon"

A final problem related to the usage of decision support systems deals with what appears to be a. "jumping on the bandwagon" effect. Simply put, in light of the tremendous amount of publicity that computer technology and DSS have been receiving lately (entire conferences and journal editions have been devoted to the topic), organizations may feel that the advantages they read about will automatically apply to them. As suggested in these pages, the value of DSS is very specific to its user and it is incorrect to assume that a DSS which works for one organization will transfer to another simply because surface-level relationships appear to be similar. There are a variety of organizational as well as operational factors working against such a cross application. Among these may be staffing, data and user-related problems (Infosystems 84, p. 31). In short, before the decision is made to implement a DSS, a very careful and unbiased review of what is expected from the system should be undertaken.

CONCLUSION

The development of decision support systems has been a significant advancement for attacking problems in a variety of organizational settings. DSS have the power and capacity to facilitate effective and efficient decision making in a great many situations. However, contrary to popular view, DSS are not a panacea capable of providing meaningful information across all problems. Particular caution must be exercised against unwarily delegating DSS to a status which reduces the questioning of its constructs. It is the contention of the authors that this pitfall is dangerously close to becoming a common occurrence. The subjective nature of critical aspects of DSS development and implementation maintain relatively unexamined. What is of particular concern is that those who are in their initial introduction to DSS and its many uses are not being exposed to the "other side" of this analytical tool. A critical examination of the caveats and issues such as those which have been noted above are necessary and important considerations if the tool is to "live up to" its advanced billing as a system which truly enhances the decision power of the user. By exposing the novice to some of the DSS limitations, better assessment of the "if's", "when's", and "where's" of its applicability should ensue, resulting ultimately in better decisions.

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