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Diamond

DEVELOPMENT OF MANAGEMENT SYSTEMS
IN THE INFORMATION AGE

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(Summary)

In working toward the development of management systems that take advantage of the new technology, and that will be appropriate to the world of the future, there are at least four basic principles of fundamental importance. A week ago, I emphasized two of these in my talk at the CIOS international meeting, but I would like to mention these briefly again, and then develop two others.

1. Although computers are used in business today mainly in routine ways--almost as very big and fast adding machines--we will only understand their future role if we regard them as thinking machines, which, in time, will be technically capable of all the kinds of thinking that humans, including executives, can do.

The work that is going on today in psychology and artificial intelligence has already developed programs that are able to do many kinds of complex thinking, problem solving, and decision making. Although the main contribution of this work has so far been to our basic understanding of the phenomena, this basic knowledge is bound to move gradually toward application.

2. Most of the information that top managers use in their decision making comes from outside the organization, not inside. Hence, computers will have only limited direct usefulness to managers as long as most of the information available to them is internal accounting and

capabilities of
computer
numerical
1/1 1/1
2/2 3/3

70

production data. Soon, however, computers will have access to substantially all information that is printed in books, magazines, newspapers.

1) Historically, computers have been blind and deaf to the outside world. They have only had available the information that has painstakingly been "fed" to them. They could not imitate the alert manager by seeking out broader information that might foreshadow trends in the industry, in the society, or in the world. But all printed materials are initially prepared on typewriters, typesetting machines or other mechanical devices. There is no technical reason why they should not be distributed in machine-readable form at the same time they are distributed in human-readable form. When that comes about--probably within a decade--computers will have available substantially the same range of information as executives.

2) At the same time, information retrieval programs for reading natural language texts, and for extracting the relevant information from them, will become increasingly sophisticated, so that the main burden of retrieving relevant information can fall on computers instead of executives.

3) *Information utilities*

3. In the information-poor world of the past, the big problems were to preserve information, make it available in a sufficient number of copies, distribute the copies to all the persons who might make use of it, induce people to store as much of the information as possible in their memories so it would not be lost.

In the information-rich world of today and tomorrow, the big problems are to preserve information in relatively condensed and efficient forms, never to copy it unnecessarily, never to distribute it to those who

*potable feed
throw away
breakers
and the tanks*

do not need it, and never, without cause, to store it in a human head.

In an information-poor world, the scarce resource is information. Human learning capabilities and memorizers must be used in every possible way to conserve that scarce resource. (The university lecture, in which students carefully transcribe by hand the professor's words, is a good example of a survival of the medieval technology of an information-poor world into the modern world of printing.)

attention-directing
score-keeping
problem-solving

In an information-rich world, the scarce resource is the attention of executives and of computers. Information ~~systems~~ must be designed so that attention and information-processing capacity can be conserved for those problems and those decisions that deserve the highest priority. Each component--human or machine--of the information-processing system must take responsibility for applying the principle of exceptions and transmitting only the information that is needed at the next processing stage of the system.

early use of
computers to
control manufacturing
tables
NPC personnel
files

Whether information should be stored in any particular memory--human or computer--can be decided only on the basis of the overall allocation of storage of the system. As transmission of information becomes cheaper and more rapid, and as retrieval techniques become more powerful, we will want to make the system less and less redundant, storing less information in fewer locations.

The information system must be designed not simply as an information-provider but as an attention-director. Information about low-priority items is not merely worthless; it imposes heavy costs on the system by distracting attention from more important concerns.

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4. The new information technology is not limited to computers, their hardware and software. It is a whole new body of science--both computer science and psychology--about the processing of symbolic structures, the solving of problems, and the making of decisions. A major task ahead for management is to understand this new body of science, and the concepts incorporated in it.

Computers are just one of the technical means available for implementing the new information technology. But a thorough understanding of the central concepts of information processing is needed also to design intelligently the complex man-machine systems that we call business organizations, and to improve the learning and thinking and decision-making processes of their human components.

① Like all new technologies, we will learn about this one best by interacting with it in every way possible. We will, gradually, and in time, learn to use computers and information in sophisticated ways, be experimenting with them freely in the naive ways that our limited present knowledge permits.

② general symbol manipulators