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Expert System Model to Analyze the Role of Information Technology in Supporting Activities in the Life

[1]B. Venkata Raju and [2]S.P. Rajagopalan
[1]Department of Computer Applications, Jeppiaar Engineering College,
Old Mamallapuram Road, Chennai-600 119, India
[2]Former Dean, University of Madras, Chenna-600 005, India

Abstract: This research is concerned with the adoption of a *collective stance* in which the human species is viewed as a single organism recursively partitioned in space and time into sub-organisms that are similar to the whole. These parts include societies, organizations, groups, individuals, roles and neurological functions. The concept of expertise arise because organism adapts as a whole through adaptation of its interacting parts. The mechanism is one of positive feedback from parts of the organism allocating resources for action to other parts on the basis of those latter parts past performance of similar activities. The knowledge-level phenomena of expertise, such as meaning and its representation in language and overt knowledge, arise as byproducts of the communication, coordination and modeling processes associated with the basic exchange-theoretic behavioral model. The model is linked to existing analyses of human action and knowledge in biology, psychology, sociology and philosophy.

Key words: Societies, organizations, groups, individuals, neurological functions, expert system model

INTRODUCTION

Here an attempt is made to understand role of technology in supporting human knowledge processes. There is a feeling that it is necessary to understand the ultimate meaning of life in order to program an expert system or build an enterprise model. It is true that deep philosophical problems surface very rapidly as soon as one attempts to analyze human knowledge processes. It cannot be true that they must be solved in order to progress with the technology. First, the problems are not of a kind that admit to solution. They involve self-reference to a degree which makes for a wide variety of different and self-validating solutions. If there are equations of human existence, they are recursive functions that can evolve in a wide variety of self-consistent forms, each of which can be fitted to human experience by appropriate choice of parameters. Second, the exploration of new technologies is an essential component of our exploration of human nature Technological action is powerful form of social action that leads to new human adaptations and extends the range of human knowledge processes.

From a technological perspective, what is valuable in examining the deeper issues is the rich repertoire of perspectives they make available to us in system design. Expert system research to date has focused largely on the development of overt knowledge structures to model the short-term skilled behavior of individual experts. It is now shifting to apply the same overt knowledge paradigm to the short-term skilled behavior of organizations. What is missing in our existing approaches is an understanding of the longer-term processes whereby skilled behavior is adapted to changing circumstances, the social processes whereby individual skilled behavior is derived from supportive human and technical systems and the systematic processes integrating individuals and organizations. It may well be that the existing focus in expert systems research on overt knowledge structures is misleading when we attempt to extend systems to encompass adaptive and social processes

Pioneering systems to emulate human expertise: Computer scientists have been willing to enter unknown territory with aspiration of achievement despite uncertainties about the terrain. The large-scale research activity involved in the development of 'expert systems' was predicated on the existence of human expertise and the value of transferring this to computers. Warnings were given, particularly by cognitive psychologists, that human expertise was not necessarily to be valued, not easy to model and not susceptible to direct transfer. Pioneers, by their nature have learnt to disregard warning, taking them as indicating real or apparent dangers to be

Corresponding Author: B. Venkata Raju, Department of Computer Applications, Jeppiaar Engineering College, Old Mamallapuram Road, Chennai-600 119, India

ignored, faced or bypassed. Expert systems have been built. Methodologies and tools for knowledge acquisition from human experts have been developed. There is an industry of expert systems.

Expert systems as another information technology: The foundational problem of current expert systems technology are major impediments to achieving the original objective in expert systems research of emulating human expertise. However, pioneers are also opportunists. Since they are never certain what they will find, they learn to perceive and communicate value in any new territory. Expert systems technology is useful. Knowledge representation systems provide desirable extension to data base functionality. Knowledge acquisition tools provide new means for developing requirements specifications. Information technology is advancing and expert systems research has contributed to that advance. The foundational problems are being bypassed by redefining an expert system to be one that just performance well, rather than one that emulates human behavior or performance. Much current expert systems development may be seen as having the goal of developing decision supports systems that emulate the performance we might expect of idealized decision makers, rather than that of human experts. This is reflected in a shift of knowledge engineering methodologies towards software engineering techniques such as KADS which emphasize modeling in general using any source of information and place no particular emphasize on knowledge transfer from human experts The adoption of a technology-centered, rather than a human-centered, perspective in the development of expert systems is a legitimate strategy for practical system development. There are advantages in merging expert systems development with mainstream information systems development. It may well be the most appropriate step for the industry. It recognizes the convergence of many related developments in sub-disciplines where integration of ideas is now highly appropriate. For example, conceptual modeling of databases, object-oriented database development, detective database development and knowledge representation for expert systems, have much in common. It is productive to develop system drawing on the insights of all four research and development communities which, even though they commenced from different cultures, have generated highly related technologies.

Models of skill and knowledge: Geochronology is not a natural phenomenon, independent of our existence, but arises of out of human choice. The stance adopted by the designer largely determines the outcome of the design process. Hence, in understanding the current state of expert systems research, it is important to recognize the sources of existing design concepts and to analyze these sources in relation to their origins and alternative sources.

Cognitive psychology and cognitive science: The obvious, or most accessible, source of models of expertise for computer scientists has been the literature on cognitive psychology[1,2] and cognitive science[3,4]. This has the attraction of being based on information processing models that resemble processes familiar in the computer.

Cognitivism is the attempt to explain human and even animal cognition in terms of internal representations and rules. The theory of perception has, for many years, been premised upon the assumption that the perceiver must construct a mental representation of the physical environment. However, technological development such as cybernetics, information theory, signal detection theory and, most recently, computer science, have encouraged a similar approach to the topic of skills[2].

A revolution occurred in the 1950s which might crudely by summarized as the overthrow of Behaviorism by Information Processing[5].

Cognitive science is the study of intelligence and intelligent systems, with particular reference to intelligent behavior as computation[6].

However, there is a danger that basing the technology of systems that are intended to emulate human expertise on a science that is itself based on a computational model of expertise is a circular and self-justifying process. In particular the science will not be able to provide a critique of what is missing in the technology and attempts to remedy defects in the technology from within the conceptual framework of the science are unlike to succeed. Hence, it is useful to widen the perspective and examine other approaches to the understanding of human behavior.

Cognitive science and behaviorism: The position of cognitive science is often overstated because its genesis was a reaction to previous overstatements of behaviorist methodologies that disallowed consideration of mental processes as part of science of psychology.

Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no part of its methods, nor is the scientific value of its data dependent on the readiness with which they lend themselves to interpretation in terms of consciousness[7].

Skinners's "radical behaviorism"adopted a more balanced position:

From this perspective, cognitive science does not involve a revolutionary overthrow of behaviorism but rather a redressing of the balance so that information flows both within and without the organism are considered as parts of an overall model. Operant conditioning is a major phenomenon in human learning and its status as a predictive model of many major phenomena cannot be overthrown. Behaviorism is itself an information-processing model focusing on the relations between sequences of inputs and outputs rather than hypothesizing internal states and much of cognitive science may be more accurately viewed as an extension of behaviorism.

behavior is shaped and maintained by its consequences, but only by consequences that lie in the past. We do what we do because of what has happened, not what will happen. Unfortunately, what has happened leaves few observable traces and why we do what we do and how likely we are to do it are therefore largely beyond the reach of introspection. Perhaps that is why, as we shall see later, behavior has so often been attributed to an initiating, originating, or creative act of will.

Constructs of modeling: The preceding section has argued that the behavioral phenomena of an exchange theoretic model of expertise derive from the presuppositions made in modeling antipoetic systems, in particular, the mutual models of interacting antipoetic systems. This section addresses the other aspect of cognitive modeling of such systems, how notions of meaning arise out of the modeling processes. The argument is again a reflexive one, that it is the way in which we model modeling that leads to our notions of higher-level cognitive processes.

Cognitive processes in modeling: One may instantiate the modeling hierarchy in a number of different contexts using the vocabularies of psychology, anthropology, organizational science, education, artificial intelligence and so on, to develop systemic architectures for modeling processes in a wide range of systems.

- To *recognize* at the lowest level is the capability to notice recurrence of the 'same' event in the world when they recur. This is already a significant cognitive act because 'same' is subject to personal definition and the concept that events recur is a strong presupposition. Recognition is fundamental to any modeling system but is in itself a weak operation since it is dependent on the recurrence to make use of the data.
- To *recall* at the next level is the capability to regenerate the distinction used in recognition internally so that it is itself and 'event' that may be processed. This facility to recreate events in the 'imagination' is fundamental to the existence of the cognitive process, detaching human knowledge processing from the immediacy of experience.
- To *represent* at the next level is the capability to derive the distinction used in recognition and recall from other distinctions that may themselves not relate directly to experience. This facility to 'represent' events in terms of distinctions that relate only indirectly to experience is again fundamental to be developed that efficiently encode wide ranges of otherwise unrelated experience.

The analysis of modeling and its infrastructure have generated a perspective in which the emphasis on information flows in cognitive science is natural and expected. However, there is nothing that has been assumed that differentiates the modeling processes of the person from those of any other cognitive system. Notions of autopoiesis and modeling apply as well to organizations as to people.

CONCLUSION

The main outcome of this study is a recommendation to adopt a collective stance to humanity and see it as a single organism, a neural network, a giant brain, that is distributed in time and space by recursive partitioning into parts similar to the whole.

The phrase *collective stance* is chosen by analogy with Dennett's *intentional stance*, because its primary justification is one of utility. A collective stance provides a convenient perspective from which to view phenomena of human existence, including behavioral and knowledge processes and the specification, design, application and impact of technological support systems.

It is surprising that we have not already adopted this stance in neurology, psychology, sociology and information technology. It seems to have no adverse effects, unless undermining our egocentricity is seen as negative and it provides an integrative framework for many significant phenomena.

The parts into which the human organism is recursively partitioned include societies, organizations, groups, individuals, roles and neurological functions. Many concepts that apply to individuals may be applied to social systems, not as metaphors or analogies, but because, from a systemic perspective, its is the same concept that is being applied to different partitions of the system.

The perspectives presented in this study are intended to be both emancipatory and instrumental--to lead to reflectively acceptable knowledge that also provides the power to transcend some of the limitations of existing information technology that derive from the limited utility of the way we currently conceive it. What we do with this power is a matter of individual and social choice--or of blind chance. It is the relationship between theses two forms of explanation that provides the dynamics of our existence.

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