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Electronic data processing

DATA BASE MANAGEMENT SYSTEMS:

THE DATA STORAGE AND RETRIEVAL TOOL OF COMPUTER BASED
MANAGEMENT INFORMATION SYSTEMS 1/

by

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PURPOSE

To introduce the participants to the basic rational of Data Base Management Systems and to extend their conceptual knowledge through the use of existant data base management systems and their implementation.

GENERAL OUTLINE

1. WHAT IS DATA BASE MANAGEMENT?
2. SOME OBSERVATIONS ABOUT DATA, DATA BASE MANAGEMENT AND THEIR DEFINITIONS
3. THE EVOLUTION OF DATA AND STRUCTURAL DEFINITION
4. IMPLEMENTATION OF DATA BASE MANAGEMENT SYSTEMS
5. CONTRASTS IN EFFECTIVENESS OF DATA BASE MANAGEMENT SYSTEMS AND CONVENTIONAL COMPUTING APPROACHES.

WHAT IS DATA BASE MANAGEMENT?

"A discipline which provides a method for centralizing the organization of data to control and assist in the design, development, use and maintenance of information systems in a reasonable cost and time frame."

SOME OBSERVATIONS ABOUT DATA, DATA BASE MANAGEMENT, AND THEIR DEFINITION

When we talk about data base management, there are several things that must be definitively understood with regards to data. In any organization data is, next to people, the most valuable resource of the organization, and unless data is used properly the intrinsic value it should have becomes nil.

Unfortunately, the value of data, or information decreases over time. Data processing, while it has been very capable of supplying data to management, has often supplied data that is out of date, and therefore of little if any value. Further, that data must also be accurate or it is not a good basis on which to make a sound decision.

The ability of data processing to gather data in large quantities is unquestionably impressive. The effort that must be expended to make this data usable as information for management is however very great. Data is normally collected at the lowest levels of an organization, typically by a clerk, and very prone to error. It is assembled, and converted

into some computer processable form. At this point it is edited, corrected, and edited again, so that the accuracy of the data may be assured. This process requires both more clerks and some very complex and therefore expensive computer programs.

Once the accuracy of the data is confirmed, more processing takes place, reformatting and manipulating the data, so that finally it can be summarized. Very few managers are going to wade through a five hundred page report. Managers are going to look only at the summarized facts to make decisions. But if these summarized facts are ninety days late and possibly wrong then how can they possibly make correct decisions.

The conclusion one should draw here is that with the proper management of data within an organization, data becomes a very important asset to the organization. Conversely, improperly managed data can lay the basis for very improper and incorrect decision making by management.

If you look at the basic structure of an organization, you find many different levels of operation and management. Data normally moves upward through the various levels. While this upward flow occurs, it is natural that more and more summarization takes place, each step introducing the possibility of error, and, where the facts do not agree with the picture desired, deceit. It is unfortunately human nature to hide ones shortcomings and project ones strengths,

and managers are just as human as anyone else, especially when presenting facts (or what are supposed to be the facts) to their managers.

The intent of a data management system is to take the approach, the process used for planning construction of plants, for managing people, and applying it to the management of data for an organization. This is of course of a feedback loop.

Normally when managing an organization you plan, you implement, you review results, and you modify your plans as a consequence of your results.

Let us now use a functionally more appropriate definition of Data Base Management: It is the art and approach to managing and structuring, in a manner considerably more simple than previously, the computer readable data of an organization as a whole, so that it constitutes a resource that can be drawn upon like inventory, like raw materials, and made available to the organization for broad range applications, especially on an ad-hoc basis. Since most raw computer applications development in an organization is in response to the ad-hoc requirements of management, and since most ad-hoc requests for information actually require data already available, but in another form, it would obviously be easier to access the data if its definition is separate from the programs that are needed to process the data. This is the primary and most basic reason for data base management. A Data Base Management System then provides for the separate definition of data so that it can be

manipulated to provide response to the requirements of management in an easy, efficient, and timely manner with a minimum of cost.

THE EVOLUTION OF DATA AND STRUCTURAL DEFINITION

There are four basic evolutionary stages with respect to the structure of data that exist in various organizations. Data is currently structured in most organizations as a manual functional replacement. What is meant here is that programs have been written to replace on a one-for-one basis functions that have previously been performed manually. Most programs written for the processing of administrative applications have been designed to mirror what a clerk did manually. This is understandable since these administrative applications were normally the first applications to be processed using computers.

Following administrative applications, various other broad classes of applications have normally been implemented using computer systems such as manufacturing control or marketing management and market analysis. What has happened though when these different applications were implemented, was that the same data occurred in different files over and over again. When systems are implemented this way, it is obvious that data is horribly duplicated and that to process that data against each one of these systems involves a batch orientation. To go on-line doesn't really solve any basic problems either.

The second stage in data structural evolution is the cross functional stage. Here is the first time that applications have been designed for computer processing without being merely a direct replacement for manual functions. With cross function designs data is usually available not only to the primary application for which it was initially required, but for other applications as well. When implementing applications at this level we encounter the definite need for data base management systems for it is here that the sharing of data across applications first takes place.

The third stage in data structural evolution is the cross functional interlevel stage. Here we start to totally separate data from applications. Here we actually require data base management systems so that we can respond to ad-hoc management demands for information.

In interlevel processing not only are lower level cross functional requirements for data being maintained but also the ability to respond to the middle and upper management requests for data. We also draw other benefits from interlevel implementations or more specifically, the facilities required to implement interlevel systems. For when data is separated from specific systems we can then start to perform Transaction Driven Processing, where each transaction that enters the system is audited, and updates all of the relevant data in a data base automatically, due to the various links and relationships specified as an integral part of the data base definition.

In the fourth stage in structural development we have what is currently considered by many to be the ultimate in data processing at this time. In the data base organizational model union, since we have achieved prompt and accurate availability of information, we can apply scientific organizational modeling and simulation to the data to do a proper job of organizational planning.

This level of processing and control is only available now due to the availability of data base management and its ability to supply information quickly and reliably, in response to the ad-hoc requests of management as well as the basic processing requirements of an organization.

IMPLEMENTATION OF DATA BASE MANAGEMENT SYSTEMS

Data Base Management Systems are basically a file and data manager. The vendor supplied software accepts as input descriptions of the logical organization and physical structure of a data base. The software then generates directories required to access the data base, the files or "data sets" that actually comprise the data base, and the access routines that are included in user programs that reference the data base.

When a user written program that references the data base is running the Data Base Management System is the program that actually handles the additions, deletions, insertions, and updates to a data base and

its composite files for the user, relieving the user programmer of the responsibility of writing file access routines.

Data Base Management Systems also relieve user programmers of much of the normal housekeeping, verification, and validation normally required in a totally user written program. For example, a Data Base Management System usually checks for duplicate records, locks records while they are being updated (which is especially critical in real-time on-line systems), updates pointers as records are inserted or deleted, verifies fields for valid information during updating, and verifies that programs and the data base itself are compatible.

The basic software components of a Data Base Management System are a Data and Structure Definition Language Compiler, a higher level language compiler such as COBOL, ALGOL, or PL/I with extensions to support data management facilities, and operating system routines to interface the data management system to the standard input-output subsystem of the computer system.

When actually generating a data base, the user has to define the data base using the Data and Structure Definition Language. The actual user programs are written in COBOL, ALGOL, or PL/I, are compiled by normal compilers, and generate normal object program code.

The execution of Data Base Management System object programs is the same as for traditional programs except that the

access routines generated by the Data and Structure Definition Language Compiler are also in execution, these being the only object programs that can access the data base itself.

CONTRACTS IN EFFECTIVENESS OF DATA BASE MANAGEMENT SYSTEMS AND CONVENTIONAL COMPUTING APPROACHES

Data Base Management Systems have been implemented by many computer manufacturers and other software suppliers for several years at this point, and a reputation has been generated by the early systems that is certainly not appropriate now (however - if considering a Data Base Management System it is most important to benchmark it before buying it).

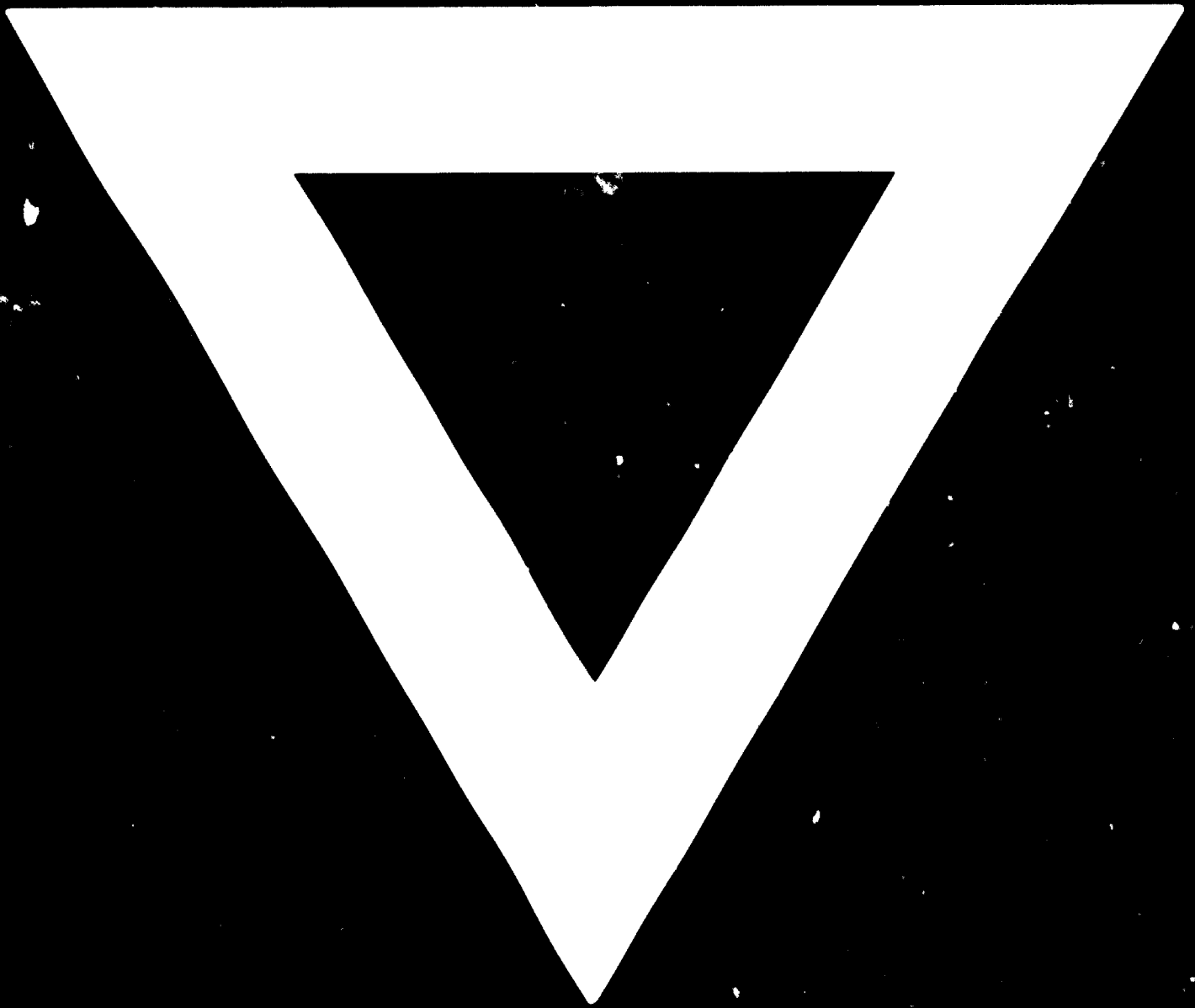
Because some of the later Data Base Management Systems are not prohibitive in terms of process requirements, memory or secondary storage space, I believe the following general comparisons with conventional processing can be made:

1. The effectiveness of people using and managing data is increased.
2. An opportunity to apply the computer and its managed data to day-to-day decisions making is available.
3. There is a reduction in design, development, and maintenance time and cost of applications.

4. Fast, high volume transaction processing that effects change throughout the data base is available.
5. Most importantly - there is higher level control of information needs so that all levels of management can be assured of getting the amount of information they need to make decisions accurately.



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