INFORMATION MANAGEMENT--TODAY and TOMORROW

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In discussing the theme of this symposium--current problems and future trends in information management--let me begin with a definition. To me the phrase "information management" means the acquisition, manipulation, transfer, and display of information for the ultimate user--scientist, engineer, manager, whomever. To be at least somewhat specific, I will try to develop the symposium theme in two separate areas of information management. The first will be the management of scientific and technical information, the kind used by engineers and scientists in their research and development work; and the second will be the management of management information, the kind used to make planning, marketing, and operating decisions.

Starting with scientific and technical information, I would like first to describe the typical, sophisticated system in operation today. Then we can take a look at near-term trends along with some long-range dreams.

Today's typical and successful scientific and technical information systems are based on bibliographic data bases, that is, data bases containing descriptive citations and index terms to technical documents, journal articles, books, etc. This is true both of those systems that are discipline oriented, like Chemical Abstracts, or mission oriented like NASA's system where the data base comprises aerospace and related material. The data bases are computerized and can be searched in a batch mode, and in most cases, from remote terminals in an on-line interactive mode. Searching is done using key words from the controlled vocabulary that was used for the original indexing of the documents, or in some cases, using words contained in the title or abstract. The documents that are acquired and processed into these data bases are checked for relevancy to the discipline or mission involved, but are otherwise unevaluated. There is no attempt to make a qualitative assessment of input. Today's system also produces publications that periodically announce what new material has been added to the data base and may contain abstracts of that material. These announcement journals may cover everything that's been acquired by the system during the period involved, or they may cover acquisitions only in certain high interest areas such as energy, pollution, or earth resources. Dissemination of the documents to requesting users is done either in printed copy or microform. Information systems managers are partial to microform since it has significant cost advantages, but users generally prefer printed copy, since it is more convenient.

That's an Instamatic snapshot of where we are today. Now, I'll pick up the deluxe Kodak with the 400--mm telephoto lens, and see if I can look into the future, at least the near future.

First, I think there is a definite trend toward full-text data bases, where the entire document is placed into machine-readable storage, not just a citation to the document. This in turn means the use of natural language searching of the data base and, for the most part, the elimination of key word indexing. I think we will move toward some sort of qualitative evaluation and value tagging of the documents going into these scientific and technical data bases. I can see an expansion by the announcement journals and by the on-line systems to include information on the numerical data contained in the report or journal article. Perhaps this will be in the form of a brief description of the tables or graphs contained in the document. This would aid the reader in deciding which documents would be most likely to contain the information he seeks. Numerical data bases themselves will proliferate and will become easier to use and to manipulate. I also predict the development of reliable and affordable microform retrieval systems coupled with facsimile dissemination of documents using electronic communication systems.

That, I believe, is the near future. As I try to look further, the visibility gets very poor, but I think I can just make out the vague outlines of the ultimate scientific and technical information system of the future. It has three main features. First, the data base will not be made up of citations to documents, nor will it be made up of the full text of documents. As a matter of fact, it will have nothing to do with documents; it will consist of pure information. It will consist of verbal data, numerical data, and formulas. It will include physical and chemical properties, physical laws, experimental results, statistical records...actually, everything available of a factual nature pertaining to the purposes for which the data base was designed. With this type of data base the user of the future will not do a literature search to identify documents relevant to his needs. No indeed. His approach will be much more direct. The data base will be entered with the specific problem facing the user, and in place of document citations, or copies of reports or articles, he will retrieve problem solutions. Now if that sounds like something you would expect to read in science fiction, consider how often science fiction has become fact.

A second feature of this ideal system of the future will be its ability to create reports. I don't mean to format reports in the traditional computer output sense. I mean to actually create a report in much the same way that an author does now when he uses relevant reference material, his command of the language, and the synthesizing power of the portable three-pound computer carried inside his skull. The ability to assemble concepts may still be unique to man but the HAL of Arthur C. Clarke's 2001 cannot be put off forever.

The third characteristic and perhaps the one that is the least blue sky is the elimination of the keyboard as an input device for data-base searching. I envision a system responding to oral commands or statements, and having the ability to reply via conventional CRT display, printed output, or even oral output. In other words, a terminal that will listen and talk back.

If we assume that I'm not too far off base on the scientific and technical information system of the near future and the distant future, what are the significant technological implications? Obviously, there will be a need for improved communication systems, advanced smart terminal concepts, distributed systems tying together geographically dispersed data bases, better software, and reliable, low-cost mass-storage devices using magnetic bubbles, lasers, or what have you. And of course, there is a very strong implication of large resource requirements for systems development and implementation. This last is a bureaucratic way of saying that the systems of the future are undoubtedly going to cost a lot of money.

The next question is, "Can we afford it?" Now I don't happen to believe that the Federal Government or anyone else can afford to do everything that sounds desirable. New York City is a current example of the results of that "do everything" philosophy. However, when you look at some of the worldwide problems that exist today, in areas such as pollution, energy, food, chemical destruction of our protective atmosphere, or chemical poisoning of our bodies, you reach the conclusion that these problems must be solved, and that solutions will require very wise decisions in very complex areas. Now what is needed to make wise decisions in complex technical areas? Information. Current and accurate information. This in turn means information systems that will enable us to acquire, manipulate, and display the necessary data on a timely basis. So to the question, "Can we afford the advanced scientific and technical information systems of the future?", I think the answer is, we have no choice. They will be essential to our survival.

Moving on to managing management information, I will not attempt to cover this area along the same lines that I discussed scientific and technical information, but I would like to offer my version of the current problems and my view of an important future trend.

I think it's fair to say that as a class, management information systems, MIS if you will, are generally in disrepute. This is primarily because they were--and probably still are--being oversold. The promised performance is rarely attained while the promised cost is always exceeded. I'm sure there are a number of burned managers around who never want to hear the term MIS again.

There are undoubtedly many and varied reasons for the numerous MIS failures, but I think there are two fundamental ones. First, there has been a misconception of what the MIS could do for a manager and second, there has been a misconception of what managers actually do.

The first case is very common and very understandable. After all, the initial business use of the computer was in the financial area where it could do a faster and more accurate job of keeping track of money. Later these initial computer systems were extended to keeping track of personnel, equipment, materials, etc., but always, they were bookkeeping system and represented the mechanization of a existing manual system.

The first so-called management information systems were mere expansions of these systems. They were designed by the people charged with accounting responsibility, and although they took advantage of the computer's capability to produce many and varied slices of the information, they were still accounting systems. For example, many personnel accounting systems after being improved by the addition of some new data elements and additional output reports, had bestowed upon them the grand title of personnel management information systems, and senior management was led to believe that the new system would provide anything they wanted to know about personnel. Actually, the system didn't even categorize employees in terms useful to the managers. After all, it was designed primarily to meet Civil Service Commission requirements. So what happened when the system failed to meet senior management expectations? It was branded a failure as a management information system even though it was a successful personnel accounting system. The same thing has happened in the financial area, in the procurement area, and in other areas and time and time again the computerized systems got a bum rap because they were called management information systems--which they really weren't--and they were portrayed as providing new and exotic benefits to managers--which they really didn't. Promises made and not kept. Expectations raised and not met. Still a current problem of some magnitude.

The second general group of failures were not designed by people worrying about keeping tack of things but were, in fact, designed with the manager in mind but--as I stated earlier--under a misconception of what managers actually do. Henry Mintzberg in a recent Harvard Business Review article entitled, "The Manager's Job: Folklore and Fact" makes these points.

1. Study after study has shown that managers work at an unrelenting pace, that their activities are characterized by brevity, variety, and discontinuity, and that they are strongly oriented to action and dislike reflective activities.

2. In addition to handling exceptions, managerial work involves performing a number of regular duties including ritual and ceremony, negotiations, and processing of soft information that links the organization with its environment.

3. Managers strongly favor the verbal medium, namely, telephone calls and meetings.

4. The managers' programs--to schedule time, process information, make decisions, etc.--remain locked deep inside their brains.

Now if we believe Mr. Mintzberg, and I think he's right on target, you realize why it's difficult to design a management information system for these kind of people. Is it wrong then to try to give a manager the best information available in the most usable form? Of course not. The fallacy is in thinking that once we have done this, we have solved 90% of the manager's job. The fact is we may have only solved 10% or 20% or some other percent depending on the type of operation he's involved in, but certainly well less than half. It's very important that people involved in the design of management information systems understand this basic fact of life.

So with respect to future trends in managing management information, I would say that as we become more realistic and better articulate the way managers do their job, we will come to realize that although the formal information system is important to the manager, it plays a relatively small part in his day-to-day activities. With this understanding, the stage will be set for functional specialists, information scientists and management officials to cooperate in the design of information systems that will provide optimum information support to the management role. A modest promise perhaps. But one that can be fulfilled.