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"The DB concept is in stark contrast to the traditional approach to storing data. It says 'Instead of storing identical information in different places, we'll put it all in one place.'"

Data Base: A New Standard for Insurance EDP

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A NEW CONCEPT for business data processing is achieving significant acceptance by computer manufacturers and major users of computer systems. This new technique uses standard "data management systems" (DMS) software packages to implement business data processing on a "data base" (DB).

Current estimates put the number of DMS users at approximately 500 nationally. DMS availability holds promise for reducing long-term costs of data processing and increasing the capabilities of the business programmer by automating many of the functions now performed manually. The data base concept has developed over the last decade to the point where it can be implemented practically by most medium- and large-scale users of data processing equipment. The 1960's saw the COBOL programming language emerge as a standard for business applications; the 1970's will see data base enhancements to COBOL enabling this new combination to become the standard procedure for implementing business data processing systems.

DB has existed for about five years, but is only today beginning to gain widespread acceptance by the data processing user community. The DB concept involves software packages (data management systems—DMS) that remove many of the functions of the business programmer from his direct control and vest those functions in the DMS package. The package standardizes all information for the systems application while supplying it to the programmer in a more readily retrievable form.

Historically, business data processing files have been oriented toward storing information on tape. Each application had its own master file containing its own information. This file contained data which typically was repeated on numerous other master files, depending on needs.

The whole DB concept stands in stark contrast to this. It says in effect, "Let us put all our eggs in one basket; instead of storing identical information in different places, we'll put it all in one place and everyone will know where it is and how to get it; it will be on an accessible piece of equipment and we'll control updating."

More Programs Available

With DMS processing on a DB, many of the transactions entering the DB will evolve in much the same way as they are currently developed from paper to keypunching and batching. However, other transactions and inquiries will be coming through more immediate on-line techniques such as by local terminals, by communications with other computer systems or remote users, or by computer-assisted instantaneous monitoring of transactions (such as point-of-sale monitoring of the checkout register at a retail store). Located on disc storage and available in thousandths of a second are the programs required to process the input and the master files against which input will be processed. As data enters the computer, the computer analyzes it and decides what program(s) is needed

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for proper processing. This program is called into the primary memory from the disc and activated. As the program proceeds, it will require certain data off the master file. Although the entire master file exists on discs, typically only a small portion of it is required to prepare printed reports, respond to an inquiry, or be updated. In these cases, only needed pieces of DB information are entered into the primary memory, updated, and returned to the disc.

There are two ways to communicate with other systems. Either the input data is kept in the computer and other application programs are brought in and use the same information; or intermediate storage files—either on the disc or on tape—are created which subsequently serve as the input for updating the other systems.

Instant Responses

The output from the data base oriented computer is often similar to current output—exception or general printed output reports. In addition, however, the on-line characteristics provided by the DMS enable some response to queries to be provided directly to teletypewriter or cathode ray tube terminals with only seconds' delay between the time the inquiry is initiated and the answer received.

Companies now using time-sharing or interactive man-computer systems already appreciate some of the advantages of the DB approach. These interactive systems permit input and response from inquiry terminals (or through the use of communications) in the same way that DMS do. However, the interactive system is only half the answer, since typically the data required for a particular application requires special loading onto a disc. If it is already there, it is not interfaced with other applications for uniform use and updating by several systems. In other words, the DB approach typically will replace several master file updates with one. The simple on line interactive computer system still leaves all of the problems of updating files that may use similar information independently.

Recent Developments

The advent of the large-scale disc drive, with its 100 million character capacity in one removable disc pack, was the engineering breakthrough which made practical the DB concept. It is now possible to retain up to several billion characters on line to a computer at any one time, and summon any piece of that information in less than one-tenth of a second.

"The corporate DB represents all pertinent information that might be correlated and cross referenced."

The concept of a total DB on a direct-access device such as a disc drive is not new. Initial approaches were tried with smaller, slower discs and second generation computers 10 years ago. These approaches were not widely adopted because they didn't use standard programming packages—DMS—which do much of the tedious yet necessary programming housekeeping. These packages sell or lease for a small fraction of the cost of writing such a system.

Choice of Several

Several DMS packages are available in today's market. The three best known are:

—Information Management System (IMS and IMS-II), developed by IBM for its 360 and 370 lines of computers.

—Integrated Data Store (IDS), developed by General Electric—now Honeywell—and now available on the Honeywell 6000 series of equipment.

—TOTAL, marketed by Cincom Systems of Cincinnati and available for several computers, including the RCA Spectra 70 (now UNIVAC) line, the Honeywell 200 series and the IBM 360 and 370 series.

DMS in the Insurance Industry

Until recently the insurance industry lagged significantly behind many other users in adopting DMS for systems developments. Within the last two years, however, many companies have taken the step, acquired a DMS, and have either completed development or are in the process of installing systems using a DMS. Below is a list of some insurance companies currently using data management systems:

Aetna Life & Casualty
Allendale Mutual
Employers of Wausau
Factory Mutual Engineering
Federated Mutual
Home
INA
John Hancock
Liberty Mutual
Massachusetts Blue Cross
Northwestern Mutual Life
Hartford
Travelers

Since DMS have been widely available since about 1968, an interesting question is why only a relatively small number of insurance companies have moved to use these systems. I think the answer is threefold.

The first DMS was IBM's Bill of Material Processor (BOMP). It was not really sold or intended to be a pure DMS for information processing. BOMP provides a parts explosion and has been extensively used in manufacturing industries. It was only after this program was already being widely used that it became obvious that the inherent logic of the system also lent itself to generalized processing of all types of information. Because BOMP was oriented toward manufacturing industries, financial institutions such as insurance companies were late in being exposed to the idea by potential vendors.

The second major reason why insurance users have lagged in developing DMS applications is that most major life and property/liability companies became heavy

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users of data processing in the early 1960's when tape oriented sequential master files were the computing industry's standard. Having made substantial investments in now out moded computer systems, these companies naturally have moved slowly and carefully in actively embracing the new random disc file design philosophies.

Gigantic Data Files

The third reason that insurance companies only recently have begun to move in the DB direction is that the size of insurance information files is typically enormous—substantially larger on average than is true for manufacturing. Extremely large files cause concern because the cost of storing information in on-line discs is much more expensive than using tapes for secondary storage. However, in 1970 with the announcement of the IBM 370 line of computers (and competitive systems such as the Honeywell 6000 series), new large disc files became available with storage capacities three times greater, access time twice as fast, and costs per character stored less than half of the prior-to-1970 standard disc files. This triple combination improvement in disc hardware technology finally made insurance companies, whose need for storage runs in the order of billions of characters of information, sit up and take notice as many applications became truly feasible and economical to implement.

Data Base Characteristics

The first important point in the DB approach is that the corporate DB represents all pertinent information that might be correlated and cross referenced. This totality can be defined in several ways. For example, the operation of a typical insurance company may be split into two parts: the larger is the actual insurance operation, involving premium collection, claim processing and payment, accounting and controls, and administration, including payment of expenses; the smaller segment concerns investing premiums to provide a steady income and capital appreciation. If the operation of these two areas is clearly segregated, there may be no need to correlate investment information with insurance results (except, of course, in the annual statement where all results are gathered —usually manually). In this environment, investment information should dwell in a separate DB.

Common Definitions Needed

An important part of creating the DB is that creators and users must agree on a common set of definitions for all information in the DB. This is not as easy as it might seem. Examination of data definitions in almost any medium- to large-scale user of data processing quickly exposes three classic problems:

(1) **Synonyms:** identical items of data called by different names in different applications.

(2) **Alternate Definitions:** different systems using the same name to describe different pieces of data.

(3) **Close Definitions:** two different names used to describe different pieces of data which have such similar definitions that there should be only one name and one definition.

To derive the advantages of DB, the corporate user must be willing to surrender his own definitions in order to live with a common set acceptable to all. The designers first must develop a complete dictionary of definitions; obtain support of the users for these definitions; keep it current, and enforce it for new applications. The dictionary needn't be particularly sophisticated. For example, it doesn't have to be on-line in a computer. It can be nothing more than a loose-leaf binder with all of the data items used listed alphabetically and carefully defined.

The next essential characteristic of the DB is that it resides on a secondary storage device—usually a disc drive. (Primary memory is the very fast, expensive magnetic core or integrated circuits.) The disc drive or other device used for a DB permits quick access to all data. This contrasts with tape or card storage. It could take a computer 150 times longer to locate a piece of data nearer the end of a tape reel than the beginning. It is through this pseudo-random ability to access data that the DMS may retrieve data swiftly and in desired sequence.

Allows On-Line Access

Another basic characteristic of the DB is that it can be interrogated by on-line terminals, usually cathode ray tube, TV-like devices. While not all DB systems have this feature, the trend toward DB allows for useful exception reporting, and the most efficient approach to getting this is through the use of inquiry and on-line terminals. Most of the leaders in DB development and marketing who don't presently have on-line features for their systems have announced or are planning to announce support for on-line and terminal access.

Most DMS may be implemented as extensions to one of the common languages used in business pro-

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gramming. Typically, this language is COBOL, the universal standard language for business. Not all DMS are COBOL extensions, however; a couple have provided a new language as a complete replacement for COBOL. Nonetheless, this approach is not as generally useful or as powerful as the basic COBOL language extended through DMS facilities.

Finally, users from different departments and through different application programs will be using one common DB. This concept has several important implications for the company electing this approach. Two of these—common data definitions and the data element dictionary—have been discussed. A third is the need for a totally new job—the data base administrator.

Data Base Administrator

The DB approach is data or information oriented, as opposed to most current business data processing which is application oriented and treats data as an adjunct to programs implementing that application. Now the definition and creation of the corporate DB is primary while the various application programs are secondary. These programs select needed data and operate against the common total DB. This stresses the importance of information and the way it is created, maintained, defined and handled. Many DB systems benefits result from requirements placed on the systems department for the establishment and maintenance of the total DB.

Broad Responsibilities

The data administrator's job resolves into two broad areas. First is creation of the DB. Until the first run, this may be a full-time job. But even after the first few applications are running, development remains a continuing job as new data elements enter the business stream while old ones are being culled. The second part of the administrator's job is, logically enough, administration. He is responsible for the control and usefulness of the DB and as such has an ongoing administrative responsibility. During the DB creation the administrator must relate with various users to develop his data element dictionary and win concurrence on definitions.

He must also structure relationships among different data within the DB, describing how one piece of information is related to or belongs to another.

Security Important

Once the DB is established, the administrator is responsible for maintaining its security, and developing procedures for recovery from disaster. With all corporate information eggs in one basket, it is extremely important to prevent unauthorized or improper access to the DB.

Through DMS tools, statistics on data usage, frequency of access and total volume are readily available. By carefully monitoring these sta-

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tistics, the administrator can optimize the data locations on different peripheral devices and suggest new definitions or the elimination of unused information. The data base administrator position is of key importance to the data processing department and the entire corporation. Depending upon the organization of the data processing department, he can report either to the manager of all data processing or to the manager of systems design and programming. Any point lower within the systems organization will not give sufficient visibility to the importance of this function.

Advantages of the Data Base Approach

The primary reason for adopting a DB is to realize significant savings in programming and de-bugging time in the development of new business applications. The few studies that have appeared on this subject show that once the DB has been established, implementing comparable programs by comparably trained programmers can be two to four times faster than with the COBOL programmer who must develop his own master files. Since the cost of the hardware in most large data processing departments has dropped below 50% of the EDP budget, and in many cases to 25% of the budget, any approach which saves on labor costs can provide highly persuasive cost justification.

More Efficient, Productive

A second important reason is the efficiency in data storage and nonredundancy that result from clustering all data in one file. Also, when the information is in one file it can be more easily updated and accessed, and is therefore more reliable.

The ease of developing new applications once a DB has been perfected is also significant. Probably the hardest part of business data processing is building and maintaining the master files. By removing much of this task from the programmer, the systems shop can use less experienced programmers and become productive more quickly under the DB environment.

One of the DB advantages most apparent to top management is that it enables one-time-only programs for decision-making or operations research to be written economically and processed against data already resident in the corporate DB. Currently, such programs are either impossible to implement or prohibitively costly and time-consuming because they require centralization of numerous tape files. It is, of course, this very sort of one-shot, decision-making information that is one of the most valuable products of a data processing department.

Problems with the Approach

Currently, the first and probably thorniest problem is that DB is considered conceptually advanced and there is a concomitant lack of well-trained people to implement it. Time will overcome this. Training is readily available, from com-

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puter manufacturers, software vendors and management firms specializing in executive and technical seminars. Already several hundred applications have been implemented and some knowledgeable people are available.

Larger Memory Banks

A second DB problem is that we are withdrawing from the programmer functions he once performed and delegating them to the integrated hardware/DMS system. By doing so, we create a need for computers with larger memories and greater processing power. Most DB users have been of a size that can afford powerful computer systems. This will likely remain true until after 1975, when new computer capabilities may depress the overhead cost to a level acceptable to smaller users.

Another problem (and associated opportunity) related to DB is that rarely are a company's existing systems merely converted onto a DB. The enlightened company will use the conversion as a complete redesign springboard for systems to be changed and in so doing develop a more versatile product. For example, it will generate exception reports instead of grinding out massive stacks of paper for inquiry use. One requirement for a redesign is a total commitment in terms of money and time; after all, we're talking about systems that may have had a 10-year genesis. They will not be replaced quickly or easily even with tools such as DB.

Along with the fact that the new system may not be just a simple conversion of the old but, in fact, new and different comes the concomitant problem of inability to use parallel runs—those computer runs which can be computer compared old to new to see if there are errors in the new system. This means that the output from the new DB approach will have to be visually examined, a much more laborious process than is involved in many standard system conversions. While DB technology permits more junior programmers to became more productive sooner, the other side of the coin is the requirement for expertise in systems programmers. These are the people who maintain the computer's operating system, and they are among the most highly skilled and paid data processing professionals. As is the case with operating systems, the introduction of DMS requires comparably skilled systems programmers to maintain data management software, and therefore an additional individual(s) with specialized expertise in this area.

Reruns More Complex

Malfunctions in computer hardware or software during the running of today's typical business applications call for reruns. Normally, the program is rewound to a check point or the beginning, the original master file and transaction file are loaded, and the run is regenerated. Even if a particular master file is destroyed, one can go back to the "father" tape—the original master from which the current master was created—and rerun a couple of times to make the system current. Under the DB approach several programs may be updating and accessing the DB at the same time, and the results of a malfunction in the hardware or software are not so easily cured. The primary technique for recovery in this situation involves continual journaling of transactions against the DB and the use of these lists to restore. Because of the large number of potential interactions, this procedure is more complex and requires more time than would be required under today's most common procedures.

Total Commitment

Finally, top management commitment is essential, initially and throughout the project. In a complete evaluation of the company's systems, quiet errors, previously undiscovered, will almost certainly come to light. Data processing and top management must be prepared to accept these as normal and take necessary steps to eliminate such errors in the new system design. Management commitment is also

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necessary because unfamiliar definitions may be generated whose use is mandatory to interface with the DB. Unless top management understands the objectives and is committed to the DB approach, one of the problems I have described will almost certainly lead to the premature death of the project.

Characteristics of Successful Companies

Some valuable lessons have been learned by comparing successful and unsuccessful DB approaches. For example, successful users have done the following:

Corporate Committee—A team of middle managers representing all major business functions was formed at the outset, sometimes during and sometimes after the preliminary feasibility study had been conducted by the data processing department. This team defined data and heard appeals regarding conflicts in approaches. *All* DB-related functions were represented on this team.

Logical Organization—The DB structure itself and the list of applications to be programmed against it were organized functionally: marketing, production, engineering, etc. Peculiarities of any individual organization because of specific individuals holding a job at one point in time were not accorded importance.

New Approach to Systems—The corporate committee, in concert with the data processing department, identified the decision-making process in the business and designed the system accordingly. In other words, current systems and their requirements were not accepted as the prototype for the new system. A more detailed investigation into information needs formed the basis for the DB system.

Dictionary Development—Early in the development, the DB data elements were defined and put in dictionary format. Often it was at this stage that the relationship among the data elements was firmed up. The analysis of this data also was structured to eliminate duplication and redundancy and to develop standardization.

Data Administrator Control—A system for data control, usually managed by the data administrator, was set up and implemented before system activation.

Phased Implementation—Finally, a schedule was developed for phased implementation of reports and information out of the DB system. While overall implementation may have been lengthy, products were identified which could be successfully delivered at early points and were made available as soon as possible throughout the development cycle of the new DB system.

Conclusion

Acceptance by the user community based on technical progress in hardware and computer software shows that the concept of DB implementation through DMS will become the standard for implementing business oriented data processing during the 1970's. For management, this means three things:

(1) Start to Investigate Now—Companies with medium to large data processing efforts should begin at once to relate the DB approach to their own information system.

(2) Recognize Importance of Basic Data—If you decide on DB, your data processing department organization will have to be changed to recognize the importance and thereby control the data used by systems. As a result, in addition to emphasizing application programs, the data processing department must search more deeply into the information needs of the firm than it did with past applications.

(3) Obtain Commitment to a Controlled Environment—Top management commitment will be needed to resolve disputes among users. It must be recognized ahead of time that some preferred definitions must be sacrificed to assure commonality in the systems language. These common definitions, in fact, are only one aspect of the more controlled environment of the DB approach. Individual users and "hotshot" programmers will have to surrender some of their specialties. This more controlled environment will provide the standards necessary for more cost effective management information systems. □