In this Issue

Turban and Watkins's 'Impacts of emerging management support systems'

Turban and Watkins have prepared this special issue of *HSM* on management support systems technologies. This initial paper identifies some of the emerging technologies and describes their major characteristics.

Included technologies are decision support systems and expert systems with discussion of the managerial and organizational issues that surround the technologies. The editorial is, by design, general with the objective to provide an overview and a basis for assimilating the papers that follow in this special issue.

One observation that may be implied from their essay is that the innovations in technology are leading the way and many organizations are unsure about how to proceed to deal with the technology or are perhaps blindly moving forward with potential downside consequences. It has been stated elsewhere that we are in the technological and information ages. Movement forward in these 'ages' is exponential compared to previous ages such as the industrial age. Thus, managers and organizations are often in a position of reacting rather than proacting to technology. Decision Support Systems and Expert Systems may be viewed as simply extensions of current information systems technology but the implications and impact of these systems may be revolutionary in many organizations. Hence Turban and Watkins provide some perspective for understanding the current boundaries of DSS and ES.

O'Leary and Turban's 'Organizational impact of expert systems'

Dan O'Leary, at the University of Southern California's Graduate School of Business, is ac-

tively pursuing a variety of research projects all dealing with expert systems technology and the impact of this technology on organizations in general, and operations research and accounting functions in particular. Efraim Turban is the Director of the Decision Support Systems and Expert Systems Programs at the Institute for Systems and Safety Sciences, University of Southern California.

This speculative paper tries to evaluate the potential impacts of expert systems on various aspects of the organization. Thus it provides some perspective for managing and dealing with this emerging technology.

Although most expert systems are still in what is called a prototyping stage, there is evidence that a very large number of systems are being developed and will be implemented very soon. The number of such systems has grown from less than a hundred just three years ago to over a thousand today. DuPont alone implements about five systems each month! For this reason there is no empirical evidence to support the propositions of O'Leary and Turban but they expect to be able to collect a great deal of data in the very near future.

Their paper, thus, is intended to show the general areas of research by postulating many hypotheses on the potential impacts of expert systems. In addition to researchers, managers too can benefit from this exposition since it pinpoints possible areas of difficulty.

It seems that ES could have a major impact on organizations, probably stronger than the impact felt by other computer-based technologies. The authors organize the impact according to eight areas of organizational theory research. Then, they acknowledge that the magnitude of the impact could vary considerably, depending on many factors some of which are generic to all computer-based information systems while the others are unique to expert systems.

Of those factors that are unique to expert systems, four factors are highlighted. The authors believe that at least in the short run, these are the major determinants to be considered. The authors

then organize the paper around these factors by evaluating the impacts in each organizational area according to the four factors. With eight selected areas and four factors, the reader is exposed to 32 different potential impacts.

Although many people are still skeptical about ES, and ES usefulness and feasibility, there are signs that the opposite may be true. The prudent executive should know that the impact of ES can be devastating. Therefore, the best strategy is to hope for the best, but be prepared for the worst. This paper provides the foundation for such a preparation.

Iyer and Raja's 'Toward an organizational DSS: A process-oriented approach'

Iyer and Raja from the University of Texas at Arlington have both extensive practical and academic experience in the design, development and implementation of decision support systems.

These authors develop a premise that much of the DSS research has been fragmented and without an appropriate framework to guide both research and development. As an example of this premise, the authors cite the research addressing individual-specific and group-specific decision support systems, often without recognition of other mediating influences such as organizational factors. They suggest that an organizational DSS should be the focal point for any type of DSS design and that specific instances of the organizational DSS can then be more appropriately designed such as the individual and group DSS.

Thus, these authors provide an integrative framework for viewing DSS. They postulate a three-tier model for generating specific DSS, e.g., individual DSS, from a process-oriented organizational DSS. The three DSS levels in the model include an individual/differentiated, group/integrated, and organizational/systemic. Associated with these levels are the types of utilization to be expected and the components and arrangements of the DSS. Finally, a DSS development approach is presented for each of the levels. For example, a 'purchase model' is proposed for the individual level and a 'process consultation' model is proposed for the organizational level.

The authors correctly point out that for their proposed approach to DSS design to be successful

in practice a strong commitment of resources and support must come from top-management of the organization. Further, they point out that the rather narrow view of individual and group DSS as separate from organizational issues needs to be resolved in most organizations and that this requires a strong endorsement of the alternative organizational view by top-management.

Although the paper does not take us step-by-step through the design process for an actual situation, the authors do provide some indication and illustration as to how the methodology might be applied to an application of international investment planning. Although lacking in detail, this illustration serves to stimulate and provide some idea of the complexities of decision support and the need for a more integrative view of systems design.

Kendall, Buffington, and Kendall's 'DSS user satisfaction and organizational subcultures'

Kendall, Buffington, and Kendall have shared their research interest in DSS since the early 1980s. Their work has primarily been involved with DSS in the public, non-profit sector. The progression of their work led them to consider the interplay between two important variables: DSS satisfaction and membership in organizational subcultures.

A large midwestern financial institution serves as the context for this exploratory study. The company, which has extensive experience with decision support systems, is thought by many to be the leader in its industry.

In essence, the researchers explored whether an organization's members can be identified as belonging to specific organizational subcultures. The authors then proceed to suggest that if members of subcultures are identifiable by their attitudes and behaviors toward DSS, then DSS designers should be better able to tailor decision support systems toward relevant attributes of organizational subcultures.

Through use of Q-methodology, (a tool appropriate for gaining knowledge of attitudes of small groups), three organizational subcultures were identified. Although the researchers took the liberty of labeling the subcultures for ease of reference, the subcultures were not labeled without deliberation.

Thus the three subcultures were identified and named: 'Loyalists' (always loyal to the official company line), the 'crusaders' (whose ultimate concerns were to wave the banner of professionalism in their careers and not the company itself), and the 'malcontents' (who opposed most of what was proposed by the information systems department).

The three subcultures are important as an area of study in their own regard. Indeed the major work in understanding, explaining, and predicting behavior of organizational cultures must eventually shift to the consideration of multiple subcultures rather than considering culture as a monolithic entity.

Once having identified the subcultures, the study continues in attempting to define the relationships between subcultures and decision support systems. The three subcultures all display marked differences in their attitudes and behavior toward DSS.

The organizational impacts of subcultural attitudes and behaviors toward decision support systems are examined in the remainder of the paper. These include the necessity that DSS designers become aware of the existence of subcultures in organizations, and become adept at observing and identifying them. Further, each subculture will most likely possess specific concerns that must be addressed during each phase of the decision support systems life cycle.

Burbridge and Friedman's 'Integration of expert systems in post-industrial organizations'

John Burbridge and William Friedman have professional and academic experience with information systems and expert systems. Their paper complements the O'Leary and Turban paper by presenting a framework for evaluating the applicability of expert systems for given decision contexts. Burbridge and Friedman recognize, however, that decision making is not independent of the organization and thus provide a useful discussion identifying issues that affect the ability of an organization to assimilate and transfer ES technology within the firm.

Central to the paper is the theme of post-industrial organizations and the need for adaptive responses to new innovation and technology.

Organizational readiness is discussed and from the perspective of ES, key issues are developed that must be addressed before ES technology should be undertaken.

A second theme, but very important one, is strategic impact of information technology. The authors advocate the use of an option generator to determine the strategic direction for expert systems development and the impact on the overall strategic position of the organization.

The authors develop a framework that includes decision styles, information system, communication system, task attributes conducive to ES and factors based on the preceding elements that contribute to appropriate selection of what is termed an 'expert' decision. The elements of the framework are based on existing organizational and decision-making theories such as the one advocated by Vroom and Yetton.

To provide perspective and show applicability of the framework, an example of a real firm's organizational and decision structure is applied to the framework to show where the most appropriate use of ES technology could be applied. This paper provides stimulation and directs special attention to the need for the organization to undertake fundamental changes before embracing any new technology and specifically ES technology.

Blanning's 'Application of metaknowledge to information management'

Bob Blanning of Vanderbilt is a seasoned researcher in information technologies, primarily in the decision support and expert systems areas. In his paper, he focuses on the concept of metaknowledge or knowledge about knowledge, more specifically, general knowledge about the knowledge in a knowledge-based system. While this paper has a somewhat different perspective than the other papers in this issue, the editors felt that Blanning's approach provided some stimulation for management to view the role of knowledge systems in an organization.

In this novel approach, Blanning describes managers as communicators who must communicate, obtain, and manage metaknowledge, among other things. He argues that metaknowledge is an important resource to be identified and managed.

For example, he characterizes managers as nodes in a much larger information network who must collect and interpret potentially large amounts of information. Thus metaknowledge about the information or knowledge is needed to effectively manage.

Thus, Blanning suggests the need for knowledge-based decision support systems (KBDSS) (note that knowledge-based decision support systems are not necessarily expert systems). Several KBDSS are identified such as for resource allocation, scheduling and assignment, problem diagnosis and information management. The key to developing KBDSS is to develop an information model and then develop various ways of searching through the information model and developing conditions (rules) for accessing and utilizing the information. While many of the techniques Blanning describes for accomplishing his KBDSS are those common in Expert Systems development, Blanning does not argue that the information model be based on expertise – which is the key distinction between the KBDSS and ES integrated into a DSS.

The paper concludes with identification of four specific areas for future research that may determine the viability of this approach for use in organizations. These four areas are related to issues raised in the previous papers for ES and DSS such as the impact of management style on the application of metaknowledge, the usefulness of this framework for unstructured decision problems, the impact of external information sources which may be vital elements of the information network such as external databases, and the relationship between metaknowledge management and group DSS. Blanning concludes by showing how his theories fit into the broader area of expert database systems and networked, distributed information sharing. Clearly, the issues raised provide some impetus for serious consideration.

Zeleny's 'Integrated knowledge management'

Professor Zeleny's contribution to Management Support Systems (MSS) comes from his study and research area of autopoiesis (self-production) of spontaneously emerging human systems and institutions. Knowledge, he argues, is one such system and has to be treated correspondingly. Other-

wise, instead of creating expertise-enhancing expert systems we shall continue to construct expertise-diminishing (if not destroying) 'expert' systems.

Main categories of autopoiesis, those of system organization and structure, can be loosely associated with those of 'deep' and 'surface' knowledge emerging in some of the more advanced efforts in knowledge engineering. Modeling with *at least* the two levels of 'deep' and 'surface' knowledge would allow the user not only to face novelty and previously unencountered circumstances, but also reflect his subjective discretion in terms of what parts of the underlying background (world of objects) should be brought forth (i.e., created or reconstituted) and thus transformed into particular user's world of objects of knowledge.

Some examples of such joint organizational and structural representation of objects in the same frame are provided. Especially in applying human expertise to human systems (distinct from applying human expertise to the physical world or the world of contrivances) such multi-level, self-producing and creative representations are unavoidable. There *is* a difference between applying human expertise to rocks (or oil-fields) and to functioning humans systems (interaction of humans and contrivances). One cannot simply transfer one type of such expertise into another.

Second main theme of Prof. Zeleny's contribution is his recognition of the powerful integrative trends which are taking place in the society. Especially the category of knowledge (as well as labor) is, after the millenia of division, specialization and atomization, undergoing the reverse process of re-aggregation and re-integration. After the historical period of *corso* (outswing), both division of labor and division of knowledge are entering into their stage of *ricorso* (rebound). Recognizing such fundamental transition and its causes is crucial not only for business and management, but for any meaningful understanding of economic systems and their evolution. No future projections, predictions or planning efforts could succeed without being firmly rooted in the *corso–ricorso* transition, the longest of all the long-term economic 'cycles' or 'waves'.

On a still different level, the paper presents a powerful argument for the *integrated process management* (IPM) approach of Deming, Juran, Ishikawa and others, but also for high technology,

quality focus and optimal system design, as well as self-management, workers' autonomy, co-determination and co-ownership in both capitalistic and socialistic enterprise. It argues that 'support systems' must support and be in harmony with the long-term micro- and macro-trends in human systems: otherwise they may end up supporting what is either unsupportable or should not be supported at all.

Prof. Zeleny's emerging synthesis is still incomplete and fuzzy, but its contours are starting to emerge: its implications for management, economic and political sciences are undoubtedly fundamental and their range and depths are only gradually becoming realized.