76-12,940

SHARIFI FARDI, Mohsen, 1945-
A PRAGMATIC APPROACH TO DEVELOPMENT AND
APPLICATION OF TOTAL INFORMATION SYSTEM.

The Louisiana State University and Agricultural
and Mechanical College, Ph.D., 1975
Accounting

Xerox University Microfilms, Ann Arbor, Michigan 48106

A PRAGMATIC APPROACH TO DEVELOPMENT AND APPLICATION OF TOTAL INFORMATION SYSTEM

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Accounting

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December 1975

ACKNOWLEDGMENT

Words cannot describe the author's gratitude to those who made this work possible.

Special recognition is owed to my committee members: to Dr. William E. Swyers (Committee Chairman) for his valuable advice, to Dr. Clarence L. Dunn for his guidance throughout my doctoral work, to Dr. C. Willard Elliott for his support and assistance, to Dr. Lloyd F. Morrison for his encouragement, to Dr. William W. Thompson for his expertise in Quantitative Methods which arose my interest in the area.

Many thanks is offered to Mr. Albert Brown, his staff, and the East Baton Rouge Parish School Board for providing assistance throughout this study.

Sincere gratitude is granted to Dr. Terence A. Oliva for making available unsolicitated materials in the area of system and for the guidance which he provided to the author.

Special appreciation is also given to Dr. James W. Pattillo for his assistance and guidance at the outset of my graduate program.

Finally, many thanks should go to my wife Azar, my children, Alidad and Leyla, who generously provided me with their time, and to my family in Iran for their support throughout my graduate program.

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ABSTRACT

Although the concept of "total system" has been regarded as a systems-design goal by both management and system specialists, it has been a controversial issue in the information processing area. The term "total system" means different things to different people at different points in time. Therefore, the first objective of this study is to examine the aforementioned concept as discussed by different academicians and system specialists.

In order to accomplish the above-mentioned objective, the most significant works of 38 different authors were reviewed with regard to the concept of total system and its attributes as suggested by them. Furthermore, the problems of total system have been examined in four areas:

1. Semantical problems and use of inappropriate terminology
2. Hardware and its impact
3. Software and its development
4. Development of data base as an alternative for a total system.

The second objective of the study is to define a total system based on the characteristics suggested by the authors and to adopt or to introduce other attributes which are regarded necessary for a total system.

According to this study, no universal concept of "total system" or "total information system" was observed, primarily due to the

problems of general semantics. Moreover, it is concluded that the term "total system" is not a meaningful term in itself, and it must be employed with a specific reference to a system's hierarchy. Therefore, the term total system has been defined at three different levels:

1. Total Data Processing System
2. Total Information System
3. Total Intelligence System

The third objective of this study is to examine whether the data base approach should be regarded as an alternative for a total information system as was suggested by some authors. Due to the similarity of data base with the memory of animal systems, it is concluded that a data base is a necessary part of total information system and should not be regarded as an alternative to it.

Finally, an actual total information system is developed for the East Baton Rouge Parish School Board as a surrogate for the model suggested by thid study. The system is designed based on the users' informational needs and is divided into five subsystems. These subsystems are: (a) Payroll and Personnel; (b) General Ledger; (c) Student(s); (d) Property control, Purchasing and inventory; and (e) Executive Planning. A common data base serves all the five subsystems.

CHAPTER I

INTRODUCTION

The impact of information upon decisions of the management is quite obvious. In fact this may be considered as the main reason for creation of the highly sophisticated information systems and major development in the hardware and software in the area of information processing. In the small organizations the information system will operate in rather informal fashion and face-to-face contact is a major part of the communications system. As the organization expands, the added degree of complexity will be observed. The number of employees will increase. Authority should be granted to the lower level manager; therefore, this will expand the communication channels and makes it more difficult to maintain. In this type of situation, management will realize that communication with various segments of the organization is a cumbersome task.

The concept of decentralized organization helps management to a certain degree to overcome the above problems. However, the problem of communication and information handling continue to exist.

The efficiency of the management decision-making activities depends primarily on the quality of the information provided. Moreover, the more timely and accurate the information, the more effective the decision could be. Then information should be provided based on certain standards of quality, quantity, and timeliness.

Computers will play the major role as far as the attainment of the above objectives are concerned.

As the information systems have gone through various stages of development, numerous forms of them have been created in different shape and format such as the accounting system, inventory system, payroll system, production system, and marketing system. The major reason for expansion of these systems was Boulding's General System Theory and concept of "system of systems."[1]

Prince relies basically on the same concept and tries to relate any system in the organization to a higher level one by treating the lower level system as a subsystem of the higher level system. He describes the hierarchy of networks of a system at three different levels. The first level is the operating system which is a computer-based, integrated network of information flows. The second level of the hierarchy is the "management information system." This is a "computer-based network" containing one or more operating systems capable of providing relevant information for the management decision-making process. This system possesses the necessary mechanism for implementing changes or responses made by management.[2] Based on his criterion, different operations of business can be viewed as separate information networks such as financial, production, and inventory. By applying the general system theory the first level of

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[1]Kenneth E. Boulding. "General Systems Theory-The Skeleton of Science," Management Science, Vol. II. (April, 1956), p. 202.

[2]Thomas R. Prince, Information Systems for Management Planning and Control, Revised Edition, (Homewood, Illinois: Richard D. Irwin, 1970), p. 40.

the hierarchy of networks is called by him the "advance information system".[3]

Total System

The concept of the total system and its complete system integration may be regarded as a goal for the management and the analysts. Although this goal, as it is claimed, may not be fully achieved with existing knowledge and technological capability, the concept would serve as a valuable guide in the design task of any type of information system.

Accepting the "total system" as a goal for design of any type of system is a valid assumption. However, there is a great deal of confusion and disagreement among those who have dealt with this term. Management consultants use the total system term when the activities of a department or a division will be handled by a group of computer equipment and other communication facilities. However, most academicians who work in a more abstract atmosphere add more dimension to the management consultant concept. For example, Prince defines the term as a "large-scale, computer-based network with on-line communication facilities that support the major decision-making activities in two or more departments within a corporation."[4] Although the computer technology is claimed to be a necessary element of a total system, it seems that the technicians in this field tend to over emphasize the capability of the computer as a data processing device. Therefore, less attention is paid by them to the philosophy of the total system,

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[3] Ibid., p. 317.

[4] Ibid., p. 318.

as a valuable concept for planning and control purposes. This is implied by Borchardt who stated that with a proper design, an integrated electronic data processing system (IEDP) involving central electronic computer together with data communication (DC), should upgrade an integrated data communication system (IDCS) to a total system (TS).[5]

Another view is the one held by Roger Christian who looks at total system as an "integrated corporate intelligence systems designed to permit management by exception, based on timely information, randomly available, and guided by rigorously determined relationships and decision rules."[6]

Finally, Rosove suggests that a total system is not just a product of the system analyst imagination, but a reality.[7] According to him, the information system should be classified according to its degree of integration or extent to which they are "total." He suggests both lateral integration that incorporates different functions at the same organizational level, and vertical integration--to incorporate different levels of organizational hierarchy.

It is obvious that the background and the relation of writers with particular groups have a great impact upon their point of view

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[5]Rudolf Borchardt, "The Catalyst in Total Systems," Systems Procedures Journal, May-June, 1963.

[6]Roger Christian, as coded in James B. Bower and William R. Welke, Financial Information Systems: Selected Readings, (Boston, Mass.: Houghton Mifflin Company, 1968), p. 92.

[7]Perry E. Rosove, Developing Computer-Based Information Systems," (New York, N.Y.: John Wiley and Sons, Inc., 1967), p. 6.

with regard to the total information system. Technicians are mainly interested in the hardware equipment and tend to consider the computer as a necessary element of a total system. Those who are working in a managerial capacity are more appreciative of any system and procedure which facilitate management planning and control.

Use of Data Base an an Alternative

The concept of total system to some authors is not practical, at least at the present time. A variety of reasons are behind discarding the total system concept. Much of the confusion arises because of vagueness of the concept per se. The previous section is perfect evidence of this charge and a good reason for those who advocate the data-base.

Becker believes that because of the limited capacity of man, it is not possible for him to work in different areas at the same time; so even if he is highly competent, his effort should be devoted to a single area. On the other hand, each user has different points of view and different criteria of value. In order to serve all users equally, a universal system must be designed to serve the present as well as future needs of those users. "Clearly such an approach is impractical if not impossible...."[8]

Another opponent of the total system is John Dearden of Harvard University. He claims that implication of total system as a single information system for a company leads us in the wrong direction, since the entire information system of a company is too large for the classification to be meaningful. So he proposes the concept of data-base

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[8] Joseph Becker et al., Information Storage and Retrieval: Tools, Elements, Theories, (New York, N.Y.: John Wiley and Sons, 1963), p. 226.

and integration of the data requirements of the various systems by using the same reservoir of data. "In the new scheme of things the data base does not constitute a 'total system' by any means."[9]

Dearden's data-base just serves different subsystems such as Financial, Personnel, and Logistic information systems and is capable of storing merely historical data.

Statement of the Problems

Since the term "total system" has been the subject of the most controversial issue in the field of information processing, the objective of this study is to examine the concept of "total system" as was suggested by many different academicians and system specialists. Through the course of study special attention is paid to the validity of the "total information system" from pragmatical points of view.

It is a major thrust of this study to demonstrate that if a Total Information System was defined at a proper level of hierarchy of systems, it would serve as a valuable guideline for designing any type of information system. In order to support the above statement, a design pattern of Total Information System is also suggested. The proposed system is capable of providing relevent information for the day-to-day operating decisions as well as long range planning decisions. The users of this system are not merely the management of an organization. Rather, a variety of interested groups may take the opportunity to use this information system.

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[9] John Dearden, "How to Organize Information Systems," Harvard Business Review, (March-April, 1968), p. 72.

Many authors have suggested that the "total system" concept, at least, is not practical with the current state of the art in technology. Thus, a data base is suggested by them as an alternative to a total system. It is furthermore a thesis of this study that a data base is an integral part of a total information system. Therefore, design of a data base should not be considered as an alternative to total information system, rather as an evolutionary step toward total information system.

Research Methodology

The research methodology of this study consists of three different parts. The first part was involved with the thorough review of the literature with respect to the theory of system, particularly "total system" and the validity of this concept. This study could not possibly include all the published literature in the area of total systems. However, included in this study are the more significant works which are readily available or which became available as a result of correspondence with different sources.

The second step was the analysis of the reviewed literature. Different attributes of a total system as were suggested by 38 authors (26 system specialists and 12 academicians) were classified into five major groups. Based on the above analysis, this study defines a "total system" at three different levels. These definitions are partially based on the characteristics of a total system proposed by these authors.

Finally, the last step suggests a design pattern for a total information system based on the model developed in this study. The

East Baton Rouge Parish School Board as an actual organization was chosen. An exploratory questionnaire was distributed among the key members of the school board system who were extensively involved with planning and control. This was done in the hope of gaining more knowledge about the informational needs of different positions within the organization. Then based on the results which have been extracted from the above questionnaire, a few persons were interviewed.

Since the East Baton Rouge Parish School Board's information system was almost in conformance with the model suggested by this study, the design stage is limited to complementary additions of those subsystems which were lacking from the system.

Scope and Limitation

Although the system approach, particularly "total system", is broad enough to encompass any type of activity, this study focuses primarily on the information providing aspects of a total system. Furthermore, in order to determine the informational needs of the users of a "total information system", only the management's requirement for the information has been determined. Therefore it is assumed that other interested groups' information requirements are readily available within East Baton Rouge Parish School Board's "total information system".

Organization of the Study

This study is organized based on the following pattern: the review of relevant literature is covered in Chapter II. This chapter is organized mainly around the ideas suggested by the proponents of total system. Fallacies of the total system concept with regard to the lack of unified definition, hardware and software implication, and the opposition point of view are presented in Chapter III.

Chapter IV discusses three different models which are suggested by this study. In Chapter IV particular attention is paid to a data base as a component of total information system. Data base and its implication with respect to this study is presented in Chapter V.

The proposed total information system for an actual organization is discussed in Chapter VI, while Chapter VII summarizes and concludes the study. Also in the last chapter are included some recommendations for further research in this area.

CHAPTER II

REVIEW OF PREVIOUS RELEVANT STUDIES

The total information system has been a subject of many controversial issues in the field of information processing and communication. Most of the problems and divergence in the points of view are in the area of general semantics. Words have different meanings for different people. In the area of total information systems this problem is very apparent. Two different individuals may argue on a subject matter, not knowing that there has actually been no difference between them to start with. In the area of total information systems, one author may define a total information system as a process of integrating all the operating systems within the organization. While in another author's point of view, integration of systems may be a necessary condition, but not a sufficient one. Still, other authors believe, total systems must be capable of providing needed information for planning and control.

In order to explore the total information system concept, it would be more appropriate to start at a lower level of abstraction and define the terms system and information system.

System Defined

Various authors in the past have defined the system in different ways. Neuschel defines a system as:

"... a network of related procedures developed according to an integrated scheme for performing a major activity of the business."[1]

The above definition has a procedural orientation. The same mode can be detected in the following by Senensieb:

"A system is an orderly arrangement of interdependent activities and related procedures which implements and facilitates the performance of the major activity of an organization."[2]

In another context, Russell Ackoff, without any attempt to relate a system to any type of procedure or particular kind of environment, defines a system as "an organized or complex whole, and assemblage or combination of things or parts forming a complex or unitary whole."[3]

Still another definition has been suggested by Ashby that actually attempts to express what is actually going on within the system.

"A system is a closed, single valved transformation. A transformation is a set of transistors (i.e., changes in states) on a set of operands (i.e., "old states"), producing a set of transforms (i.e., "new states"). A transformation of each operand results in only one transform. A transformation is closed if no new element (unspecified in the list of operands) is created by it, i.e., the set of operands defines the universal set of all transforms."[4]

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[1]Richard F. Neuchel, Management by System, (New York: McGraw-Hill Book Co., 1960), p. 60.

[2]N. L. Senensieb, as coded in C. C. Wendler, Total Systems: Characteristics and implementation, (Cleveland, Ohio: Systems and Procedures Association, 1966), p. 15.

[3]Russell L. Ackoff, "Towards a System of Systems Concepts," Management Science, (July 1971), p. 661.

[4]W. R. Ashby, An Introduction to Cybernetics (New York: John Wiley, 1963), p. 39.

The above mentioned are only a handful of definitions in the field of information processing and cybernetics. Any attempt toward mentioning all the possible methods of defining a system will lead us nowhere. Generally, the term system has been used in three different senses.

System used as theory. In this context the word system directly corresponds to the word theory. "Here let us observe that the plurality of numbers is not original, but derived. The System does not start like Atomism, with an unlimited plurality of units (emphasis added)."[5] In the same context: "It might seem reasonable, incidentally, to regard the distinct enumeration of the primitive terms of a system as superfluous, since these terms are precisely those to be found in the primitive propositions. In the earlier axiomatic systems, certainly, this precaution was not always taken (emphasis added)."[6]

System used as method. Here, emphasis is added to the components and interactions among them. The two definitions which were cited by Neuchel and Senensieb are of this nature. A better example of a system as a method is expressed by the United States American Standards Institute:

> "A system is an assembly of procedures, processes, methods, routines, or techniques united by some form of regulated interaction to form an organized whole."[7]

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[5]Francis MacDonald Cornford, Plato and Parmenides, (Indianapolis, Ind: Boblis-Merrill Company, Inc., N. D.) p. 7.

[6]Robert Blanche, Translated by G. B. Keene, Axiomatics, (New York, N.Y.: Dover Publishing, Inc., 1962), p. 24.

[7]John A. Beckatt, Management Dynamics: The New Synthesis, (New York, N.Y.: McGraw-Hill Book Company, 1971), p. 28.

Finally, the word system has been used to mean the entity. In day to day activity various references are made to a university system, government system, etc., which refers to the whole organization, not a specified set of procedures and methods or sets of relationships which may exist within the system. Therefore a system can be defined as "any entity, conceptual or physical, which consists of interdependent parts."[8] In order to unify the above definitions and apply the system approach, the major step has been taken by Ludwig von Bertalanffy. By defining General Systems Theory, he believes that there are a certain number of general principles which are true in any type of system. It does not matter if the system is biological, social, etc. These principles are equally applicable to all of them.

General Systems Theory

According to Bertalanffy, the organic principle can be equally applied to all types of systems. This is what is called a system approach and for justifying his theory he suggests that "the mechanistic scheme of isolable, causal trains and meristic treatment had proved insufficient to deal with theoretical problems, especially in the biosocial sciences, and with the practical problems posed by modern technology. Its [system approach] feasibility resulted from various new developments -- theoretical, epistomological, mathematical, etc. -- which, although still in their beginnings, made it progressively realizable."[9] These general principles can be established for

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[8]Russell A. Ackoff, "Systems, Organizations, and Interdisciplinary Research," <u>General System Yearbook</u>, Vol. 5, (1960), p. 2.

[9]Ludwig von Bertalanffy, <u>General System Theory</u>, (New York, N.Y.: George Braziller Company, 1968) p. 11.

any type of system through application of General System Theory. He defines General Systems Theory as:

> "... a logico-mathematical field, the subject matter of which is the formulation and derivation of those principles which hold for systems in general. A system [then] can be defined as a complex of elements standing in interaction. There are general principles holding for systems, irrespective of the nature of the component elements and of the relation or forces between them.[10]

Bertalanffy, certainly, is the father of General Systems Theory. Introduction of his concept not only encouraged, but facilitated a great deal of interdisciplinary research. However, there was a shortcoming in his work to the extent that his proposal did not go beyond the biological system, at least, up to the time that General Systems Theory was considered to be applicable to social sciences by Boulding. Kenneth Boulding's thought is well expressed in the letter that he sent to Bertalanffy to the fact: "I seem to have come to much the same conclusion as you have reached, though approaching it from the direction of economics and the social sciences rather than from biology [science] -- that there is a body of what I have been calling 'General Empirical Theory,' [General System Theory], ... which is of wide applicability in many different disciplines."[11] (emphasis added)

Later, Boulding presented his article "General Systems Theory: The Skeleton of Science" that indeed caused most of the evolution and progress in the field of economics, management and data processing, which was then called Management Information Systems.

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[10]Ludwig von Bertalanffy, Problems of Life (New York, N.Y.: Harper Torch Books, 1960), p. 199.

[11]Bertalanffy, Loc. cit., p. 14.

According to Boulding, a body of systematic theoretical constructs must be developed in order to discuss the general relationships of the empirical world. By doing so, the communication process between various disciplines becomes much easier and enables the specialist to obtain relevant information from others.[12]

Two approaches are suggested by Boulding. In the first approach he uses the principles of inductive logic. Therefore, by observing the empirical universe and by picking up certain general phenomena which are found in many disciplines, he seeks to build up general theoretical models relevant to those phenomena. The objective of the second approach is the arrangement of theoretical systems and construction of a hierarchy of complexity which roughly corresponds to the complexity of the individuals of the various empirical fields. The latter approach is probably the ultimate goal of General Systems Theory and led the researchers toward finding the "system of systems."[13]

Prior to the introduction of the General Systems Theory concept, the majority of the analysts were not aware of the fact that their efforts toward development of any type of system had not been as productive as it could have been. Most of the systems had been designed without any due care and without consideration for their impact on the higher level or lower level systems. Moreover, some of the systems were designed just for the sake of satisfying designer's curiosity or ambition. The idea of searching for the system of

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[12]Kenneth E. Boulding, "General System Theory: A Skeleton of Science," Management Science, Vol. 2, (April 1956), pp. 197-199.

[13]Ibid., pp. 200-202.

systems has contributed a tremendous amount to the field of information processing by overcoming the above deficiencies.

Information Theory

Information theory is a new field of study which was created in recent years in order to evaluate and measure changes in knowledge. The basic concepts involved in this field are concept of information, information value, and optimum quantity of information.[14]

Information can be defined as "... selected data for the decrease of ignorance or for the reduction in the amount and range of uncertainty surrounding a decision."[15] Accordingly, the main objective of communicated data is to enable the decision-maker to make an informed decision. Whatever is used to eliminate the state of ignorance or provide a less uncertain state could be called information. Thus, it is possible to increase the amount of data to a great extent without hindering the uncertainty which surrounds a given decision. In this context, information may range from nothing to almost everything. Therefore, increasing the amount of data or facts does not of itself insure the generation of information.[16]

In an alternative type of definition, information refers to inferentially intended material evaluated for a particular type of problem, for a specified individual, at a specific time, and for the

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[14]Norton Bedford and Mohammed Onsi "Measuring the Value of Information - An Information Theory Approach", Management Services, (January-February 1966) pp. 15-22.

[15]Solomon Kullback, Information Theory and Statistics, (New York, N.Y.: John Wiley and Sons, Inc., 1959) p. 7.

[16]Peter Shoderbek, Management Systems, (New York, N.Y.: John Wiley and Sons, Inc., 1971) pp. 174-178.

explicit purpose of achieving a definite goal.[17] Thus, what may constitute information for an individual at a specific point in time may not do the same for another person or even for the same person at a different point in time. Useful information for one manager may be totally irrelevant to the decision model of other managers in the same organization. For instance, the detailed information which is provided for the production managers may be invaluable to the controller of the company. The former may be interested in the non-monetary aspects of information in detail format for product planning and control. The latter devotes his major effort toward pricing the products and inventory in aggregate form, based on certain guidelines -- Generally Accepted Accounting Principles -- which he must observe for external reporting purposes.

Defining information haphazardly has limited value. Most of the information which is prepared based on the above definition is subject to a certain degree of human and institutional error. Only when the organizational structure and measurement of performance are taken into account, can defining the information in a most effective way be possible.

Anything of value which has present as well as potential utility to an entity is called a resource. Traditionally, the term resource is applied to natural resources such as land, labor, and capital. Information has not been recognized as a resource of organization. While it possesses many of the characteristics of the material resources, capable of being obtained, processed, stored and

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[17]Norton Bedford and Mohammed Onsi, Loc. cit.

used, information is a perishable resource in the sense that it loses its utility when it is not needed; yet, it is not consumable in a way that it can be used up.[18]

The concept of information economics which is suggested by McDonough treats information like any other scarce resource subject to the principle of allocation and uses which are applicable to any resource. He defines the concept as:

> "... the study of the allocation of certain scarce resources of an organization to achieve the best decisions for that organization. In particular, information economics concentrates on the allocation of resources for the storage of knowledge, for the obtaining of information through data processing, and for the effective utilization of both stored knowledge and processed information by individuals in the firm."[19]

This concept probably should be considered a milestone toward developing any information systems, particularly Management Information Systems.

Management Information Systems

Introduction of information theory and other factors, such as advancement in the data processing field and theory of the systems, are between those factors that contributed the most to the creation and development of the phenomenon which is called Management Information Systems (MIS).

Although, it is not very obvious as to who initiated the use of this term for the first time; it is very likely that the

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[18]Robert L. Johnson and Irwin H. Derman, "How Intelligent is your MIS?" Business Horizon, (February 1970) pp. 55-62.

[19]Adrian M. McDonough, Information Economics and Management Systems (New York, N.Y.: McGraw-Hill Book Company, 1963) p. 2.

American Management Association Report Number 62[20] was the first major publication which heavily used the term MIS throughout the report. However, in that report, the term MIS was not used in the same sense as it is used in today's literature. For instance, Guest,[21] used the term MIS as part of the title of his paper which is presented in the above-mentioned report, thus, he did not use this term again in the body of the paper and the word data-processing system and EDP were mainly employed by him.

In another paper in the same Report, MIS is considered as part of a more advanced system called Automatic Data-Processing (ADP). In order to forecast the future and predict the priorities of tomorrow, Dwyer suggests "the need for an 'intellectual radar' that probes beyond the clouded horizon... [which is nothing but] automatic data-processing equipment."[22]

Two approaches for ADP are suggested by him: (a) improvement of the administrative efficiency of the data-processing system by a substitution of hardware; or, (b) improvement of the effectiveness of the <u>management information system</u> by a re-evaluation of the informational needs (emphasis added).[23] Based on the above proposals, improvement of MIS will culminate in the achievement of a higher level

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[20] American Management Association, <u>Advances in EDP and Information Systems</u>, Management Report Number 62, (New York: American Management Association, 1961).

[21] L. C. Guest, "A Temporate View of Data Processing and Management Information Systems," Management Report No. 62, <u>Loc. cit</u>., pp. 7-13.

[22] Edmond D. Dwyer, "Some Observations on Management Information Systems," Management Report No. 62, <u>Loc. cit</u>., p. 15.

[23] <u>Ibid</u>.

goal, which is ADP. It is needless to mention that the reverse cause and effect relationship is more appropriate. Therefore, the author has not used the term MIS carefully. Indeed, it is the improvement of ADP which might increase the effectiveness of MIS.

In short, the AMA report suggests that a good MIS is the one which uses the service of EDP equipment. All the means for data communication are integrated and information finally prepared for planning and control of the organization. Only one reason may be suggested for overemphasizing the word data in the terms Electronic Data-Processing, Automatic Data-Processing, etc. Traditionally, it has been the major assumption that the more data that is available to management, the better the quality of decisions that will be made. In other words, in order to epitomize the quality of a decision, a maximum amount of data must be provided, irrespective of the decision model which is employed by the decision maker and the environment that surrounds him. No attention has been paid to the fact that some differences exist between data, information, and so called intelligence.

Data are passive raw facts that are cataloged according to a retrieval scheme, maintained either in the computer or manually, as elements of knowledge at the statistical level.[24] In other words, data is normally referred to as the "raw material" used in production of information.[25] Therefore, there are some basic differences between data and information.

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[24]Robert L. Johnson and Irwin H. Derman, Loc. cit., p. 55.

[25]Jerome Kanter, Management-Oriented Management Information Systems, (Englewood Cliffs, N.J.: Prentice Hall, Inc. 1972) p. 10.

Information is "processed-data" that will satisfy certain needs of the decision-maker with regard to the planning and control function. An analogy between the production process of finished goods and data-processing of information is shown in Illustration II-1.

Intelligence is a term which is used at the highest level of communication hierarchy. After the analysis of organized information, intelligence will result in the form of selection of a preferred course of action from the inventory of available alternatives.[26]

Now that a clear line has been drawn between data, information and intelligence, the term MIS can be defined in a more appropriate way. Of course, it should be emphasized that after the AMA Report of 1962, the efforts toward defining the term MIS have been continued in literature and with the highest probability this trend will be extended into the future. But since MIS means different things to different people, it has yet to reach a stage when everybody will agree on an acceptable definition for MIS.

Kanter's[27] definition of MIS is probably the most meritorious yet simple one. He designates a definite meaning for the words management, information, and system.

The first term is Management, which usually consists of several layers in each organization. Normally, these layers are called top management, middle management, and operating management. Distinction has to be made between responsibility and authority of each layer. While top management responsibility is to set overall

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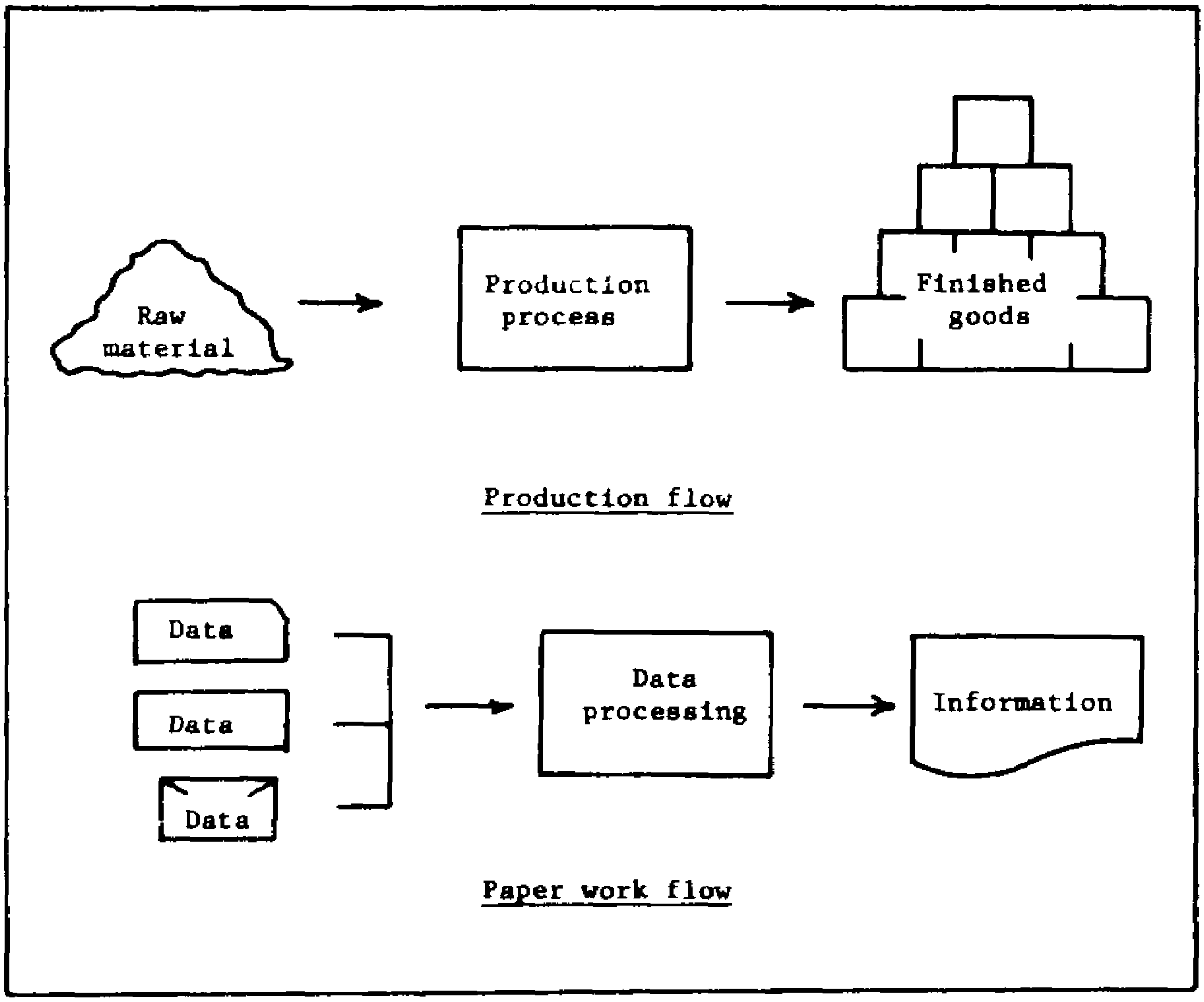
[26] Robert L. Johnson and Irwine H. Derman, Loc. cit.

[27] Jerome Kanter, Op. cit.

ILLUSTRATION II-1. AN ANALOGY BETWEEN PRODUCTION PROCESS AND DATA PROCESSING.



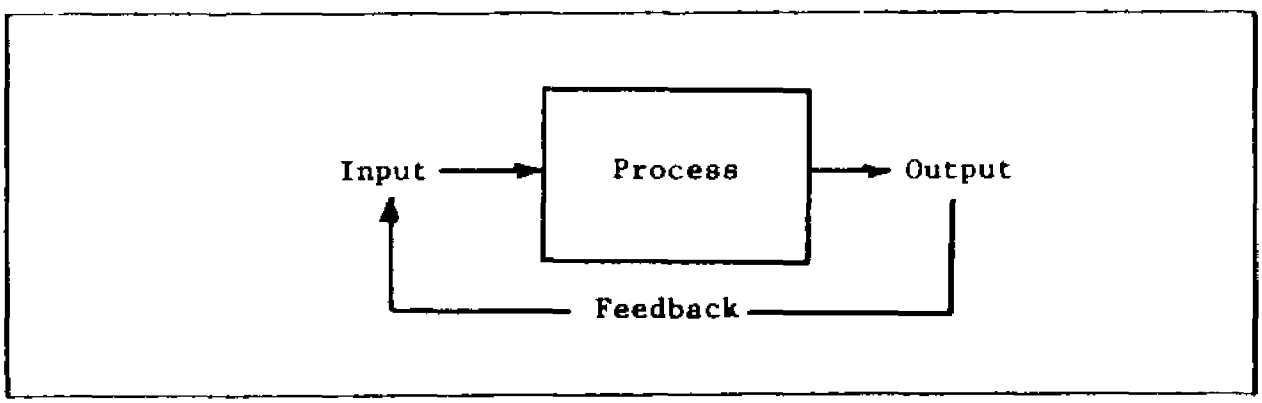
Source: Jerome Kanter, Management Oriented Management Information Systems, (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1972) p. 10.

goals and objectives for an organization, the lower level management is concerned with implementing those goals. Therefore, it is very crucial to understand the management process before designing a MIS.

Information is defined as processed data. In order for a MIS to be successful, it must be capable of providing all layers of management with the desired type of information. Top management of any organization asks for a variety of information which is by its very nature unexact, futuristic, unstructured, etc. Operating management usually asks for the type of information that is exact, historical, structured, etc.

Finally, in regard to the term system, which was discussed previously in this chapter, Webster suggests that a system is a regular, orderly way of doing something which is a more useful definition for the purpose of MIS. Every system has four elements in common which are input, process, output, and feed back (Illustration II-2).

ILLUSTRATION II-2. SYSTEM MODULE.



The above system module has universal applicability and offers a simple yet useful way of analyzing any type of system. Although the analogy of the above model can be found much more easily in a physical type of system, such as a production system, its principles also apply to an information system.

Part of the MIS objective is to achieve a certain degree of control by means of comparing the actual outcomes against predetermined plans. Physical systems only provide the management with "what" is going on. It is actually information systems that reveal to the management how things are being done. Therefore, included in a MIS are both physical and information systems.[28]

Based on the discussion about the terms management, information, and system; a MIS can be defined as "a system that aids management in making, carrying out, and controlling decisions."[29] The merit of the definition depends on its focus on the decision-making process with regard to the planning and control activity within an organization.

The term MIS is often used synonymously with "total information system" or "integrated system." However, some difference definitely exists between MIS and Total Information System (TIS). In the next section the term TIS is explained in more depth.

Total Information System

Business applications of data processing did not start until two decades ago. As a matter of fact, it was in the 1950's that computers were acquired for the first time by business. Payroll was the first application to be processed by the computer. Later, computer processing was extended to more sophisticated (at that time)

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[28] Ibid.

[29] Ibid., p. 1.

applications, such as customer billing, stockholder record keeping, inventory control. From the inception of this phenomena (the computer data processing), integration of the subsystem was the primary goal of any system specialist. The motive behind it was the more efficient use of the computer. According to the system specialist, development and maintenance of each subsystem necessitates a certain amount of duplication in capturing, processing and storing the source data. Since Integrated Data Processing (IDP) will eliminate all of the above duplication, it will result in a more efficient system.

Gradually, the term IDP changed to Total Information System and Total System. The term TIS is used by many authors and means many things to them. It has been used in a variety of senses for describing the system from the most elementary system to the most advanced one. Therefore, it is almost impossible to find a precise definition to describe the TIS.

The objective of this section is to search various sources in the area of information systems and data processing and to expose how the TIS concept is considered differently by different individuals. The approaches suggested by authors are divided into two sections. Those concepts which are mainly expressed by practitioners or system specialists are discussed in the first section. This group generally has a practical orination and seeks a pragmatic solution to the problems in the area of system development and data processing. The second section is devoted to the different thoughts of TIS, which are suggested by academicians. Within each section, various points of view, either pro or con, are discussed in detail.

Although this section will cover a majority of the literature published about the TIS concept, it is limited to the more important and more significant pieces of work in the area.

System Specialists' Approach to Total Systems

Integrated Data Processing

ıntegrated Data Processing (IDP) approach is to be considered a milestone in the development of TIS. The major thrust of the concept lies in the fact that all the data must be captured as close as to the point of origin in such a form that can be processed and used for all purposes. This will result in the elimination of duplication, reduction of costs, and increased system efficiency.

The American Management Association, Special Report Number 11, has mentioned three fundamental characteristics for IDP.

"1. Original data are recorded at their point of origin in a mechanical form. In other words, the all-pertinent information is recorded once at the beginning of the clerical process.

2. From then on -- whether on tape, cards, film, or whatever the medium may be -- data are processed exclusively in a mechanical manner. The whole concept of IDP is negated if at some station along the line data are recorded manually.

3. All processing of data is integrated so that original data in mechanical form serve all subsequent applications."[30]

Insignificance of the above concept is due to the fact that in early days of computers, data processing had not been benefited by a high degree

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[30]American Management Association, Establishing an Integrated Data Processing System, Special Report No. 11, (New York: American Management Association, 1956), p. 9.

of technology and application of other related sciences. Still, another concept was suggested four years later. It is unimportant in nature and is heavily affected by the available procedures which were the major issue of that time. "... Any routine which may be automated through the use of punched paper tape of whatever variety, and which truly effects the elimination of repetitive writing, should earn the badge 'I.D.P.'."[31]

The primary objective of the so called IDP is:

"... the creation of a situation whereby one single writing of a given set of information, fully planned and programmed, will cover all writing. ... [the] approach also suggests mechanization of the present or proposed system, with integration between function so that all data, once entered, became self-perpetuating... paper work simplification [is the] goal, regardless of degree of mechanization which proves practical. ... [Also] objectives are to eliminate rewriting of repetitive data, discard time consuming duplicating, replace manual key punching, centralize data processing, provide accuracy, overcome distance and delay."[32]

W. D. Hopkins, from the same group has an interesting idea about IDP. He is very impressed by the capability of the punched paper tape and defines IDP as "techniques employing common-language punched paper tape to link or integrate otherwise independent machines

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[31]Harry S. Brown, "Integrated Data Processing", Ideas for Management, 12th Annual International Systems Meeting, (Cleveland, Ohio: System and Procedures Association, 1960), p. 162.

[32]Ibid.

and eliminate the normal transaction of original data."[33] In order to justify his approach, Hopkins offers some statistics about the speed of processing, cost reduction, and accuracy which results in IDP.

Yet another author, Ellis, defines IDP in both a narrow and broad sense. According to him, management's desire is the major factor for achieving the total integration. This approach also is valuable to the extent that it gives some credit to the management control process, by saying that:

1. IDP is designed to cope with the persistently changing patterns of business, that is, to help management control the business in the most orderly manner possible, despite the seeming disorder arising from change.

2. IDP is a risk reducing, decision-making aid; it generates timely, integrated information for all echelons of management.

3. In its narrowest sense, IDP is the mechanization of data at their origin and their continuous processing until their final use. It is, in other words, a means of doing clerical work mechanically, and its end products are integrated, timely information and clerical cost reduction.

4. In its broadest sense, IDP embodies new aids to decision-making and makes possible the concept of "Management by exception." "It is the totally integrated systems."[34]

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[33]W. D. Hopkins, "Integrated Data Processing" Ideas for Management, Op. cit., p. 167.

[34]Howard Ellis, "Integrated Systems Produce Profit", Management Report No. 62, Op. cit., pp. 141-142.

Integrated or Total System

A major breakthrough occurred and a new term -- Total System -- suggests a new challenge for the system specialist. This change in mood is very well observed in the two articles written by J. W. Hasett of Shell Oil Company in two consecutive years.[35] In his first article he refers to the system that is to be installed in Shell Oil Company as totally integrated MIS. This system, if installed, will provide the automatic handling and processing of data from collection at the point of sale to the final consolidation of financial statements. Machines used at each stage of the data processing are integrated with the other equipment in the total system. Although he used the term total system, he did not make any attempt to define it.

In his second selection he considers the words "integrated" and "Total" to be synonymous and continues "... integrated data processing and total systems convey the idea that the area of interest takes in the recording work of all departments of the company, with particular reference to the relationships among similar or similarly used information."[36] Without any further explanation of "similarly used information," he suggests a two-fold objective of the total systems. These objectives can be stated as:

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[35]J. W. Haslett, "Toward a Totally Integrated Management Information at Shell Oil Company," Management Report No. 62, Op. cit., and "Total Systems--A Concept of Procedural Relationships in Information Processing" in Total Systems, Edited by Alan D. Meacham and Van B. Thompson, (Detroit, Michigan: America Data Processing, Inc., 1962).

[36]J. W. Haslett, Total Systems, Ibid., p. 16.

"To organize administrative work flows from the viewpoint of the company as a whole without regard for barriers or organizational segments.

"To develop an information system whereby source data are recorded once and thereafter perpetuated in various summary forms to meet departmental operating and financial needs without repetitive processing."[37]

Haslett is probably the first who used the words "integrated" and "total" interchangibly. However, his practical orientation creates a tremendous gap between his two stated objectives. The integration of administrative work and elimination of organizational barriers which is stated as the first objective is not compatible with his second objective which is a procedural step by step for capturing and processing source data.

According to Haslett, both objectives have interdependent components. These components are: organizational structure; groups of procedures and sub-procedures, including forms; electronic and other processing and communication equipment; employees; and data originated, numerized and otherwise processed. The degree of totality will be determined by specifying how well the resources and techniques are integrated.[38] Therefore, in Haslett's approach to total system, the organizational objectives, organization's major activities, decision-making areas, management informational requirements, and other factors are completely ignored.

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[37] Ibid.

[38] Ibid., p. 17.

Norman Spray of Bell Helicopter thinks of total systems as an extension of integrated data processing. Accordingly, he defines total system as a "complete integration of all major operating systems within a company into a single operating system through the medium of data processing."[39]

Yet according to the system planner of Carborundum Company, total system is an integrated electronic data processing system which serves two purposes: (a) the processing and/or production of operating documents, records and reports, and; (b) the preparation of management control information through data reduction and analysis.[40]

Barnes and Weaver suggest a new term on the same line of thought. They believe that any company that uses automatic data processing equipment needs a total system approach. Accordingly, "the system must process data that will produce transaction, supply information and provide scientific management tools.

"... The company must be visualized as one entity. [Therefore] the design of a total data system, the vertical integration of application areas, and the synchronization of business and the mathematical programs are the target."[41]

Still there are some practitioners who are trying to solve the total system problem by a logical deduction and mathematical analysis.

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[39]Norman Spray, "Total System Concept in Action at Bell Helicopter," Paperwork Specification, Issue No. 58, (1960), p. 5.

[40]"Carborundom Company Developes (Total System Approach) in Data Processing," Office Management, (January 1959), p. 21.

[41]Carl B. Barnes and Charles C. Weaver, "Total Systems Approach to Automatic Data Processing Planning," in Total Systems, Op. cit. p. 75.

As it is suggested by Rudolf Borchardt,[42] communications includes data origination and transmission, code and language conversion, and en route and terminal storage. Therefore, data communication may be considered to be the integrating factor in IDP. When data communication (DC) is combined with IDP, the happy result should be an integrated data communication system (IDCS). Although the IDP concept refers to a variety of manually and/or machine language operated office machines, it does not necessarily involve a large central computer installation.

Therefore, IEDP + DC = TS which means with proper design, an integrated electronic data processing system (IEDP) involving a central electronic computer, together with DC, should upgrade an IDCS to Total System (TS).

The term "Total System", as explained, is either used as an alternative to IDP or as an extension of it. There are still some authors who believe that these two terms have completely different meanings. Becker expresses this feeling by mentioning that the work of <u>each department</u> should be considered in the total perspective. Therefore, management might think that each department can separately automate its own functions and later join these functions together as an integrated system.

"Even a management which initially agrees with an integrated approach [at the department level], often compromises it for a short term gain. But if the total system is to be what its name implies,

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[42]Rudolf Borchardt, "The Catalyst in Total Systems," <u>Systems and Procedures Journal</u>, (May-June 1963), pp. 20-30.

management must be understanding and patient with the problems and slow pace of an integrated analysis."[43]

Total System - A Reality

A majority of the system specialists consider total system as an operational reality. As one system specialist suggested, it will require five to ten years to install a TIS in a large corporation.[44] According to some of these practitioners, the total system has not only passed the test of feasibility, but in some cases it is in operation. For instance, John Field of Bosch Arma Corporation claims that the total system has already been installed in less than two years at the Corporation headquarters in Springfield, Massachusetts. This system has three main features:

1. The forward look feature by providing the information necessary to run the business. The major emphasis of information-providing is placed upon forescasts, schedules, orders, collection, and reporting of information. Added emphasis on the above areas will eliminate most of the extraneous data that make creating a total system difficult.

2. The modular approach feature to information processing is achieved by constructing the standardized units of information which are called "modules."

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[43] James L. Becker, "Planning the Total Information System," Total System, Op. cit., p. 67.

[44] Ibid.

3. The assembly-line processing feature is called "continuous flow" processing. Assembly line processing means the use of on-line computer as an integral part of modular information processing.[45]

According to Lach, in pursuing a total system concept, great progress has been made at the plant level. Many problems arise, however, as a result of failure to automate the production reporting systems. In order to enhance this situation, the system analyst must make an effort to automate paperwork processing in order to provide local and corporate management with fast and accurate operating results.[46]

It is obvious that this view was expressed at a time when the effort of system specialists was entirely devoted to automation of procedure in an organization, and production reporting procedure was probably considered more sophisticated than other procedures.

Perry Rosove of System Development Corporation also believes in the reality of the total system. He states that the total system is not just a product of the system analyst's imagination, but is a possible reality. In this context, the information systems must be classified according to the degree of integration or the extent to which they are "total."[47] Because of his orientation, he considers the computer to be an important element in developing a total information system.

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[45]John Field, "Total Systems: A Definition and a Case History", Management Report No. 62, Op. cit., p. 151.

[46]Edward L. Lach, "The Total Systems Concept" Systems and Procedures Journal, (November 1960), pp. 6-7.

[47]Perry E. Rosove, Developing Computer-Based Information Systems, (New York: John Wiley and Sons, Inc., 1967), p. 6.

As management of an organization gains more experience about the routine functions of the company and use of computers for applications like payroll, inventory retrieval and control; it usually pays more attention to the use of a computer for attaining higher level goals. A higher level goal could be profit-maximization on a company wide level. As the objective of management changes, the system boundaries will change too and more functions will become automated. At this level, systems such as marketing, inventory, accounting, sales forecasts will become subsystems of higher level systems. Normally, after this stage, more attention will be paid toward efficient operation of integrated systems which is structure based on higher level organizational goals.

Rosove's integration includes both lateral integration, which involves incorporation of various functions within the same organization, and vertical integration, which is incorporation of the organizational hierarchy.

There are five levels of integration which should be taken into consideration in any system design task. These are:[48]

Level 1. Functional level - integration of a single function, for example, payroll.

Level 2. Plant or departmental level - integration of several functions, such as payroll, finance, sales.

Level 3. Company or organization level - integration of several plants, departments, offices or geographical regions, such as military command.

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[48]*Ibid.*, pp. 9-12.

Level 4. Intercompany or interorganizational level - integration of several affiliated or unaffiliated but functionally interdependent companies, such as integration of several military commands.

Level 5. Industrial level - integration of several unaffiliated companies in a given business field, such as defense industry or banking.

According to Rosove, integration at the first level is history now. Also vertical and lateral integration have developed to the point where integration is occurring not only at the plant or organization wide, but also on multiple plant and industry wide basis. Therefore, a TIS can be defined as "an integrated, multiple-purpose, geographically dispersed, computer based configuration of people, procedures, and equipment designed to satisfy the informational needs of a user."[49] An example of these types of systems are SAGE (Semi-Automatic Ground Environment) and NORAD (North American Air Defense Command).

These groups of practitioners, in one way or another, consider "total systems" as an operational reality. Along the same line, as the technology advances and more of the procedural steps are overcome, more attention is paid toward other capabilities of the total system. It is quite obvious that the objective of total system is not the means -- display devices or computer, etc. -- which are used as part of a system. Rather, the objectives should be the ends -- information providing capabilities -- of total system. This point of view is observed in the review of some works. For instance, the total system in the new context is defined as "that system which provides the

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[49] Ibid., p. 11.

maximum pertinent information that management or operations require to effectively discharge their assigned responsibility."[50] Although some part of the above definition conceptually seems to be unsound, still the emphasis on the word information makes it acceptable. It should be kept in mind that management uses the information and not the operation. Moreover, the information provided will not be used only in the area of discharging responsibility.

The approach which is suggested by Graham is defining and establishing subsystems such as Accounting, Marketing and Sales, and integrating them into the TIS. The practical merit of the approach is observed in Sohio's TIS. There are approximately seven subsystems which are designed and implemented in Sohio. These are:

1. Control Reporting System
2. Supplementary Reporting System
3. Library System
4. Planning System
5. Forecasting System
6. Wholesale Accounting System, and
7. Monitor subsystem which controls the above-mentioned subsystem within the total system.

These subsystems can operate independently, or in conjunction with each other, as the occasion demands. According to Graham,

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[50] Richard W. Graham, Jr., "Total Systems Concept," Management Technology, (June 1964), p. 1.

continued management support and diligent effort of all interested parties, will make the total system fully operational.[51]

To some of the system practitioners, introduction of TIS to business enterprises is considered to be a second industrial revolution. This is actually the revolution of information flow, "which permits storing on-line to a computer millions of characters of data, [therefore], business information systems are beginning to be able to return to the total information system which was characteristic of industrial giants of several decades ago."[52] This type of system is operational at the present time at the Westinghouse Electric Corporation, Tele-Computer Center.[53]

The reality of the TIS is almost proven to the above-mentioned system specialists. Therefore, any attempt made by them in the future will be entirely devoted to improvement or completion of their proposed system.

Total System vs. MIS

The trend towards emphasizing the information-providing aspect of the total system led some of the system specialists to believe that TIS is nothing more than a MIS. Any business system can be regarded as an information system composed of interrelated and integrated systems and subsystems.

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[51] *Ibid.*, pp. 1-6.

[52] Richard W. Brightman, et al., *Data-Processing for Decision-Making*, second edition, (New York, N.Y.: Macmillan Company, 1971), p. 370.

[53] *Ibid.*

Dickey and Senensieb[54] suggested that to take a total system approach, one must rather explicitly define the total dynamics of the business. An integral part of a business dynamics is a corporate memory. This corporate memory facilitates the flow of information between various component parts of an organization. Thus, "the design of an effective management information system (MIS) that properly integrates administrative action"[55] should be the main objective.

Deluca has interpreted total system in two different ways. The first is traditional interpretation which emphasizes the development of integrated operational systems. It refers to the creation of proper paperwork systems which improve routine clerical operation, such as purchasing, receiving, inventory control, etc. In contrast, the second approach, a more recent development, is the management information system [MIS] concept.[56]

In this newer approach, both operational effectiveness of the system and management informational needs are equally emphasized. Therefore, a TIS of an organization is viewed to be equal to MIS.

Although the term MIS often has the same connotation as total or integrated system, they should not be confused. The total or integrated system "implies that all functional systems have been

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[54] R. E. Dickey, et al., "A Total Approach to Systems and Data Processing," Total System, Op. cit., pp. 25-29.

[55] Ibid., p. 29.

[56] A. Richard DeLuca, "Understanding Total Systems," Total System, Op. cit., p. 31.

designed and implemented."[57] The MIS is a system which aids a manager in carrying out his decision-making functions. Therefore, these two terms are not synonymous. It would be possible for the analyst to design and implement an integrated system at the operating level without aiming it at any particular managerial position.

Total System - Unique Approaches

The various thoughts in the area of total systems are classified based on their relationship to IDP and their degree of realization and similarity to the MIS. There are a few more approaches to total systems which cannot be classified based on the above criteria. This is the major area of controversy toward development of TIS. Most of the opponents of the total system approach concentrate on this issue by saying that the total system is not a universally accepted concept and that it means different things to different people. The following are samples of some of these views.

"The total systems concept came about several years ago in view of the complexity of business systems. Simply interpreted, it calls for an over-all study of systems in a company before making major revisions in any one system."[58]

Another unique approach is suggested by Max Carasso. He uses the term total system to solve the problems of mobilization of the entire economy in the area of defense.[59]

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[57]Kanter, Op. cit., p. 20.

[58]John W. Field, "A New Brand of Data Processing Manager - Part II", Computer and Data Processing, (September 1964), p. 40.

[59]Max Carasso, "Total Systems," Systems and Procedures Journal, (November 1959), pp. 22-27.

Furthermore, two different approaches are suggested by Moravec for planning of Advanced Electronic Data Processing Systems. The first approach is a total system which involves the integration of inventory control, sales, and accounting subsystems into a single executive control subsystem that controls run sequence and produces the desired report. The second approach is single information flow. "This approach is sometimes called the 'single transaction processing' or complete 'single record' concept; [and] sometimes it is known as the 'total information systems'."[60] The objective is to enter a single piece of data into the data processing system only once in its history.

The only difference between these two approaches is in the procedural implementation of the advanced system. The second approach which he labels as TIS accomplishes the same goal as the first approach. Therefore, they are extremely similar.

The words "total" and "total system" are sometimes associated with the MIS concept. Burdeau[61] suggests a total system approach to MIS, by providing the management with all the information needed for making a "correct" decision. Included in this system is primarily quantitative type information. In order to make the system more desirable, the qualified factors also have been considered.

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[60] A. F. Moravec, "Basic Concepts for Planning Advanced Electronic Data Processing Systems," Management Services, (May-June 1965), p. 53.

[61] Howard B. Burdeau, "Environmental Approach to MIS," Journal of System Management, (April 1971), pp. 11-13.

"A total system as the name suggests would be one in which all [of] a company's inputs and outputs are automatically coordinated."[62] This will result in optimal allocation of the resources. The market will be gauged and the manager will have only to read the tape to make any decision. SAGE system according to this passage is considered to be an example of TIS.

The following are a few more haphazard approaches to a total system:

"The objective of the total systems is to bring to bear all possible scientific disciplines in a quantitative way to create information systems that will make it possible for management to operate an organization in the most efficient manner."[63]

Total System is an approach for "developing a system for the operation of the company itself [which] provides myriad patterns of interlocking data and information flow."[64]

"The goal of this management effort and investment of funds is often called the 'total systems concept.' This is nothing less than the complete monitoring of the business enterprise by a computer, or group of interconnected computers; the automatic control by machines of inventories, production scheduling, shipping, accounting, and all other operations that can be reduced to mathematical representation; and limiting the human control to such functions as setting overall

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[62] Gilbert Burck, The Computer Age, (New York, N.Y.: Harper Torch Book Co., 1965), p. 15.

[63] Richard E. Sprague, "Advances in Data Processing Hardware and Software," AMA Report No. 62, Op. cit., p. 75.

[64] James M. Ewell, "How to Organize for a Total System," Systems and Procedures Journal, (November-December 1961), p. 5.

objectives and reacting to such totally unexpected situations as earthquakes or wars."[65]

In this group there are two more approaches which suggest a truly unique approach to total systems. The first is a term "Total System Development for Information Systems," suggested by Frank Kirk in his book of the same title. What Kirk actually means in this book is a "step by step" guide toward development of information systems. Therefore the term "total" is used as a synonym for "step by step."[66]

The second approach treats TIS as part of the Generalized Data Management System (GDMS). Accordingly, GDMS can be divided into two distinct classes: (a) Data Management Support Systems (DMSS) and (b) Total Information Systems (TIS). DMSS is defined as "a computer program or set of programs intended to be used as a subset of a larger programming system, and to perform data storage and retrieval functions for the larger systems."[67] However, TIS "is intended for direct human use and is capable of directly solving user problems, answering questions, or creating or changing files."[68] Examples of TIS in this sense are MARK IV, RECON, and IBM's Generalized Information System.

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[65] Herbert E. Klein, "The Office Management's Billion Dollar System," Dun's Review and Modern Industry, (September 1964), p. 134 A.

[66] Frank G. Kirk, Total System Development for Information Systems, (New York, N.Y.: John Wiley and Sons, 1973).

[67] Charles T. Meadow, The Analysis of Information Systems (Los Angeles, California: Melville Publishing Company, 1973), p. 397.

[68] Ibid., p. 398.

In the previous pages an attempt was made to review some of the more important concepts which were suggested by various system specialists. In addition, different concepts were classified based on some sort of similarity, such as degree of integration, degree of realization. The main objective of the next section is to discuss the points of view that are suggested by academicians in the area of total information systems.

Academician's Approach to Total System

In this study the term "academician" refers to those who have less practical orientation and mainly to teachers who do research in the information systems area. The number of opponents of the total system concept are greater among academicians. Although it is hard to generalize, it appears that those who have published textbooks in the area of information systems tend to agree more with total systems and TIS. Moreover, it has been observed that some academicians have second thoughts about TIS, as a result of further research in this area. In other words, the proponents of the concept have later become its opponents.

Pragmatic Points of View

Various concepts which are suggested by academicians go through the same evolutionary process, as in the case of system specialists. That is, earlier ideas mainly concentrated on computer capability and integration of data processing task or so called IDP. Later, as technology became mature enough to handle more sophisticated functions, new ideas were suggested, such as overall information system, advance information system.

Elliott and Wasley[69] in their textbook -- Business Information Processing System -- have explained that the concept of electronic data processing is often confused with IDP. The relationship between them is that of a part and the whole. They point out that the concept of integration includes electronic elements, and a system cannot be truly integrated unless it does include such elements. IDP concept unites data accumulations, computations, processing, and control. The product of such a system is information in a form that can be used by all levels of management in the performance of their duties.

Due to the efficiency problem which may have existed in any EDP system, a solution is suggested by Pike[70] in order to overcome this problem. He states "tomorrow's executive will use data processing equipment for much more than handling simple routines, so that the complex interactions among the many individual operations of a business firm will merge into a total system."[71] By "total system" he means integration of data handling systems. "The concept is not that of an automatic office, without human operators, but of the integration of data handling routines in such a way that humans are assisted in making decisions, not replaced as decision makers."[72]

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[69]C. Orville Elliott and Robert S. Wasley, Business Information Processing Systems, (Homewood, Ill.: Richard D. Irwin, 1968), pp. 303-305.

[70]Arthus H. Pike, "Total Systems Approach to Business Management," Total System, Op. cit.

[71]Ibid., p. 60.

[72]Ibid.

The merit of the above concept lies in the use of the computer in the information processing task and in providing information by means of the most efficient method. There is nothing mentioned about the nature of the decision to be made and the decision model of an individual decision-maker. Indeed, one cannot design an information system unless he considers the types of decisions that are pertinent to the performance of a given organization and the environment in which those decisions have to be made.

Martin, by considering above factors which were ignored before, suggests that overall organization should be designed as a "total system" by incorporating all the other subsystems which exist in an organization. "This, of course, sounds a bit utopian and 'blue sky', ...; but this overall approach has been remarkably effective in military systems, such as SAGE, and a few business organizations, and it will surely be of greater importance in the coming years."[73]

Some academicians consider TIS as a goal or trend rather than an operational reality. This view is very well expressed by Professor Swyers, who states that there is a very definite trend toward the design and installation of a single automated and integrated data processing system for management information and control. Therefore the objectives of many organizations "is an information system (or more properly, a network of sub-systems which are linked by automated data processing) into which each element of basic data

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[73] E. Wainright Martin, Jr., Electronic Data Processing--An Introduction, Revised Edition, (Homewood, Ill.: Richard D. Irwin, 1965), p. 32.

need only be entered once."[74] In order for this objective to materialize, applications of "system approach" is considered highly necessary.

Similarly, TIS is considered to be a system which encompasses the entire spectrum of information utilized by an organization. The total system in this sense is a combination of all individual subsystems, such as accounting subsystems, etc.[75] The idea of integrating different subsystems into a single all inclusive system or so called total is the dominant criterion which is used by many academicians. The primary motive behind this trend is probably the extension of the system approach to various areas including the area of information system. The following are two more examples of this trend:

Total system is "an approach to system design with the objective of placing all significant operational components of an organization under total or partial control by computer."[76]

Also, it is expressed by Wilkinson that the "overall information system" of a firm will be better understood if described as:

"System No. 1 - a production-logistics, on-line realtime, operational control, optimization, modular-coupled, centralized

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[74]William E. Swyers, "Employee Compensation Accounting in Total Information Systems," Management Accounting, (July 1966), p. 11.

[75]Gerald E. Nichols, "Accounting and the Total Information System" Management Accounting, (March 1971), pp. 27-30.

[76]R. V. Head, Real-Time Business System (New York, N.Y.: Holt, Rinehart, and Winston, Inc., 1964), p. 358.

processing and decentralized decision making, owned system primarily for operational management use.

"System No. 2 - a financial, inquiry, strategic planning, prediction, centralized decision-making, time-shared system for top management use."[77]

Although the above system is in a sense total or advance, the main objective of the system is to provide information for management and the better label for it would be MIS.

Total System vs. MIS

The same pattern may be observed in the group of academicians. That is, TIS according to some of these theoreticians is the same as MIS. Firmin and Linn,[78] are among those who advocate this idea. They state that the information system which enables the process of management is the MIS, and the term "total information system" connotates all the information needed by management. This implies a system approach to the study of management's informational needs. According to them, "the management information system may be a loosely joined set of sub-systems designed to serve the purpose of providing information for management. Such systems may be formal or informal, planned or ad hoc, integrated or separate. Their totality still could be called a management information system (emphasis added)."[79]

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[77]Joseph W. Wilkinson, "Classifying Information Systems", Journal of Systems Management, (April 1973), p. 31.

[78]Peter A. Firmin and James J. Linn, "Information Systems and Managerial Accounting," Accounting Review, (January 1968), pp. 78-82.

[79]Ibid., p. 83.

Therefore, the MIS is exactly the same thing as TIS, whether it is integrated or not.

Emery's Approach to TIS

Because of the uniqueness and importance of some of the ideas suggested by some academicians, it would be worthwhile to mention each one separately.

According to Emery, an integrated or "total" information system is a common goal for all designers of information systems. In this sense, TIS means "a more tightly coupled system with less independence among its parts."[80] This integration may be achieved in two ways. First, by a closer coupling of the information system itself; and secondly, by a closer coupling of the organizational activities.

Traditionally, due to triviality of the data processing application, an individual subsystem was designed completely independent of other subsystems. System designers felt that because of the limited capacity of information processing, a system could be more effective if designed on a highly fragmented basis. In this context, each system is responsible for collecting its own data. Since these approaches necessitate the creation of numerous files for each subsystem, it was involved with a great deal of duplication among various files. Advances made in information technology facilitated processing of information, led to integration of the information system, and overcame this problem.

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[80] James C. Emery, Organizational Planning and Control Systems--Theory and Technology, (New York: The Macmillan Company, 1971), p. 63.

Although the integration of information processing is a necessary task, it is not a sufficient condition if the objective is optimization of total systems. Therefore, an attempt must be made to integrate the entire organizational activities within an organization in order to ensure achievement of a maximum amount of effectiveness.[81]

Prince's Approach to TIS

Prince, who is highly impressed by the capability of computers, defines MIS "as a computer-based network containing one or more operating systems capable of providing relevant information for management decision-making process, also contains in it the necessary mechanism for implementing changes or responses made by management in this decision-making activity."[82] Although the above definition can be considered as a comprehensive definition for any information system, he still believes that there are five different types of information systems. These are:

Type 1 information system has two different phases, a planning phase and a control phase. Responsibility accounting is considered by him as a type 1 information system.

Type 2 information system. A coordination phase is added to this system, besides the planning and control phases. The production information system is viewed by Prince as a Type 2 system.

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[81] Ibid., pp. 63-65.

[82] Thomas R. Prince, Information on Systems for Management Planning and Control, Revised Edition (Homewood, Illinois: Richard D. Irwin, 1970), p. 40.

Type 2.5 information systems. Two more phases, in addition to those mentioned in Type 2 system, are included in this type of system. These are the systems processing phase, and the monitoring-inquiring phase. The systems processing phase consists of a series of operations which prepare information for both the planning and control phases, while the monitoring inquiry phase acts as an information retrieval service for both standardized and nonstandardized information requests.

Type 3 information system. The additional phase of information-gathering, classifying, and storage is attached to this system. This new phase satisfies the continuous requirement of data-capturing for the system. Marketing information system is assumed to be of this type of information system.

Type 4 information system. This is a type of system that Prince has named Advanced Information System which is equivalent to TIS. This system contains all the above-mentioned characteristics, plus a new phase which is called long-range planning. Therefore, he defines advanced information system as "a large-scale- computer-based network with online communications facilities that supports the major decision-making activities in two or more departments within a corporation."[83] This system is not necessarily fully automated. Thus, some manual operations may be required by the system.

Wendler's Approach to Total Systems

In the study done by Wendler, nine hypotheses, which he considers to be fundamental tenets of a total system, are tested.

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[83] Ibid., p. 318.

A sample of 75 is selected from the population of systems specialists or practitioners. The following are the characteristics which ranked in the order of the importance:[84]

Rank	Highlight of the Characteristics
1	System provides timely and accurate information
2	System provides both operating and non-operating information
3	Various subsystems are interlocked
4	Data processing are integrated
5	Total integration of systems
6	Uniform identification and classification of data
7	Management by exception is possible
8	System is automated
9	Scientific techniques are included

Validity of the above tenets are further examined in Chapters III and IV.

Total System vs. Systems Approach

The total system, according to some academicians, has large boundaries which cover the entire environment, and according to others, it has no specific boundaries at all.

Academicians in the field of management theory consider the entire organization as a total system, or to be more accurate, "total

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[84]Charles C. Wendler, Total Systems--Characteristics and Implementations (Cleveland, Ohio: Systems and Procedures Association, 1966), p. 23.

adoptive system".[85] The input of an organization is economic resources and other environmental factors, such as psychological, sociological, political. The adoptive characteristic will cause the organization to show some reaction to these outside impulses. One type of these reactions is the programmed decision rule within an organization. The output of this organization would be some type of economic welfare.

Another view is suggested by Anthony and Welsch. They think of a management control system as a "total system". They state that "ordinarily, a management control system is a total system in the sense that it embraces all aspects of a company's operations. It needs to be a total system..."[86]

Still, according to some academicians, no definite boundary can be assigned to any system. Stanford Optner states that "In its original form, the new concept of system contains the totality of everything required to bring about the desired result, including things subsequently discarded as not useful. The idea of radar as a system evolved as the experimenters moved closer to solving individual parts of the total problem, whose boundaries were defined by stipulating all the component elements required to bring about a desired result (emphasis added)".[87] He makes an example of weapon

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[85] Stanley Young, "Organization as a Total System," California Management Review, (Spring 1968), pp. 21-32.

[86] Robert A. Anthony, Glenn A. Welsch, Fundamentals of Management Accounting, (Homewood, Illinois: Richard D. Irwin, 1974), p. 307.

[87] Stanford L. Optner, System Analysis for Business Management, Third Edition (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1975), p. 4.

systems as a total system and states that as a component of the total system, the information system will enable the hardware to fulfill its mission. Regardless of his opinion about the totality of the weapon system he expresses the idea that "... the notion arises of focusing attention on all the elements necessary to a given alternative. The generic whole that emerges from this activity is known in system analysis as the <u>total system</u> or simply, the system (emphasis added)."[88] Therefore, there is no difference between a system or total system except the fact that the term "total" is used in an emphatical sense in order to show the true essence of the systems approach. The totality concept is sometimes referred to as "Wholism". This is an approach which views the whole system with all its interrelated and interdependent parts in interaction, because the whole is greater than the sum of its parts.[89]

According to Van Gigch,[90] "total system" is somewhere between "subsystem" and "whole system" in the hierarchy of system level. In order to convey the idea in a more clear way, he uses the System of Criminal Justice as an example. These system levels are:

1. The Subsystem Level, at which each of the agencies of the Total system operates as a self-contained and self-sufficient organization, pursuing the objectives established for its own guidance. Examples of subsystem level are the police, the sheriff, or the district attorney's office.

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[88] <u>Ibid</u>., p. 37.

[89] Peter Schoderbeck, <u>op. cit</u>.

[90] John P. Van Gigch, <u>Applied General Systems Theory</u> (New York, N.Y.: Harper & Row Publishers, 1974), pp. 23-24.

2. The Total System Level, in which the agencies are aggregated into a single system working for a common goal. An example of this level is a Criminal Justice System.

3. The Whole system level which encompasses all the levels contains other systems such as economic or social systems.

The above is another example of system approaches toward solving various types of problems. The problem at this stage seems to be one of semantics. All of the above authors generally talk about the system, but each uses his unique approach to solve a given problem, or to mention an important point of view of the systems.

Summary

Total system means different things to different people at different points in time. That is why it has been a controversial issue in the area of information processing. Some of these problems are caused by the unique nature of this field. Technological advances have occurred so fast that it has become difficult for some to keep abreast of new developments. Also, the introduction of the systems approach required interdisciplinary knowledge and depth in this area, thereby creating many conceptual problems.

The objective of this chapter is mainly to review the relevant literature in the area of information system, especially Total Information System (TIS). In order to do so, some introduction to the system approach, General Systems Theory, Information Theory and Management Information System was given first.

The term system is used to mean three different things. First, system as a theory, second, system as a method and finally, system as an entity. This semantical problem existed and to some degree still exists. Bertalanffy presented the concept of General System Theory which helped to overcome some of the problems in this area. Then Kenneth Boulding applied GST to social sciences, particularly to economics.

Introduction of information theory and its basic concepts, such as information value and optimum quantity of information, coupled with GST, created a new era of information systems. Advancement in other interrelated fields generated a new phenomenon which is called Management Information System. This new term also was subject to many controversies. Some believed that it was part of an advance system, some expressed the idea that the MIS was the advance system, and finally, some called it a "mirage".

Since the computer was considered to be a necessary part of any type of information system, a new force was formed to use the computer more efficiently. This idea culminated in the introduction of Integrated Data Processing (IDP). IDP simply means integration of all hardware and all processing equipment in order to facilitate the use of the system in a very efficient way. This idea was continued until the time when the new term Total Information System (TIS) was suggested. This new approach -- TIS -- created a new type of problem. TIS has different meanings for various individuals. Much of the problem was because of semantics. However, the maning that was attached to this term has a high degree of correlation with the background of the individual who was using it.

Those who had the benefit of a technical background in the area of information systems considered the TIS concept as an extention of IDP. The majority in this group, classified as system specialists, are firm believers of TIS as an operational reality. This is due to the fact that, to them, the TIS is nothing more than an integration of some hardware or procedural steps. Each member of this group used the terms "TIS", "total system", "Integrated System", etc. interchangably. Moreover, each assigned a type of characteristic to his proposed system that either was readily available, or operationally feasible. Still, there were some that did have completely different notions about the word total and used "total" to mean "step-by-step".

Another group that has more diverse opinions about the TIS are academicians or those who are credited with advocating the information systems. Not very many of this latter group believe in the reality of the TIS. As a matter of fact, some of them openly reject TIS and consider it as untrue, superficial, and impractical.

Those who offer some practical points of view about TIS believe that by integrating all the subsystems within given organizations, the TIS goal can be achieved. Some of the ideas, especially those which were suggested in the early days, are similar to those of the system specialist. That is, integration of processing is considered to be the most important characteristic of TIS.

The treatment of TIS by academicians, to some extent, has more merit. Prince's study of TIS, which is incidentally called Type 4 system is a good example of this fact. According to him, an advanced information system must benefit from certain characteristics or phases. These are planning, control, system processing, monitoring information gathering, and long-range planning phase.

There is still another group of academicians which think of the TIS as just another system. The word "total" in this sense is used by them to emphasize the importance of the system approach.

CHAPTER III

FALLACIES OF A TOTAL SYSTEM CONCEPT

"Total system" per se is not a well defined concept. As mentioned in the previous Chapter, it means different things to different people. The major thrust of the above statement will be further revealed in this chapter. First, various problems with reference to defining the "TIS" concept are discussed. Most of the misconceptions seem to be the result of a lack of communication among various authors. Later, in this chapter, the current state of the art in technology and possible impact of the hardware and software on TIS are examined. Finally, abandoning the concept of TIS suggested by various authors and validity of this proposal are discussed.

Lack of Unified Concept

Characteristics of Total Systems

Most of the problems in the area of total systems are due to the lack of a unified concept. Numerous definitions for the TIS, total systems, IDP, are suggested by various authors. Each definition is unique in its nature and no attempt is made to unify or to modify the concept of total systems.

In order to examine this problem further, a comprehensive study of the available literature was undertaken. This study could not possibly cover all the existing literature in the area of total systems. However, it has been the main objective of this study to review the more significant pieces of work which were readily available or that became available as a result of correspondence with various sources.

Included in this study are different points of view suggested by 38 authors. These authors are classified into two groups (a) systems specialists, and (b) academicians. This classification is arbitrary to a certain degree. The background and orientation of each author were used as the major criterion for assigning them to each of the two groups. The number of systems specialists is slightly more than twice the number of academicians, and this is entirely due to chance (26 system specialists, 12 academicians).

In order to define a unified (or generally accepted) concept of TIS, the most important characteristics of the concept had to be determined. A review of available literature was a starting point to determine whether there is any consensus about these characteristics among various authors. The concept is defined in Chapter IV by a selection of those characteristics which are suggested by the authors; or modifying and/or adding the new relevant characteristics which have to be considered as an integral part of the concept.

It seems that there is very little consensus among the various authors concerning the total systems concept. For instance, 27 different captions are assigned to this concept by different authors. The alphabetical list of these labels is shown in Table III-1.

All of the labels have basically the same meaning. In other words, the objective is to identify the same phenomenon, but different symbols are used to express it. Some of these symbols are created by adding a word to the label which is defined previously by some other

TABLE III-1. LIST OF ALTERNATIVE TERMS USED FOR IDENTIFYING A TOTAL SYSTEM.

Advanced Electronic Data Processing Systems
Advanced Information Systems
Complete Systems
Consolidated Functions Approach
Generalized Data Management Systems
Generalized Information Systems
Holistic Systems
Integrated Data Processing (IDP)
Integrated Data Processing Systems
Integrated Information Systems
Integrated Management Information Systems
Integrated Systems and Subsystems
Macro Systems
Management Information Systems (MIS)
Over-all Information Systems
Real-time Systems
Single Record Approach
Single Transactive Processing
Total Data Handling System
Total Information Systems (TIS)
Total Integrated Systems
Total Management Informative System
Totally Integrated Management Information Systems
Type 4 Information Systems
Unified Approach
Uniform Operations Management

author. "IDP and IDP Systems" and "MIS and Total MIS" are good examples of this situation. Other captions are probably created as a result of a high degree of imagination or fantasy by the authors without any theoretical support. "Totally Integrated MIS," "Macro Systems and Holistic Systems" are of this nature. Still, there are some labels which do not convey any clear meaning about the concept suggested by the author. "Uniform Operation Management" is a caption which illustrates this case very well.

The same type of inconsistency and disorder was observed when the characteristics of a total system were considered. A table of different characteristics is prepared and presented in this chapter. Some of the characteristics or attributes of total systems are drawn from the definitions suggested by a number of authors. There are a few authors that have not made any attempt to define the total system concept, but they have mentioned the attributes of this concept by defining the objectives of the total system.

Characteristics suggested by these authors are numbered to 44. A list of these attributes, in the order of the literature review in the previous chapter, is presented in Table III-2. Also provided in the same table is the number of times that various authors agreed upon the existence of a given characteristic, as a necessary requirement of a total system.

Evaluation of Proposed Characteristics

A great amount of duplication and inconsistency was observed at this stage. Most of the problems are due to different semantics. For instance, "integration of subsystems" which is suggested by some

TABLE III-2. LIST OF CHARACTERISTICS OR ATTRIBUTES OF A TOTAL S.STEM AS SUGGESTED BY VARIOUS AUTHORS.

		Number
1.	Original data must be recorded at their point of origin	4
2.	Data are captured mechanically	8
3.	Data are recorded only once	5
4.	Integration of processing	11
5.	Mechanization or automation of the system	7
6.	Integration of functions	3
7.	Timeliners of information	6
8.	Punched paper tape	1
9.	Integration of hardware	3
10.	Adoptable to management control process	2
11.	Total integration	3
12.	Facilitates management by exceptions	3
13.	Administrative integration	2
14.	Data bank	3
15.	On-line computer	7
16.	Using the modular (standardized) units of information	3
17.	Elimination of extraneous information	1
18.	Integration of operating systems	3
19.	Producing operating documents	2
20.	Vertical integration	1
21.	Integrating the scientific management tools with the system	5
22.	Horizontal distribution of information	1
23.	Filter vertical distribution of information	1
24.	Random access computer	2
25.	Real-time computer	6
26.	Batch processing	1
27.	To satisfy informational needs of the users	6
28.	Display devices	1
29.	Simplified inputs	1
30.	Computer	6
31.	Integration of subsystem	7
32.	Integration of procedures	1
33.	Have protective capability for information	1
34.	Integration of information	1
35.	Automation of input and output	1
36.	Interlocking data and information flow	1
37.	Supply of historical data (information) and analysis of that data (information)	1
38.	Decentralization of decision-making for operating manager	1
39.	Centralization of decision-making for top management	1
40.	Time shared computer	1
41.	Integration of activities in the organization	1
42.	Facilitates interdepartmental decision-making	1
43.	Provide both operating and non operating information	1
44.	Similar inputs	1

authors, has the same connotation as "vertical integration" or "integration of operating systems."

There are other attributes attached to a total system, which indeed have very little, or in some cases, no impact on the concept. Existence of "punched paper tape" as a necessary requirement is a fair example of this situation. A punched paper device may facilitate certain data processing tasks by increasing the efficiency of some clerical functions. But, there are many organizations which have no use for this type of device. Therefore, if the total system concept has to be a universal concept, this procedural characteristic which has no major impact on this concept, should have been eliminated.

However, in order to come up with a consensus regarding the above-mentioned characteristics or attributes, two statistical tables were prepared (Tables III-3 and III-4). The columns of these tables indicate the suggested characteristics and the rows represent the names of the authors. Whenever an individual author agreed upon the existence of a certain characteristic(s) as an integral part of a "total system", an "X" mark was placed in the box which is located at the intersection of each row and column. Each column of the tables is represented by a number which corresponds to the order of the attributes listed in Table III-2.

An attempt has been made to classify those characteristics into several smaller subgroups. In order to accomplish this goal, all the attributes have been compared with each other. By means of comparison and by the use of judgment and intuition, all of the 44 attributes are divided between five major sub-groups. These sub-groups consist of:

TABLE III-1. BREAKDOWN OF THE CHARACTERISTICS OF TOTAL SYSTEM INTO FIVE MAJOR SUBGROUPS (SYSTEM SPECIALISTS).

	Integration															Hardware											Users' Info. Need										Mgt. Control Process					Data Base		
	11	31	20	18	4	9	34	36	44	29	41	32	6	13	21	30	25	40	24	15	35	5	28	26	8	2	27	43	7	23	22	37	19	16	17	33	10	12	39	38	42	14	3	1
A.M.A.					X																					X																	X	X
Barnes & Weaver			X												X							X																						
Becker																			X										X	X	X							X						
Borchardt					X												X			X				X																				X
Brightman																	X			X						X																X		
Brown					X								X									X				X			X														X	
Burck																					X																							
Carborundum																																	X	X			X							
Carosso					X																	X																						
Crowley																	X			X												X												
DeLuca				X																							X																	
Dickey et. al.							X					X		X													X		X							X								
Ellis	X																									X			X								X	X						X
Field																				X														X	X									
Graham		X								X						X													X													X	X	
Haslett					X	X								X												X																X		X
Hopkins						X																			X	X																		
Kanter													X																															
Klein															X							X																						
Lach													X										X			X							X										X	
Moravec		X				X											X		X								X																	
Place		X														X																												
Rosove	X																					X					X																	
Sprauge								X							X																													
Spaulding																											X																	
Sprary				X	X																																							

TABLE III-4 BREAKDOWN OF THE CHARACTERISTICS OF TOTAL SYSTEM INTO FIVE MAJOR SUBGROUPS (ACADEMICIANS)

	Integration															Hardware											Users' Info. Need										Mgt. Control Process					Data Base		
	11	31	22	18	4	9	34	36	44	29	41	32	8	13	21	30	25	40	24	15	35	5	28	26	6	2	27	43	7	23	20	37	19	16	17	33	10	12	39	38	42	14	3	1
Churchill, et al.																X	X			X							X																	
Elliott, et al.					X											X																												
Emery					X						X																																	
Head				X																																								
Martin		X																																										
Nichols		X																																										
Pike					X											X										X																		
Prince																X				X																					X			
Schoderbek, et al.									X																																			
Swyers		X																				X																					X	
Wendler	X	X			X										X							X						X	X					X				X						
Wilkinson					X										X		X	X		X																			X	X				

1. Those characteristics which suggest some sort of integration, e.g., integration of subsystems, integration of processing.

2. Those characteristics which emphasize the hardware aspect of a total system, e.g., on-line computer, display devices.

3. Those characteristics that put some weight on the information providing capability of a total system, e.g., satisfying informational needs of the users, providing timely information.

4. Those characteristics which facilitate the management control process, e.g., to provide management by exception, decentralized decision-making.

5. Those characteristics which suggest some sort of data base, e.g., databank, recording data only once.

Table III-3 shows the above breakdown for the system specialist or practitioner, and Table III-4 shows the same breakdown for academicians.

Analysis of individual characteristics is meaningless. Therefore in order to summarize the above analysis the following two tables are provided.

TABLE III-5. DEGREE OF CONSENSUS ON INDIVIDUAL CHARACTERISTICS

	Integration	Hardware	Information Providing	Management Controls	Data Base
Practitioners	73%	73%	50%	11%	31%
Academicians	83%	58%	16%	25%	8%

Table III-5 illustrates the degree of consensus between different groups on various categories of characteristics. These statistics reveal that there is a higher degree of consensus among academicians on integration attributes, while the practitioners show a higher degree of agreement on the hardware characteristics. This situation is quite normal because most of the academicians do not think of a computer as a necessary requirement for a given information system. Surprisingly, the academicians agree less on information providing capability of the system. However, more emphasis on management control process is stated by this group. System specialists show a greater tendency to include data base as a necessary part of a total system. This is probably due to the fact that the development of a data bank requires a good knowledge of the hardware used, and the system specialists are well informed in this area.

TABLE III-6. NUMBER OF CHARACTERISTICS SUGGESTED FOR TOTAL SYSTEMS.

	Number of Characteristics					
	1	2	3	4	5	Total
Practitioners	19%	43%	23%	12%	3%	100%
Academicians	42%	25%	25%	8%	none	100%

Among the five groups of characteristics suggested earlier, not all of them necessarily have to exist in a system in order to qualify it as "total." This implication is well illustrated by the Table III-6. Out of 26 system specialists, only one (3% of the population) agreed on existence of all five characteristics. The majority of the system specialists (43%) have suggested that only two characteristics are necessary for the existence of a total system. This view is somehow narrower among academicians. The majority of academicians (42%) believe that only one of the characteristics is necessary in order to have a total system.

Concluding Remarks

It was the objective of this section to reveal some of the problems that exist in the area of information systems due to the lack of a unified definition of the total system. This concept per se is an asymptomatic one. That is, if no boundaries are set for the concept, the list of attributes and definitions will approach to infinity.

According to Cherry, who is one of the leaders in the field of communications, "words are signs which have significance by 'convention', and those who do not adopt the convention simply fail to communicate."[1] This problem is recognized in the area of social sciences, particularly in the field of information processing. It has been claimed that the degree of advancement in pure sciences is much higher than in social sciences. This is due to the existence of a scientific language - like mathematics, which greatly facilitates the communication process. However, in the area of social sciences there exists no well defined language about the reality.[2]

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[1]Colin Cherry, On Human Communication, Second Edition, (Cambridge: The M.I.T. Press, 1966), p. 69.

[2]For further information see Alfred Korzybski, Science and Sanity, (Lakeville, Conn.: Institute of General Semantics, 1933).

The problem of defining a total system indeed starts at the early stages. This is the time that one tries to define a "system." It was observed in Chapter 2 that the word "system" has many different connotations. Lack of a unified term for some concepts like management, organization, procedure, etc., added to the problem and has caused a great deal of difficulty to those who tried to define the "total system" concept.

Current State of the Art in Technology and Hardware

Part of the blame for not being able to achieve the total system goal is attributed to the hardware and software inadequacy. The purposes of this section and the next are to discuss the current state of the art in both areas. After a discussion of the current state of the art, one can come up with an obvious connection about the implications of hardware and software in the development of a total system. In order to discuss these topics, some historical background is necessary.

Computer Generations

The origin of computers can probably be traced back to 3000 B.C., when the Chinese invented the abacus. The abacus for the first time employed the concept of "positional notation." Another one of its capabilities was a fixed storage for the purpose of storing various data. The fixed storage in the abacus was limited to only one number. It is needless to mention that the data storage capability observed in the abacus and later in the development of similar devices such as

Napier's bones, Pascal's adding machine and Leibnitz multiplication machine, is one of the basic concepts in the development of computers.[3]

During World War II, the need for sophisticated techniques to provide information, in addition to the demand for speed in calculations, resulted in the invention of the ENIAC (Electronic Numerical Integrator and Calculator). This series of computers which were originally designed for the Government, have all the basic capabilities of today's computers, except for a memory for storing program instructions. This is the major reason for this computer not playing a role in terms of creating a new generation of computers, and sometimes is referred to as the "zero generation"[4] computer.

The first commercially built computer was put into service in 1951 by the Remington Rand Corporation. It was named UNIVAC I and was used mainly for tabulating the results of census by the United States' Bureau of Census. The main feature of this unit was vacuum tube memories and circuits. The operating costs of this unit were unreasonably high due to the large amount of power consumption and maintenance. Also, the unit did not possess a high degree of reliability, a necessary requirement in business applications. This series of computers was called first generation.

The second generation of computers presented a major breakthrough in technology. By replacing the vacuum tube memory with the transistor, operation became faster and less expensive. This was due

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[3]Wayne S. Boutell, Computer-Oriented Business Systems, 2nd Edition, (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1973), pp. 136-137.

[4]Chris Mader, et al., Information Systems: Technology, Economics, Application, (Palo Alto, CA., S.R.A. Inc., 1974), p. 26.

to the fact that the transistors could be built and installed more efficiently. A high degree of reliability was another feature of this generation. Computers constructed with transistors also had other advantages, like lower use of power and much less maintenance.

Miniaturization appeared to be the name of the game. In the third generation of computers, transistors were substituted by solid state technology consisting of standardized transistors and integrated circuits. The operating costs of this generation was much lower than the previous two generations. Also, it provided many features previously unavailable and uneconomical in a single computer. Those new features were as follows:

(a) data processing of both business and scientific applications

(b) enlarged main memory

(c) fast response secondary memory for bulk data storage

(d) comprehensive operating systems

(e) improved data communication

(f) remote input/output

(g) standardized peripheral devices[5]

Although a new generation of computers has been claimed by computer manufacturers (Burroughs 3700, IBM 370), the merit of it has to be tested. The main feature of this new series is multiprogramming capability. This new feature has been developed through further miniaturization of circuits. Another implication of the new generation is lower cost, greater reliability, and faster processing of data.

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[5] *Ibid.*, pp. 31-32.

Types of Application

The degree of sophistication in computer applications has direct correlation with the computer generation. The triviality of the application which was run by the early generations of the computer is the best evidence of this situation.

UNIVAC I was the first computer that used the stored programs which resulted in a great amount of efficiency in processing data. Unfortunately, the capability of the computer just was limited to record data, to process those data, and to prepare elementary summaries of those data. The implication of the system with regard to providing the management with required information was generally ignored. Therefore, the system remained essentially in its pre-electronic state.[6]

Introduction of the second generation computers created a new era which was distinguished by the "integration" phenomenon. In order to increase the clerical effectiveness of the system and at the same time to satisfy management informational needs, the systems designer decided to integrate the previously isolated control and production scheduling whose applications were realized on the second generation computers. The integration of data recording with the sophisticated planning system, such as simulation, brought management and information a few steps closer to each other.

The third generation computer offered a broader point of view to the management. That is, the integration of a system should not be the primary factor for the development of an information system.

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[6]Arthur B. Toan, Jr., "MIS--A Status Report on the Concept and Its Implications" The Journal of Accountancy, (June 1970), p. 78.

Rather, the major emphasis should be on the production, delivery, and content of the information.[7] On-line capability, with regard to the remote transmission of data and receiving those results in shortest possible time, is the main characteristic of the third generation application. These include air line and hotel reservations, on-line banking, and other similar applications.

Hardware Implications

Characteristics of today's computers may be summarized into four basic areas. The first area is the "processing speed," which at the present time is measured in terms of microseconds. A fast computer can execute one million instructions in the wink of an eye. In terms of storage capacity also, the statistics are amazing. An ordinary disk pack can store up to 100 million characters. The same number of characters if they had to be stored in a hard copy form probably would need 10 filing cabinets. Access time and data transfer rate are two other areas which have been improved a great deal in today's computer. In some of the on-line systems, any piece of data can be accessed in a millionth of a second and the same data can be transferred to other units with the same speed.

These technological advances have introduced a new era which according to some authors is comparable to the Industrial Revolution. However, as far as a total system concept is concerned, very little is mentioned about the implications of hardware. Most of the problem in the business application of a computer is caused by lack of speed of input and output. Recent generations of computers have overcome

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[7] Ibid., p. 79.

this problem, which is called "I/O bound" limitations. Implication of strategic planning is the only other problem mentioned in this area. According to John Dearden the computer has very limited application to strategic planning. He argued that: "About the only characteristics of strategic planning that fit into the computer capabilities is that strategic decisions sometimes involve many interacting variables. Because of this, the general business simulation may prove to be of considerable value in strategic planning."[8]

Therefore, the capability of hardware for the application to strategic planning is questionable. This problem is further put under scrutiny in the next chapter where the total system is defined.

Impact of Software on Total Systems

The implication of hardware development in total systems was discussed in the previous section. In this part, there will be a discussion of software and its impact on the total system.

Programming Languages

Software is said to be everything else besides hardware. Normally it refers to programs and routines whose purposes are to facilitate the use of computers by the user installations.[9] Software, of which programming languages are a part, extend the capabilities of the computers. Therefore, they are very critical to effective utilization of a system.

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[8]John Dearden, "Can Management Information Be Automated?" Management Control Systems: Cases and Readings, (Homewood, Illinois: Richard D. Irwin, Inc., 1970), p. 531.

[9]Gordon Davis, Computer Data Processing, Second Edition, (New York, N.Y.: McGraw-Hill Book Company, 1969), p. 12.

Since a definite pattern is observed between the development of softwares and computer generations, programming languages naturally were very trivial at the beginning. Originally, programming was based on the binary principle and written in so-called machine language form. Due to the limited capacity of storage, the spaces had to be used economically. In order to use the available storage in an efficient manner, the programmer was required to have en extensive knowledge of the hardware, too. Therefore, the programming task was machine dependent, and at the same time, cumbersome and slow.

As a result of hardware development, the storage area was expanded and symbolic language was created. By assigning symbols to the program instructions, and having these symbols translated into machine language, the programmers were separated from the hardware.[10] Therefore, the computer programs became machine independent.

After this era, almost every computer manufacturer developed its own programming language which was best suited to its own hardware. Capability of these specialized languages was very limited and programs written in those languages could be run only on a particular brand of hardware. The limited capabilities of specialized language created a new trend toward adoption of standardized languages which could be run on any brand of hardware.

The first language of this type was FORTRAN (FORmula TRANslator), which basically was developed for scientific application. Since this language was found to be unsuitable for certain types of applications, a new language -- COBOL -- was created. This language, which was

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[10] Chris Mader, et al., Information Systems, op. cit., p. 39.

mainly developed for data processing of business applications, has convenient data handling, editing, and self-documenting features that FORTRAN lacks.[11]

This trend toward developing high-level languages has continued to the extent that some specialized fields within sciences have developed their own unique language for their very unique purposes, e.g., ICES (Integrated Civil Engineering Systems), which was developed by MIT.

Types of Software

Software are generally divided into two main categories, (a) system programs; and (b) application programs.

(a) System programs, also called utility programs; perform certain common and recurring tasks, such as sorting, printing from a particular tape, or card-to-tape transfer routine. This of software also assists the programmers in translating an application program into a machine language.

Operating system, which was originally developed for IBM Computers, is the single most important program within the utility programs. The internal monitor that resides in computer memory, directs and manages the execution of programs both sequentially and simultaneously.[12] Some manufacturers have other names than Operating Systems (OS). Burroughs version of OS is called MCP (Master Control Programs) which basically performs the same functions. This type of

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[11] Ibid., p. 40.

[12] Jerome Kanter, Management-Oriented MIS, op. cit., p. 144.

software is highly critical in a large type system, for scheduling and allocating the computer resources in the most efficient manner.

(b) Application programs are the second type of software. This type of programs usually is developed for specific users and definite purposes within the users' organization. According to some authors, application programs may be further broken down into two subgroups of business application and scientific application.[13] Business application software is generally those programs which facilitate planning and control process within a firm. Processing of sales, inventory control, etc., are typical applications in this area.

Scientific application programs are designed to perform very specific tasks in particular areas of science. Statistics, operations research, numerical analysis, and engineering science are some fields which have benefited the most from these types of programs. Some elements of these types of programs are incorporated into the business application programs. Particularly, the strategic planning area normally utilizes linear programming techniques and statistical routines, such as correlation analysis for forecasting and optimal allocation of the resources.

Total Systems and Software

The idea of a total system was created as a result of the evolution of integrated data processing. The primary goal of IDP was to bring all the computer facilities together and form a single data processing unit which supposedly would be more efficient. At

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[13] *Ibid.*, p. 143.

the time the idea was suggested, hardware was the major part of any data processing operation. Therefore, the only obstacle toward the development of IDP -- later total system, was assumed to be the lack of hardware capability.

Because of the above fact, software virtually received very little attention in development of a total system. Part of the neglect was probably due to the fact that nobody had a clear and concrete idea of this concept. However, as the new hardware with more advanced capability was introduced, the software also had to be advanced as an integral part of the hardware. There was no use for any hardware, though, if no expertise existed to use it. However, the softwares had problems, too.

The common programming languages, such as COBOL, FORTRAN, and PL/I were developed to deal with sequentially organized files. The backspace feature is available in FORTRAN, therefore the file can return to the desired position, while PL/I and COBOL do not have this capability.

Other than the introduction of random access devices, the least often provided feature of all programming languages is the ability to handle random data organizations. The COBOL language provides some basic statements which are not fully implemented by any manufacturer. PL/I has a class of statements to read, write, and rewrite the records on direct access media. However, these statements are limited to perform within the confines of the IBM, 360/ Operating System and do not let the programmer have access to all the capabilities of the physical hardware.[14]

Therefore, as far as the software is concerned, there is no single language which is best suited for any particular application. Also, some of the languages have their own specific shortcomings which probably will be overcome in the future.

Abandoning the Total System Concept

The problems that appeared to exist because of the lack of a unified concept of a total system and the implications of hardware and software were discussed in the previous section. The objective of this section is to examine the opposing point of view with regard to the total system. Data base, as suggested by some of the opponents, is an alternative approach to the total system. This idea is further explored in this section.

Opposing Point of View

The opposition point of view in the area of total system is expressed in a variety of forms. Some of the opposition disagrees with the entire notion of system approach and its totality, applied to a particular type of organization. Others find the total system impractical or impossible to implement due to some limitations in hardware capacity of vagueness of the concept.

Brooker objects to utilization of the system approach for business organizations. After referring to literature written on the systems, he states that there is no mention of business or

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[14]George G. Dodd, "Elements of Data Management Systems," Computing Survey, Vol. 1, No. 2, (1969), p. 131.

people found in such literature. Furthermore, nowhere in the literature is the use of system engineering suggested for businesses. His concept of "totality" has to be interpreted to mean the "wholeness" characteristics of the systems.

According to Brooker, the fallacies of the total system approach for the businesses lies in the fact that:

1. The total systems approach in business makes no attempt to explain, predict, or understand why the human members of the business system act the way they do.

2. If it cannot explain the way things are, it also cannot explain the way things are going to be. Therefore, the total systems approach must be very weak in predicting the future with regard to people.[15]

Contrary to the above objections that have been made about the concept of systems; Schoderbek and Schoderbek have mentioned several problems which exist in designing and implementing a total integrated system. These problems are:

1. The lack of integrated models capable of accepting processing and analyzing the information. This problem is always amplified because of;

2. The lack of a useful model, in general, for human decision-making in the first place;

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[15] W. M. A. Brooker, "The Total Systems Myth", Systems and Procedures Journal , (July-August 1965), pp. 28-29.

3. Ignoring the interaction of the major functions of the organizations in the design stage of information systems, and finally;

4. Tying together of the entire information flow which is definitely unwise from the economic standpoint.[16]

Therefore, due to the existence of the above problems, they conclude that the design of "holistic" systems at this time is only a shadow, since it is neither financially nor technically feasible.

There are other writers who technically oppose the concept of total systems. Neil Churchill calls the concept of total information an awesome one. According to him, "The formulation of such a concept has awaited the availability of computer hardware with the capacity for storing and obtaining a reasonably rapid access to amounts of data large enough to represent a significant subset of 'total'."[17] (emphasis added)

The computer limitation has such impact on Anthony's thought that he almost disregards the possibility of a data base as an alternative for total system. He states that:

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[16] Peter P. Schoderbek and Stephen E. Schoderbek, "Integrated Information Systems--Shadow or Substance?" Management Advisor, (November-December 1971), pp. 27-32.

[17] Neil C. Churchill and Andrew C. Stedry, "Some Development in Management Science and Information Systems with Respect to Measurement in Accounting," Printed in Research in Accounting Measurement, Edited by Yiyi Ijiri, et al., (American Accounting Association, 1966), p. 41.

> It is because of the varied and unpredictable nature of data required for strategic planning that an attempt to design an all-purpose internal information system is probably hopeless. For the same reason, the dream of some computer specialists of a gigantic bank from which planners can obtain all the information they wish by pressing some buttons is probably no more than a dream.[18]

The same idea rather broadly is stated by Schwartz. He believes that the complete system integration which is suggested by the total system is difficult to implement and maintain. Therefore, the alternative view is a federation of subsystems which can be developed and maintained somewhat independently.[19]

It seems that Schwartz has very distinct notions about a system or system approach. Unless he thinks of a total system in a very specific sense, both the federation of subsystems and total systems have to mean the same thing.

Some authors express the total system in terms of informational requirements of different users. Since the users of information are heterogeneous; they have different points of view, different needs, and different value systems. To serve all users with equal proficiency would mean the creation of a universal system consisting of subsystems for each known user whether present or future. "Clearly such an approach is impractical if not impossible...."[20]

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[18] Robert N. Anthony, Planning and Control Systems: A Framework for Analysis, (Cambridge, Mass., Graduate School of Business Administration, Harvard University, 1965), p. 45.

[19] M. H. Schwartz, as cited in Gordon B. Davis, Management Information Systems, (New York: McGraw-Hill Book Company, 1974), p. 21.

[20] Joseph Becker, et al., Information Storage and Retrieval: Tools, Elements, Theories, (New York, N. Y.: John Wiley and Sons, Inc., 1963), p. 226.

This is probably the first time that one tries to develop a total system by having the user's needs in mind as a primary goal. In the previous chapter, it was observed that some of the authors have mentioned the user's requirement for information. But, this fact was never stated as the main objective of a system.

Various opposing points of view reveal that either because of hardware limitation, or vagueness of the concept, or disregarding the decision models, a total system as a goal is either impractical or impossible to attain. Therefore, it would be in the best interest of any organization to adopt an alternative approach by designing a data base. This new approach is further explained in the next section.

Data Base: An Alternative

John Dearden of Harvard Business School can be considered a major opponent of the total system concept. Since some of the authors believe that there is a single information system for a company, this information system should be considered totally.

Dearden states that the concept of a single information system which implies central control of the systems effort will lead us in the wrong direction because of two main reasons:

1. The entire information system of a company is too large and all encompassing to be considered a single information system.

2. The development of an information system requires such different kinds of skills that just the use of the term "total system"

will not help management to solve the organizational problems that exist in the development of any information system.[21]

In order to overcome a total system problem, he suggests the breakdown of systems and data processing activities both vertically and horizontally. The horizontal classification determines the type of work performed; the vertical classification defines kinds of information which are handled within an organization. In this context, three major information systems are typical to any type of company. These are:

1. Financial information systems which deal with the flow of dollars through the organization. Also, this system is concerned with internal data and historical data, and provides projection of capital investment and budgeting;

2. Personnel information systems which provide information about the people working in an organization; and, finally,

3. Logistic information systems, which provide information about the physical flow of goods through organizations and encompasses procurement, production, and distribution.[22]

There are some other types of information in the system, such as R & D, marketing, strategic planning, which Dearden considers to be minor. However, the major thrust of his idea lies in the fact that in order to serve all the above-mentioned information subsystems, a data base must be established. This data base is designed and

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[21] John Dearden, "How to Organize Information Systems," Harvard Business Review, (March-April 1965), p. 66.

[22] Ibid., pp. 66-71.

integrated based on the various data requirements of each subsystem. Therefore, this same reservoir of data is used by all the components of the system.

Dearden concludes his proposal by stating that, "in the new scheme of things the data base does not constitute a 'total system' by any means."[23]

Milton Cooke is another author who considers a data base an as alternative to the total system. He states that if the total system can be kept accurate, current, and easily accessible, it will be invaluable in making business decisions. Management information which is provided by such a system will resemble a snapshot of what is occurring at any given single point and no more.

Therefore, in order to enhance the efficiency in management's decision-making, and guaranteeing business success, "the mass of detail backup information required in any overall system of this type ... [is to] be manipulated and stored -- and the data base concept appears to be the most realistic way to accomplish this task."[24] (emphasis added).

In the next chapter, by defining a total information system, it is revealed that definitely a data base is not an alternative for "total system."

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[23] Ibid., p. 72.

[24] Milton J. Cooke, "The Data Base Revolution", Systems and Procedures Journal, (March-April 1968), p. 20.

Summary

The concept of total system has been the target of controversy almost since its inception. Like any other idea, a total system has its own opponents and proponents. The proponents of the concept were mainly system specialists backed by the computer industry, but the opponent front consisted of mainly academicians or those who had approached the concept more from the theoretical rather than practical point of view.

Generally, it is claimed that the huge sum of money that is spent for design of such a system, at least in the short run, is not justified. Moreover, the evaluation of past performance of the system group has been unsatisfactory to the management. However, in this chapter, the problems of total systems have been approached from another angle.

Basically, these problems are claimed to be caused by the below areas:

1. Semantics and use of inappropriate terminology
2. Hardware and its capability
3. Software and its development
4. Development of data base as an alternative approach.

In the first part of this chapter, 27 different entries which seem to be comparable to the total system term are listed. Later, various characteristics of a total system suggested by different people in the area of information processing are analyzed. The list of characteristics or attributes is rather lengthy; therefore, in order to draw any meaningful conclusion, the list had to be reduced to the five major categories. Basically, these five groups are: (a) Integration of systems in various forms, (b) Hardware aspects of a system; (c) Information providing capability of a system; (d) Management control process, and (e) Data base.

The study of these groups of characteristics reveals that integration attributes are considered to be one of the main characteristics of a total system, according to the majority of the writers. Hardware, information processing, data base, and management control process are considered to be of lesser importance in the order of mentioning them.

Only 3% of the practitioners believed that all five attributes are necessary for a total system, and the majority of the authors have agreed that only two of the above characteristics are necessary to make a system total. Therefore, it is quite obvious that there is very little consensus in this area among the authors, and, most of the problem is caused by the lack of a unified concept or definition for "total system."

Hardware capabilities and their limitations are discussed in the second part of the chapter. It is obvious that the computer capacity has become more ample; the speed of processing and transferring the data items has increased fantastically and the cost was reduced substantially. Therefore, those problems of a total system which supposedly are caused by a lack of speed and capacity are almost nonexistent at the present. The only problem that seems to be unsolved at this stage is the application to some stages of strategic planning.

Software reasonably had lesser impact in the development of a total information system. As discussed in an earlier chapter, software has almost benefited to the same degree of advancement that hardware has. However, there are a few limitations in the use of software yet to be overcome. For instance, some of the computer languages are capable of handling only sequential processing, such as FORTRAN and COBOL. Yet, other softwares are only operational in a certain environment, such as operating system of IBM or Master Control Program of Burroughs.

Due to the problems mentioned both in this chapter and the previous one, the concept of a total system is considered to be non-operational and infeasible. Therefore a new group of authors suggested an alternative approach for a total system. This is simply the creation of data bases capable of storing mainly historical data. Since the organization already is divided into various subsystems, it would be more practical to satisfy the informational needs of each subsystem by processing the data stored in the data bank.

In the next chapter, the concept of a total system is defined by the researcher. Further, it is asserted that a data base is not an alternative to a total system, rather, it is a step toward accomplishment of the goal.

CHAPTER IV

TOWARD DEFINING A TOTAL INFORMATION SYSTEM

Different concepts suggested by various authors and the fallacies of a total system were explained in chapters two and three. The objective of this chapter is to define a total system based on the characteristics suggested by different authors in the previous chapters. This chapter also adapts or introduces some other attributes which are necessary to qualify a system to be "total". To accomplish this goal, the term "total system" must be defined on three different levels in order for the concept to be meaningful. However, before defining these levels, it is necessary to elaborate further on the concept of "totality" and its impact on a system approach.

Systems Approach and Totality Concept

According to Webster, the word "total" when applied to a system constitutes the "whole". In a system approach, "wholism" means that a system cannot be broken down into its constituent parts, and those individual elements studied in isolation; rather it is a concept that considers a system in its entirety, including all the sets within a system and the relationship which exists between those sets. Most of the problems mentioned in the previous chapters are caused by misconceptions or an inappropriate use of the "wholism" or "totality" attribute of a system.

An important point should be mentioned. Up to now the terms Integrated Data Processing, Total Information System, Total System, and other proposed terms were used interchangeably according to the format suggested by different authors. However, it is the major thrust of this chapter that the above mentioned terms do not have the identical meaning. Their meanings and connotations drawn from the concept must be considered within a specifically defined environment.

The term "total system" is used many times in the previous chapter to mean the total integration of different subsystems, human organization, management control process and many other things. The major conclusion of this research is that the term "total system" is a meaningless term per se. Any time that the term is employed, a reference must be made by the user to a system's hierarchy or level of abstraction which was meant by him. Otherwise, the term communicates no meaningful information.

The problem, indeed, starts when one tries to define a system. As mentioned earlier, the word system, has several meanings. In this context, the reference is always made to the solar system, system of equation, transportation system, weapon system, management system, and even the Bell Telephone system. This makes it fairly difficult for a beginner to grasp the concept at least at the early stages of introduction to system approach.

Generally a system is considered as a set of units with relationships among those units.[1] The same definition, if explained in mathematical notation, probably would convey more meaning. Therefore, it would be possible to express that:

S is a system, thus,

1. $S = [E; R_1, \ldots, R_n]$
2. E is an element set
3. $R_1, \ldots, R_n$ are relations which hold between members of E.[2]

The most important implications of the above definitions are the relationships that exist between the components of a system. Therefore, it is the essence of the system approach for problem solving, that the relationship between the sets within a system have to be examined before any solution for the system is submitted.

Although the recognition of the above mentioned relationships are a necessary condition in a system approach, it definitely is not a sufficient one. This requies that the level at which a system is discussed be defined prior to dealing with any type of system.

Generally, the universe contains a hierarchy of systems. Each system is a subsystem of higher level systems which in turn are

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[1]Ludwig von Bertalanffy, "General System Theory", <u>First Yearbook of the Society for the Advancement of General System Theory</u>, (Ann Arbor, Mich.: Braun-Braimfield, 1956), p. 2.

[2]Terence A. Oliva, "An Examination of the Use of a Dualistic Construct of Energy to Account for Synergy in the Development of First Approximation of a Generic General Systems Model," (Unpublished Ph.D. Dissertation, University of Alabama, 1974), p. 51.

subsystems of a higher level system. It is absolutely necessary that the explicit reference be made with regard to the particular level of the system under scrutiny. Miller also suggests that the discourse should not change to another level without a specific statement that this is occurring. Therefore, he classifies a systems' hierarchy as follows:

> "Systems at the indicated level are called systems. Those at the level above are suprasystems and at the next higher level, suprasuprasystems. Below the level of reference are subsystems, and below them subsubsystems."[3]

Most of the problems stated in the earlier chapters with regard to a total system are caused by lack of recognition of each specific level of systems. Because of this situation the term "total system" is used by different authors to mean almost every level of system. The range of meaning started with integrated data processing systems, integration of all information providing activities, and continued to the point that an entire organization was considered as one system. Each of these systems is referred to as a "total system". In this context, some of the ideas that were mentioned earlier are: (a) J. W. Haslett's concept of totally integrated MIS; (b) Anthony & Welsh's concept of management control process; and (c) Young's concept of total adoptive system of an organization.

Among all the ideas suggested, only Van Gigch's "total system" can truly be considered as "total". To justify his concept, he definitely made an explicit distinction between a system level

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[3]James G. Miller, "Living Systems: Basic Concept," Behavioral Science, (July 1965), pp. 216-217.

that he talked about. According to him, the total system level is a level between subsystem level and the whole system level. Therefore, by the distinction which is made by him with reference to the different levels of system, no communication problem could exist.

A very important point must be mentioned at this stage. That is the term "total system" should never be used alone. It always must be qualified by using certain adjectives or other limiting words in order to convey a definite idea. However, it may be possible that the addition of other words to the term "total system" *per se* creates more conceptual problems. In this case, it is the duty of users to define and elaborate on the term as explicitly as possible. Any lack of communication that would result in this area would be mainly caused by the language. In the language of mathematics, it would be possible to expand or contract a system by simply adding or omitting a subscript, while this situation is almost impossible if it had to be done in other languages.

Due to the fact that no generally accepted concept of total system has yet been suggested, and in order to overcome the semantical problems, this study defines a total system at three different levels. These are: (a) Total Data Processing System (TDPS), (b) Total Information System (TIS), and (c) Total Intelligence System (TINTS).

Total Data Processing System

The review of literature in Chapter II revealed that a total system includes a whole range of systems, from a simple data processing system to the entire organization system. However, if the concepts suggested by different authors are to be analyzed chronologically on a solid basis, a classification of different types of information systems can be found. Table IV-1 shows the chronological list of characteristics or attributes of a total system as suggested by different system specialists. Table IV-2 basically is the same as Table IV-1, except it is prepared for academicians. The column number still corresponds to the number which was previously assigned to each characteristic in Table III-2.

The trend which is observed in both Table IV-1 and IV-2 is quite interesting. In the early days, the attention was mostly paid to the integration of data processing activities rather than effective utilization of systems. The first table reveals that since the inception of the total system idea by the American Management Association (1956) until 1962, no attention was paid to the information providing capability of the system. DeLuca[4] was first to suggest that one of the major characteristics of a total system is to satisfy the informational needs of the users. Among the academicians, this trend was observed a few years later. Churchill[5], according to Table IV-2, is the first who suggested the same idea, but four years after DeLuca.

Prior to these dates, the main emphasis was on the design of a so-called "elegante" system by changing the appearance of a system rather than the contents of it. This situation is noted in both tables. The goal at the early stages was to integrate the processing, to

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[4]Richard DeLuca, "Understanding Total Systems," Total System, op. cit.

[5]Neil Churchill et al., "Some Development in Management Science and Information Systems with Respect to Measurement in Accounting," op. cit.

[illegible] CHARACTERISTICS [illegible] ATTRIBUTES OF A TOTAL SYSTEM AS SUGGESTED BY SYSTEM SPECIALISTS.

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
[illegible]	AMA	X	X	X																																									
1959	Carborundum Corp.										X						X			X																									
1959	Larosso				X	X																																							
[illegible]	Brown		X	X	X	X	X	X																																					
1967	Hopkins		X						X	X																																			
1967	Lach		X				X													X																									
1967	Sprary				X														X																										
1961	Ellis	X	X					X			X	X	X																																
1961	Field															X	X	X																											
1961	Sprauge																					X															X								
1962	Barnes & Weaver																				X	X																							
1972	Becker							X					X										X	X	X																				
1972	DeLuca																		X									X																	
1972	Dickey et al.							X						X														X					X	X	X										
1972	Haslett	X	X		X					X				X	X																														
1963	Borchardt	X			X											X										X		X																	
1964	Graham			X				X							X															X	X	X													
1964	Spaulding																											X																	
1965	Burck																																			X									
1965	Klein					X																X																							
1965	Moranee			X						X															X	X		X				X													
1966	Crowley															X										X												X							
1967	Place																														X	X													
1967	Rosove					X						X																X																	
1971	Eightman et al.		X												X	X										X																			
1972	Kanter						X																																						

TABLE [illegible]. CHRONOLOGICAL LIST OF CHARACTERISTICS OF ATTRIBUTES OF A TOTAL SYSTEM AS SUGGESTED BY ACADEMICIANS.

Year		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
[illegible]	[illegible]		X		X																										X														
[illegible]	Read																		X																										
[illegible]	Martin																															X													
[illegible]	Churchill et al.															X										X		X			X														
[illegible]	Swvers			X		X																										X													
196[illegible]	Wendler				X	X		X				X	X				X					X										X												X	
[illegible]	Elliott, et al				X																										X														
[illegible]	Prince															X															X												X		
[illegible]	Emery				X																																					X			
[illegible]	Nichols																															X													
[illegible]	Shoderbeck																																												X
1973	Wilkinson				X											X						X				X													X	X	X				

mechanize or automate the facilities or to include some fancy hardware into the system. Therefore, it would be justifiable to consider this era as a separate stage called Total Data Processing System (TDPS). By separating this system from the entire spectrum of total systems, a new system level is definitely created. This new system can be considered a suprasystem to a given information system such as financial or personnel, and subsystem of a higher level system (total information system) which is defined later.

Total Data Processing System for a Division

A TDPS may be designed at a division level of a given organization. Therefore, it would be necessary to assume that the principles of divisional performance for the decentralized organization are fully applicable.

If a TDPS has to be designed for a division, one of the conventional models of information system has to be adopted. For instance, Dearden[6] suggests that the entire information system for an organization should be divided into different subsystems such as financial, personnel, logistic, research and development.

In order to design a TDPS, therefore, it would be both technically feasible and operationally efficient to integrate just the data processing of the financial, personnel, and other subsystems. An alternative to this approach is to integrate the subsystems which are previously built around each functional area such as accounting, inventory, production, and payroll.

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[6] John Dearden, "How to Organize Information Systems," op. cit.

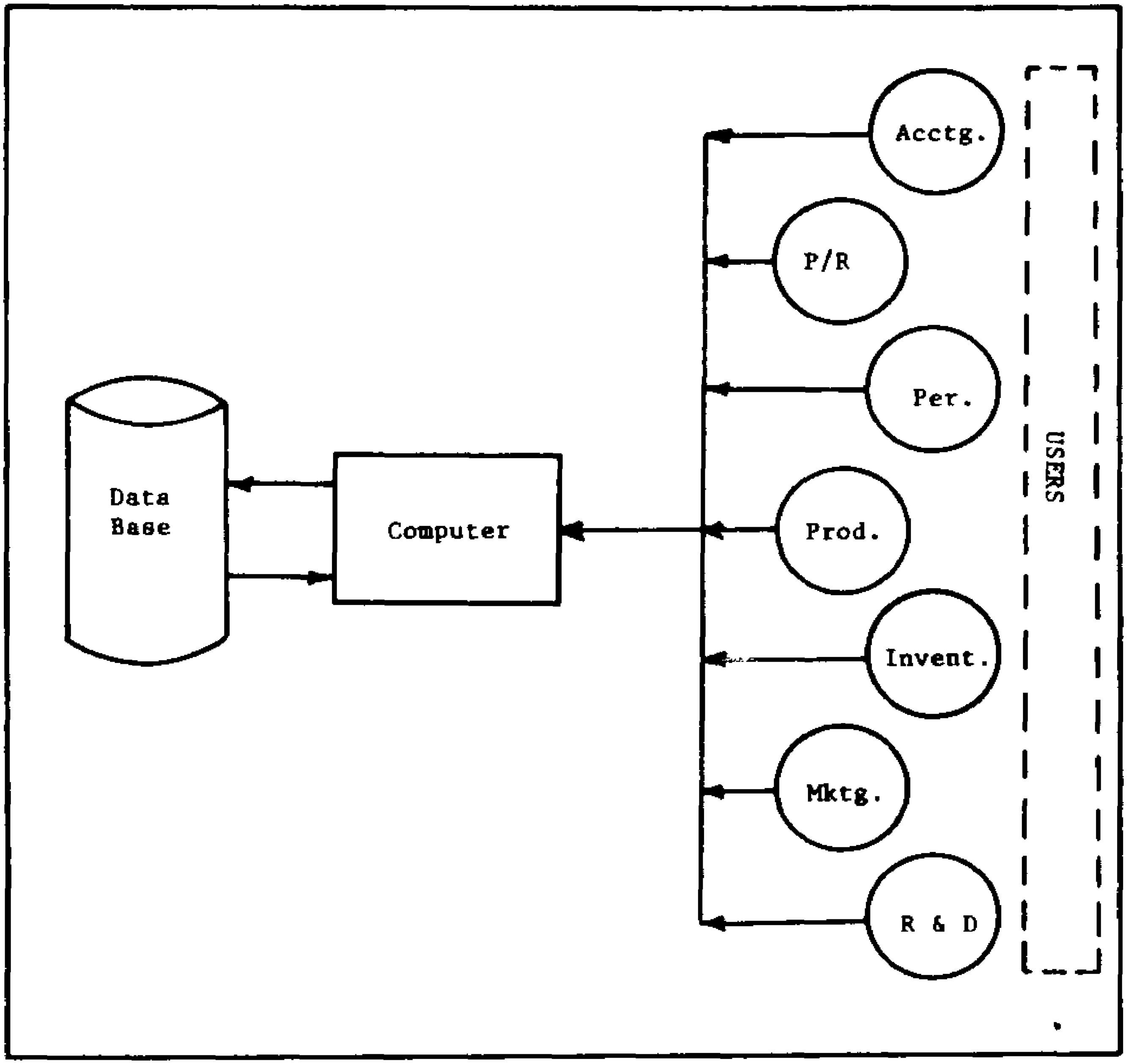
However, since the emphasis is on the data processing aspect of a system, the purpose would be served in a much better manner if the subsystems were to be defined as explicitly as possible. For this purpose, Illustration IV-1 is developed.

Based on the above illustration, all the data processing activity for the entire subsystems within a division is integrated. In order to perform the integration task efficiently, a data base has to be established for serving the entire system. The data base storage capacity must be divided into two sections. The first section includes the storage for different types of programs in the system. These programs are called application and utility. Also, some lower level processing specifications with lesser priority are stored in this storage section. As the need for these specifications arises they will be quickly transferred into the fast storage section of the computer for processing purposes.

The second section of storage with greater capacity is used for storing various data files. Data in this sense, as mentioned in earlier chapters, represents facts or elements of knowledge at the statistical level. These facts can be maintained in a computer or in manual form. But especially in TDPS case, the processing would be more efficient if an attempt is made to capture and store the data in a computer.

The data base and file organization of the data base are discussed later. However, it would be worthwhile to mention that stored data of this system is historical in nature and directly related to the subsystems. It should also be noted that the stored

ILLUSTRATION IV-1. TOTAL DATA PROCESSING SYSTEM FOR A DIVISION.



data does not have to be recorded only once, since the objective of the data base is mainly to minimize the amount of duplication. This is discussed further in the next chapter.

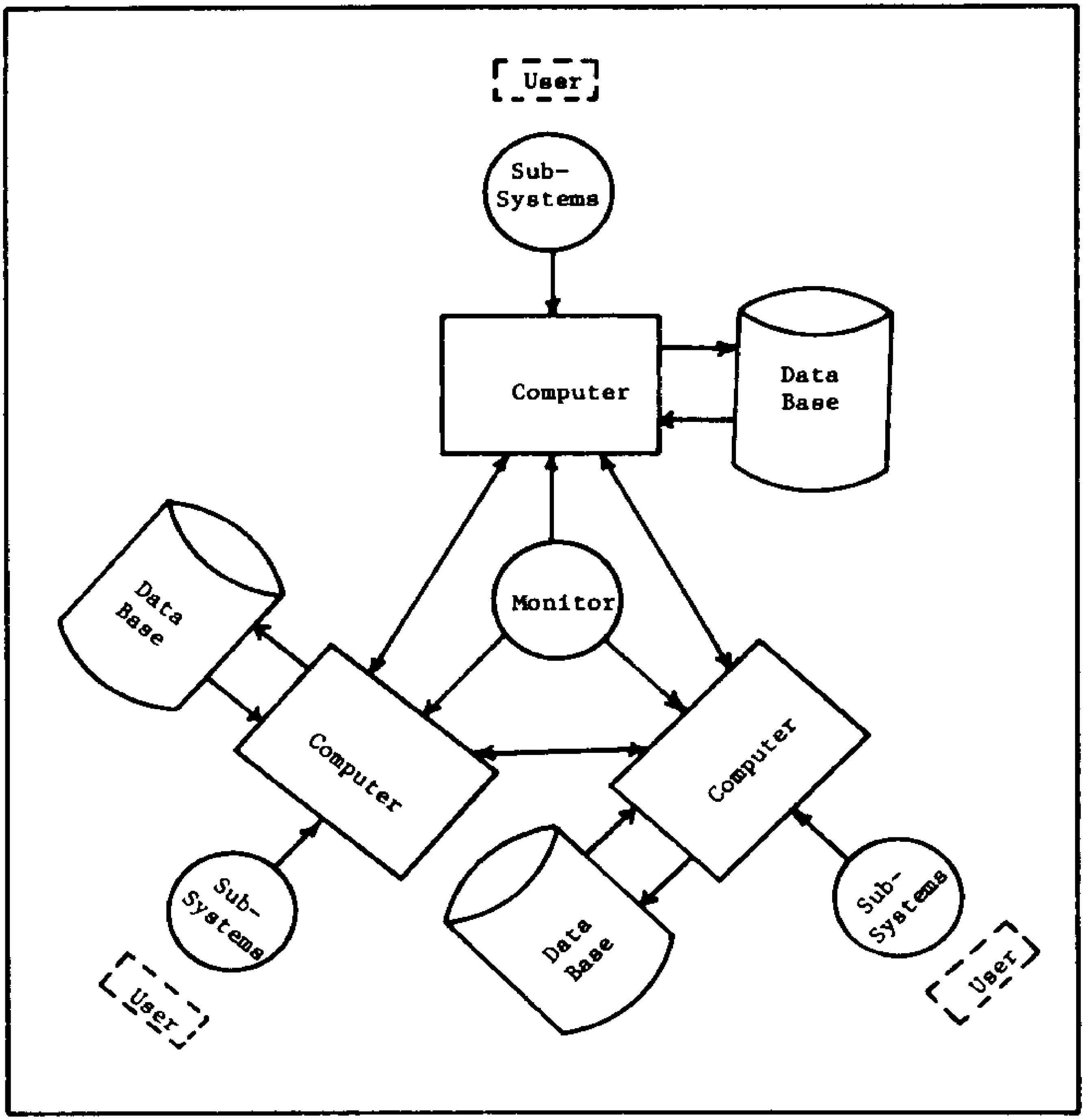
Total Data Processing System for an Organization

Design of a data processing system can go one step further and the TDPS may be designed for an entire organization. Since the principle of the decentralized organization is assumed, one, two, or more divisions may exist in a given organization. Illustration IV-2 shows a TDPS designed for an organization.

In Illustration IV-2, three systems are integrated by means of a monitor. Each of the three components of this system is a TDPS designed for a division and exactly corresponds to the Illustration IV-1. The subsystems circles refer to the combination of the subsystems presented in the previous section. Each division has its own computer and data base. All three divisions of data processing activities are integrated by a monitor, which is the most important part of this system.

The monitor in the above system consists of computer units and sets of procedures that coordinate the data processing task among the three divisions. The monitor's main function is the efficient use of hardware resource in terms of memory space usage, multiprogramming and multiprocessing. Various data items can be traded by the divisions either with a monitor supervising the transition or directly through the monitor. The retrieval of any piece of data can be performed rather simply with a monitor and extracted data may be aggregated in any form. Finally, a system designer attempts to

ILLUSTRATION IV-2. TOTAL DATA PROCESSING SYSTEM FOR AN ORGANIZATION.



include into the system all conceivable data processing techniques, and hardware equipment, as far as his imagination permits.

The TDPS can be labeled "hardware oriented", because the major emphasis is on hardware capability and the fancy yet inconsequential activity which can be performed by them. There is no attention given to the users of the system. This situation is well explained in both Illustrations IV-1 and IV-2. The users in those illustrations are represented by dotted boxes which are isolated from the system. Since there is not any input into the systems by these users, they cannot be considered as part of the system. This is due to the fact that interaction between sets of a system is a main feature of system, and this characteristic definitely is not observed in the above systems.

This type of system, if perfectly designed, is claimed to be very efficient. However, if it actually were used to be in operation, the excessive costs of the system would offset the claimed efficiency.

In order to compare the characteristics of this system with the characteristics suggested in Tables IV-1 and IV-2 by the authors, it would be more appropriate to list the attributes according to the order of agreements. The following are the attributes which can be found in TDPS:

Integration of processing (#4)

Integration of hardware (#9)

Computer (#30)

Time Shared Computer (#40)

Random Access (#24)

On-line computer (#15)

Elimination of extraneous information data (#17)

Protection of Information [data] (#33)

Data base (#14)

There are some other attributes that may be attached to this system which do not have a great impact upon the operation of the system. It would be safe to assume that the existence of the following attributes are not crucial to the system.

Similarity of inputs (#44)

Simplified inputs (#29)

Integrating Scientific Management tools into the system (#21)

Automation of inputs and outputs (#35)

Batch processing (#26)

Punch paper tape (#8)

Mechanically capturing data (#2)

The remaining characteristics are not relevant to this system, and thus do not have to be considered. For instance, real time feature of a computer system in this case is meaningless. Because the users of this type of system do not actually interact with the data processing system, there would be no need for a real time feature in this type of system.

It would be extremely difficult, if not impossible, to come up with a definition having all the above mentioned features in it. However, the alternative is to define such a system in the following manner and assume that the necessary attributes mentioned earlier are implicit in the system. A Total Data Processing System may be defined as being:

<u>Hardware oriented; integrating all of the data processing applications within a division of an organization; or integrating the entire computer system on an organization wide basis</u>.

<u>Total Information System</u>

The second level in the hierarchy of information systems is the Total Information System. This level is considered in this study as a suprasystem to TDPS and a subsystem of the next level which is explained later in this chapter.

Further analysis of Table IV-1 reveals that after 1962, the system specialists considered the users of a system to be part of the broad concept of total systems. The same trend is observed in Table IV-2 after 1966. Including users as part of the system probably was due to added emphasis on some managerial concept such as "management by exception" and "management by objective" (MBO). Because of the later concept (MBO), the information was considered to be a vehicle which facilitates the attainment of the managerial goals or objectives. Therefore, the system designers decided to give recognition to the users of the system and provide them with the type of information which would satisfy the particular needs of those users.

Traditionally, the management of an organization are assumed to be the main and to a certain extent, the only users of generated information. Therefore, a system designer's objective was to match the sources of information with the particular managerial needs by designing a so-called management information system (MIS). However, there are certain groups, other than the management of an organization, who have a substantial interest in the destiny of the organization.

Thus, an information system must be able to provide the desired information, not only for the management, but for everybody who somehow has an interest in the organization.

Those groups include stockholders, creditors, suppliers, various government agencies, customers, and finally the general public. If the informational needs of these groups have to be satisfied, at the same time the management's information requirements are met, a total information system (TIS) for the entire organization must be designed. Therefore, a TIS consisted of two parts: (a) Management Information System, and (b) Outsiders Information System (OIS).

Information Providing Feature

Information is defined in a variety of forms. Russel Ackoff defines information as "the amount of potential choice of courses of action a person has."[7] But, it does not matter how you define it. The amount of information has an inverse relationship with the uncertainty within a system and in other words in the negative of uncertainty.[8] As more information is gained, the uncertainty is reduced, and as the amount of uncertainty is reduced, the entropy of a system would be reduced.

Generally, a so-called scientific approach to the problem solving requires that after a problem is defined and alternatives are determined and evaluated; the decision has to be made based on the criteria used by the decision maker. Whenever a selection has

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[7]Russel Ackoff as coded in John Beckett, Management Dynamics: The New Synthesis, (New York, N.Y.: McGraw-Hill Book Company, 1971), p. 97.

[8]James Miller, "Living System," op. cit., p. 194.

to be made between the numbers of alternative courses of action, a certain amount of risk is accepted by a decision maker. In order to reduce this uncertainty, the decision maker needs to have access to all relevant information. The amount of uncertainty may be measured quantitatively. For instance, if one is faced with a choice among eight alternatives, the uncertainty or entropy is only three bits. Four choices among the eight alternatives will reduce the uncertainty to two bits, so forth. With only one course of action from which to choose, the uncertainty and entropy is reduced to zero.[9] Therefore, in terms of bits of knowledge or facts, the more knowledge a person has, the better off he is.

In TIS, the information providing capability of a system is the most important feature of system. The above explanation was necessary to distinguish between information and data which was discussed earlier. Information is valuable for the decision maker in terms of reducing uncertainty. While data does not have any value per se, if data is processed properly, based on predetermined specifications, it will take the form of information and become useful. This is probably a major difference between TIS and TDPS. Because the former system's main objective is to provide information for specific user or user groups; while the TDPS objective was to process data according to the designer's specification.

TIS Model

The proposed model for a TIS is shown in Illustration IV-3. The concept of totality is built around all the interested groups

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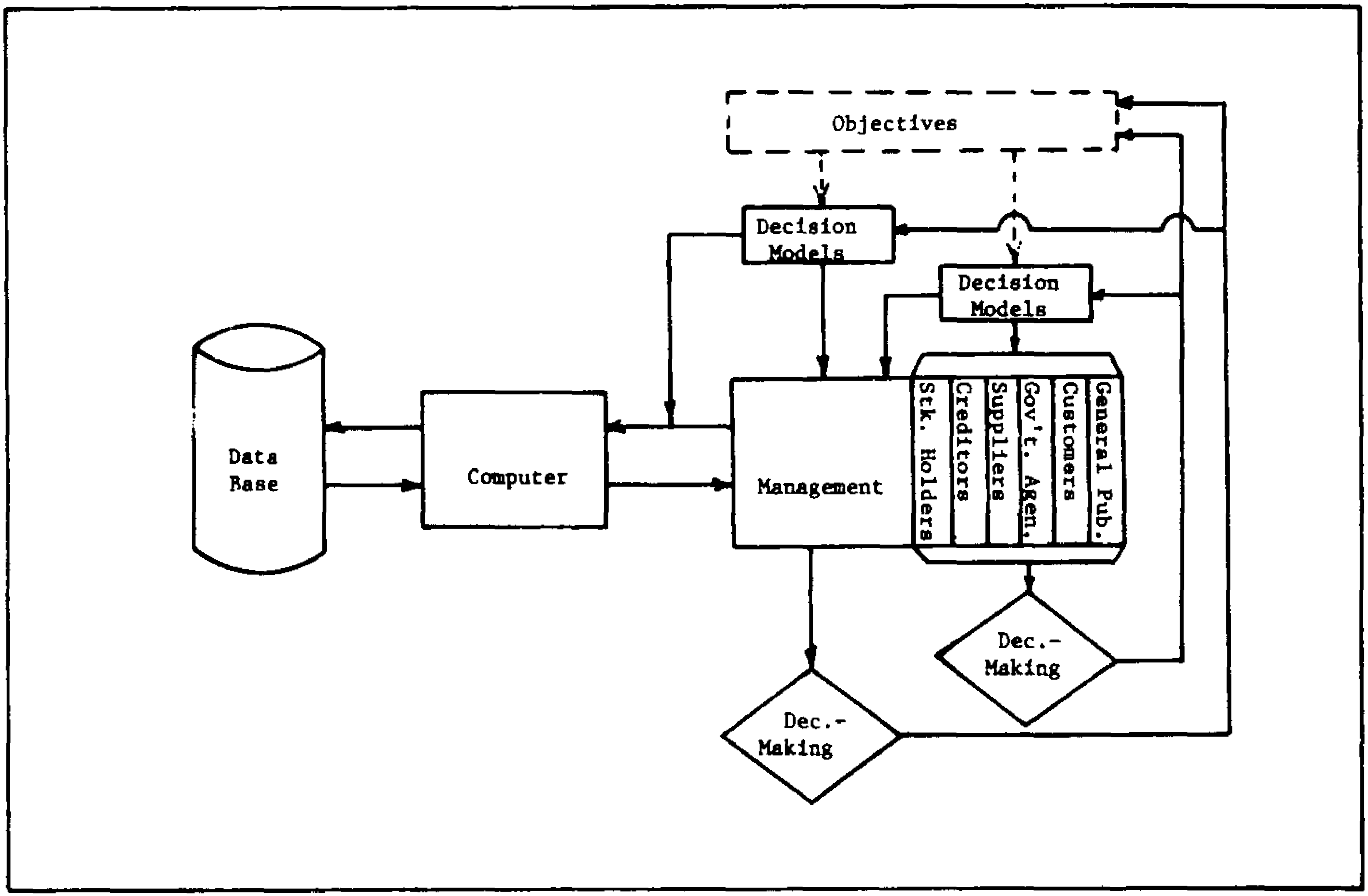
[9]John P. Van Gigch, Applied General System Theory, op. cit., pp. 42-43.

ILLUSTRATION IV-3. TOTAL INFORMATION SYSTEM.



within and outside of an organization. This type of system is users oriented rather than hardware oriented.

As it is illustrated, the information users of this system are divided into the two distinct groups; management and others. The word "others" refers to that group of interested people whose decisions somehow will affect the organization; but they are basically outside of organizational boundaries.

Both management and outsiders have their own decision models and these models are structured based on their objectives. Models which are used by management will have planning and control features built in them, while the outsiders' models might lack these features due to the diversity of their objectives. In order for management to attain its objective, it needs to make certain types of decisions. Based on the decision model, they seek relevant information. The relevant information will be retrieved from the data base through the computer facilities. The system has an interactive capability by which management is able to specify the desired requirement for a given type of information and receive a fast response to different kinds of inquiry that they may have. The needs of management, for information is satisfied by this system in both planning and control areas. Therefore, it is implied that the principle of management by exception and management by objectives are fully observed in the design of this system.

The outsiders require other kinds of information based on their objectives which normally are different from management's objectives. Stockholders are generally concerned with a long run prosperity of a given organization and earning power of a firm, while the creditors and suppliers would prefer to have the information about the ability of the firm to meet its obligation. Government agencies such as the Internal Revenue Service or other regulatory bodies may require information for tax collecting purposes or administering certain types of activities. The customers might want to know whether they can rely on a given firm as a regular source of supply and quality of the firm's products. Finally, as the social awareness of the general public increases and corporations are held responsible to the society more than ever, the informational needs of society must be satisfied in order for them to be able to evaluate the performance of a given corporation against the responsibility which is charged to them.

The important point which must be observed in this model is that outsiders do not have direct access to data base and all of their inquiries are directed toward management. It is management's duty to provide the necessary information to fit to the outsiders' decision model.

Strategic Planning Aspects of TIS

Anthony's definition of strategic planning is probably the most accepted one. He defines it as:

> "The process of deciding on the objectives of the organization, on changes in these objectives, on the resources used to attain these objectives, and on the policies that are to govern the acquisition, use, and disposition of these resources."[10]

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[10]Robert N. Anthony et al., Management Control Systems: Cases and Readings (Homewood, Ill.: Richard D. Irwin, 1965), p. 4.

Generally, a strategic planning type of decision is very complex and unstructured. Thus, another terminology is suggested for this type of decision - "non-programmed." Although the communication of the information is claimed to be relatively simple[11] in this area, the amount of information which is available is very small. As a matter of fact, simulation and "what if" models are the only application that is basically used for this type of decision.[12]

The traditional point of view with reference to the application of the strategic planning is changing as a result of advancement of knowledge in this area. Most of the problems in this area were caused by the lack of coding technique for capturing and processing strategic data. A new coding scheme according to Bruha[13] must accommodate: (a) different types of decisions, (b) significant variations in demand frequency of an element of data, and (c) the on-line indexing of new data that may immediately change the demand frequency. A statistical technique is definitely needed in order to cope with the coding problems. Since the coding is similar to the measurement process, according to Bruha,

> "if the identified properties of information requirements can be viewed statistically at the nominal scale of measurement through the use of clustering techniques, the identified properties of the information requirements

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[11] Ibid.

[12] Neil Churchill et al., Computer-Based Information System for Management, (New York, N.Y.: National Accounting Association, 1968), p. 121.

[13] George R. Bruha, "Effect of Strategic Planning Decisions on the Design of a Coding Process in an Advanced Information System." (Unpublished Dissertation, Northwestern University, 1972), p. 56.

can be modeled and subjected to the scientific method of analysis."[14] (emphasis added).

The proposed TIS can provide a strategic type of information to the extent that current technology permits. Also included in the data base is various information about the competitors and the models that they are employing.

Compliance of the Model with Suggested Characteristics

Since the evaluation and compliance of all 44 characteristics are almost impossible, in this section only those characteristics which are in full compliance or partially relevant to TIS are mentioned. There are some characteristics which are definitely too vague to be included. For instance, the term "total integration" is as vague as "total system". Therefore, it is not included in this discussion.

The following characteristics are directly related to a TIS:

Vertical integration (#20)

Integration of operating systems (#18)

Integration of processing (#4)

Integration of hardware (#9)

Interlocking data and information flow (#36)

Integration of scientific management tools into the system (#21)

Computer (#30)

Real-time (#25)

Time shared computer (#40)

Random Access (#24)

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[14]*Ibid.*, p. 84.

On-line computer (#15)

Display devices (#28)

Satisfy information needs of users (#27)

Provide both operating and non operating information (#43)

Timely information (#7)

Protection of information [data] (#33)

Adoptable to management control process (#10)

Facilitate management by exception (#12)

Data bank (#14)

There are a few characteristics which are not truly crucial for TIS. They may or may not be included in the system. These are:

Similarity of inputs (#44)

Simplified inputs (#29)

Automation of inputs and outputs (#35)

Batch processing (#26)

Punch paper tape (#8)

Mechanically capturing data (#2)

To summarize, this study considers a TIS as two information subsystems: (a) the management information subsystem, and (b) the outsider information subsystem, and defines a TIS as:

> A user's oriented information system, designed within a given organization, to assist all the interested parties in their decision making process.

Total Intelligence Systems (TINTS)

Quite often, a management information system, MIS, or another type of information system is criticized because of the inability to provide all types of information for the users of the system. Since

the information is negative of uncertainty, more information will result in less uncertainty. The number of alternative courses of action also will be reduced as the bulk of relevant information increases. Therefore, when sufficient amounts of information are available, there would be only one course of action with the probability of occurrence that would be equal to unity. At this stage, there would be no decision to be made, and if the system is programmed, the final solution automatically would be reached.
A system which is capable of providing a final answer to any sort of problem can no longer be called an information system. The more appropriate terminology for this type of system is "intelligence system".

Intelligence

Intelligence according to Alfred Binet is the faculty of

> "judgment, otherwise called good sense, practical sense, initiative, the faculty of adapting one's self to circumstances. To judge well, to comprehend well, to reason well, these are the essential activities of intelligence."[15]

Although it is not clear to the psychologist what intelligence is, a number of attempts have been made to measure it. The practicality of the intelligence measurement is due to the fact that, the superior intelligence is made of an assembly of superior mental elements. Thus, it would be possible to measure each element that

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[15] Alfred Binet as coded in William N. Dember et al., General Psychology: Modeling Behavior and Experience (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), p. 517.

enters into the performances called intelligent, then combine these measurements for the overall measure of intelligence.[16]

Intelligence in business communication is treated differently. Accordingly, intelligence will result from the analysis of organized information that provides the decision maker with a preferred course of action after having evaluated available alternatives. In this sense, if a system is designed somehow that automatically captures the data, processes it, analyzes the information and selects the best alternative course of action, that system would be an "intelligence system".

TINTS Model

The decision process consists of four different stages;[17] (a) observation of the state of the environment, collecting, coding and storing data; (b) inference to be made as a result of analysis of the processed data; (c) evaluation of the available alternatives with reference to goals and objectives and finally, (d) selection of the preferred or best alternatives based on the predetermined criteria.

By programming the above process for all types of decisions which affect the organization, both internally and externally, a successful TINTS would be designed. Illustration IV-4 shows a proposed model for a TINTS. This model is composed of two parts,

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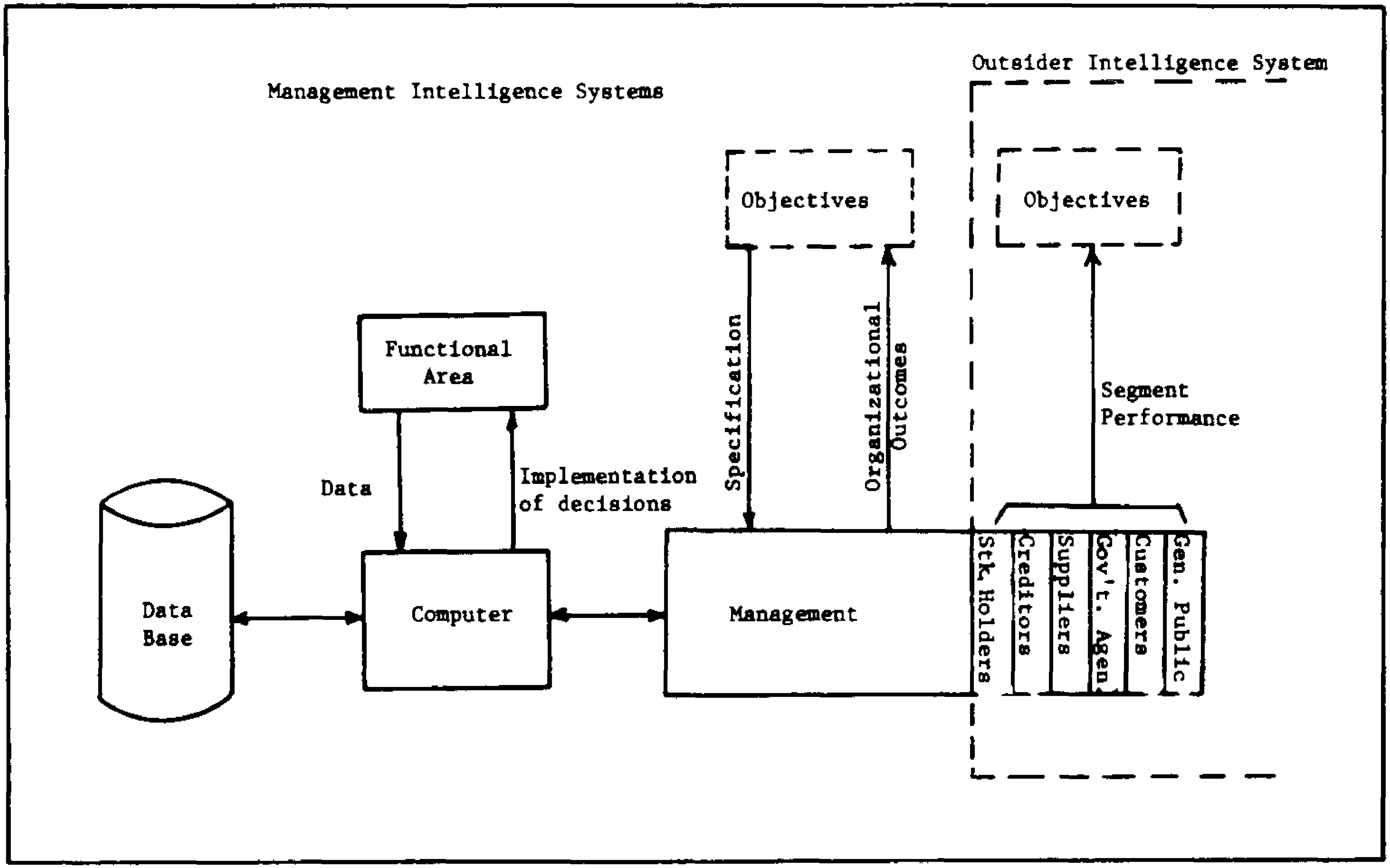
[16] Ibid., p. 515.

[17] Charles H. Kriebel, "Management Information Systems Technology: A View of the Future," Journal of Contemporary Business, (Spring 1972), pp. 2-3.

ILLUSTRATION IV-4. TOTAL INTELLIGENCE SYSTEM.



namely, a management intelligence system and outsiders' intelligence system.

Based on the organizational objectives, certain sets of rules, guidelines and specifications are defined by management. These guidelines are a basis for the computerized operation of the system. Organizational outcomes will be automatically evaluated against the predetermined objectives, through the automatic feedback and feed forward process. This evaluation process may be cause for management to use the old specifications, revise those specifications or come up with entirely new sets of guidelines. It is needless to say that all the managerial specifications and decision rules are stored in the data base and are readily available to the processing subsystems.

The data base also hosts the data from operating segments of the organization. This data after being processed, will provide the necessary inputs for the models within the systems. The models automatically reach a decision which is most desired for the organization. As a result of the above decision, certain action should be taken through the functional areas in order to implement those decisions. A new set of data with regard to the proposed action will be captured by the system, and the process continues.

The management intelligence system definitely requires a data base with a great capacity to store all types of data and models. The major part of the storage is allocated to various operating data. This data is available to the system at all times. The coding scheme used to store the data is designed, based on several considerations such as, efficient use of storage core and fitability to the models.

The remaining capacity of the data base is allocated to the different models or decision rules. These models are of a different nature, depending on the environment with which they deal. Heuristic models are designed for the organizational needs for which such a solution is satisfactory, while optimizing algorithm is developed for those areas that the final solution based on management's specification must be optimal.

A management intelligence system, theoretically, will provide for management, a solution to any type of problem they might have.

Some of the authors, as it was mentioned in the review of the literature, believed in the total integration of the systems. There was not found any specific reference to the total integration concept and its meaning to those authors. However, there are some references to the corporate intelligence system as a system that permits management by exception, based on timely information, which is not the same as the management intelligence system as it is discussed here.

The outsiders' intelligence system (a subsystem of TINTS) is reasonably more complex than the management intelligence system (the other subsystem of TINTS). A dotted line separates this subsystem from the management intelligence system in Illustration IV-4 due to its particular nature. The same type of relationship which was discussed in previous subsystems exist between the decision makers and operating environment. However, the decision models for outsiders are not included in the management's data base which was discussed. Each individual of this group has his own intelligence system, which is similar to the management intelligence system. The performance data, with regard to this segment of interest, will be combined with the data which is collected from the segments of other organizations that a particular decision maker has an interest in. Then, the captured data from all segments will provide a basis for processing the information; hence this information will supply the necessary inputs for the decision models of this individual.

For instance, an individual may have shares of stock in ten different corporations. In order to attain his objective, namely maximizing the return on his investments, he needs to gather data from all of the ten corporations in which he has interests. Then this data will be processed and used for his decision models. Like the management intelligence system, a similar mechanism exists between him and his decision models. Thus, depending on his model, an adequate or optimal solution is readily available to him. Needless to say, the same type of system is assumed for the rest of the group of outsiders.

In short, a TINTS consists of two parts: (a) management intelligence system, and (b) outsiders intelligence system. Both TIS and TDPS are part of this system, which are respectively two lower level subsystems within this system. All the characteristics which were mentioned earlier about TIS and TDPS are applicable to this system also. In addition to those attributes, the feedback and feed forward mechanisms are the two main characteristics which must be considered as essential parts of this system. Therefore, a TINTS may be defined as:

A system which basically provides intelligence for all the interested parties. All the steps from capturing data, to reaching the decisions and actions are done within the system in a coordinated manner. Included in the system are feedback, feed forward capabilities and a data base to store both operating data, decision models, and system specification.

Data Base Requirement

In the two previous sections, it was pointed out that a data base is a necessary part of the total information system and the total intelligence system. The objective of the following section is to elaborate further on this thought.

General Systems Research

The goal of the general systems research or more specifically General Systems Theory is to study the isomorphy of concepts, laws and theories of various disciplines and apply them to other disciplines. Boulding suggests that there are certain general phenomena which are found in many disciplines that can be explained by the general theoretical models relevant to those phenomena.[18] Bertalanffy[19] has expressed the similar thought in a more obvious manner. He stated that there are certain general principles which hold for systems, irrespective of the nature of the component elements and the relation between them.

The above-mentioned theories are used in this study to show the analogy between a data base and the human memory. Therefore, it is necessary to define the characteristics of a living system and its similarity with the types of systems such as TIS and TINTS.

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[18]Kenneth E. Boulding, "General System Theory," op. cit.

[19]Ludwig von Bertalanffy, Problems of Life, op. cit., p. 199.

The living systems are a special subset of all the possible sets of concrete systems, consisting of plant and animals. There are certain characteristics which distinguish this type of system from nonliving systems. First, they are open systems. Second, they maintain a steady state of negentropy. This situation is possible due to accepting the inputs of matter-energy of a higher order of complexity. Third, they contain a decider subsystem which controls the entire system.[20] Fourth, the goal of the system is defined internally within the system. Since any type of human organization, particularly information systems, can be classified as a living system, the same types of characteristics are equally applicable to them. This can be used as a comparison basis between the human memory and a data base.

Learning and Memory

Learning and memory are assumed to be closely related to each other and in some cases are regarded as an operational congruency. However, it should be realized that both learning and memory deal with the handling of information. Therefore, according to Bogock:

> "there must be a stimulus, a mechanism to receive the informational content of the stimulus and 'recognize' it, a mechanism to classify it, one to code it, one to store it, one to retrieve it, one to associate it, and one to discharge the information or its derivative as response.[21]

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[20]James G. Miller, "Living Systems: Basic Concepts," op. cit., pp. 203-204.

[21]Samuel Bogock, The Biochemistry of Memory (New York, N.Y.: Oxford University Press, 1968), p. 8.

There are many theories to express the phenomenon of learning and the memory system, but almost none of those theories have been able to come up with any concrete basis. Thus, it may be concluded that all of them are at a developing stage. However, there are two theories which have more popularity and acceptance than others.

First, is the theory which explains memory and learning from the psychological point of view. According to this theory, learning occurs as a result of interaction or enforcement between the "Law of Effect," stimulus and responses. The Law of Effects suggests that <u>an action that leads to a desirable outcome is likely to be repeated in similar circumstances</u>.[22] As a result of response to a certain type of stimulus, the Law of Effects reinforces the situation. Thus, the behavior will be learned. The information extracted from the learning experience is added to preexisting meaning structure within the memory system. The stored information traces in the memory will become stronger as a result of relearning. As more information about the world is accumulated, the understanding of the memory system continues to expand and become elaborated. Therefore, the by-product of this changing structure is the continuous change in the man's knowledge.[23] This process is very similar to a process of updating a data base, when the current data is being added to the vast pool of data already stored in it. Furthermore, the same analogy can be

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[22] Peter H. Lindsay, et al., <u>Human Information Processing: An Introduction to Psychology</u> (New York, N.Y.: Academic Press, 1972), p. 471.

[23] <u>Ibid</u>., p. 431.

established between what is claimed to be a short-term and long-term memory system, and fast and slow storages of a computer system.

The psychological approach assumes that the living system produces a stable circuitry in the memory. According to von Foerter:

> "The essential features of physiological memory [stable circuitry] are its various abilities to manipulate symbols, first, inductively, by computing generalities from particulars, and deductively, to reconstruct the particular from the structure of the generalities."[24]

Therefore, the memory seems to function as a computer which consists of networks of "unidirectional transmission lines which interact with each other at certain discrete, lcoalized regions."[25]

The second theory discusses the learning and memory through the chemical compounds formed within the brain. A detailed discussion of this theory is beyond the scope of this study. However, the extract of this theory suggests that the genetic information for each organism is stored in its giant molecules, deoxyribonucleic acid (DNA). This information may be transferred from DNA by a molecule of ribonucleic acid (RNA) to the surrounding protoplasm. Due to containment of genetic memory in DNA, it may be implied that RNA could transmit the knowledge previously acquired.[26] A different sequence of the RNA basis will result in a different protein, since RNA can produce the synthesis of new protein.

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[24]H. von Foester *et al.*, as coded in Samuel Bogock, *The Biochemistry of Memory*, *op. cit*., p. 77.

[25]*Ibid*.

[26]Peter H. Lindsay, *Human Information Processing*, *op. cit*., pp. 297-298.

There are many experiments favorably supporting this theory. The planarian flatworm study and the study of transfer of the memory between rats are among the best known experiments. A major breakthrough occurred when the scientists at Baylor University discovered the first chemical code words that control memory and learning. The chemical material consists of 14 different amino acids, isolated from the brains of rats which have acquired a fear of the dark from being subjected to electric shock.[27]

There are a few concluding remarks that have to be made with regard to the analogy between the memory and data base. First, the learning process is nothing but the ability to retrieve pre-stored data from the memory system. Since intelligence is created as a result of learning, the second conclusion is that intelligence is a function of the relevant data already stored in the memory. Thus, the more relevant data stored in the memory system, the more intelligence consequently will result.

Any basic control system has the following units: the activity or process to be controlled, the sensor, the goal setter, the discriminator, the decision maker, and the effector.[28] This is very similar to the functions performed by the human brain as a communication system. The major components of the human communication system are the <u>receptor system</u>, <u>the effector system</u>, and <u>the central mechanism</u>.[29] The receptor

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[27]"Code Word of Memory," <u>Chemical & Engineering News</u>, (Feb. 9, 1970), p. 11.

[28]John P. Van Gigch, <u>Applied General System Theory</u>, <u>op. cit.</u>, p. 353.

[29]<u>Ibid.</u>, pp. 370-371.

system is probably the most important part which basically translates the physical and chemical stimuli received from the environment into neurological events or impulses. Therefore, it is the memory system that by recording all the events provide a basis for responding to different stimuli and execution of those responses.

A data base was regarded as the most important component of a TIS and TINTS in the two previous sections. Due to the similarity between the human information processing system, TIS and TINTS, the third conclusion of this study is that a data base is a necessary part of a TIS and TINTS. Thus, developing the data base as suggested by some authors must not be considered as the abandonment of the total information system. Rather, it should be regarded as a major break-through toward the formulation of TIS and TINTS.

A point should be brought up here that the current technology is not ready yet to accommodate the requirements of the data base for a total intelligence system. However, the recent progress of both hardware and software should make the development of a total information system a reality. The recent advancement in technology would include the multiprocessing of the computer operation and the development of mass storage systems such as IBM System 3850 and Ampex TBM.

The total intelligence system goal should be attainable in the future. TINTS requires a sophisticated data base capable of storing and retrieving data randomly. The current hardware and software have a limited capability for capturing and processing data. The input data must be stored in an orderly manner within the framework of a given file, and the retrieval process is subject to almost the same restriction. The retrieval of data from other files is possible only through the orderly indexing of data records and a ring structure that should be regarded as inefficient, costly and to some extent impossible for random processing of data. These problems should be overcome as man's knowledge of the computers, artificial intelligence, and understanding of the processing of information in the brain increases.

Summary

Based on the fallacies of a total system which were explained in the two previous chapters, it is concluded that the term "total system" is not a meaningful term by itself. Moreover, it does not communicate any information without reference to the level of abstraction of a system.

In order to define a total system, first the components of such a system have to be determined. Then a meaningful definition of the system can be made if the relationships between various sets and subsets of it are known. This study defines the term "total system" at three different levels of abstraction.

First, Total Data Processing System (TDPS) which can be designed at both division level and corporation wide scale. The principles of divisional performance for a decentralized organization must be completely observed for designing this type of system. Moreover, most of the attention is paid to the data processing aspects of the system by use of highly sophisticated hardware. Thus this system may be called a "hardware oriented" system. The users of this type of system do not have any interaction with the data processing system.

Second, the Total Information System (TIS). The motive behind the design of this type of system is to provide information for all parties who are interested in a given organization. The primary objective of this system is to satisfy the informational needs of the users. The users can interact with the computer system through the feedback loope. The data base is the most important part of this system which by storing all types of data will provide a base for producing all types of information.

Third the Total Intelligence System (TINTS). Based on the assumption that the relevant information is negative of uncertainty, this system stores all types of data and produces all the necessary information for making a given decision. The data base of this system is large enough to store both the data which is captured from functional environment, and management's decision models. These decision models are structured based on predetermined specifications which will provide for the management an optimal solution to any type of problem.

Since a data base is the necessary part of both TIS and TINTS, development of it should not be regarded as an alternative to a total information system. The existing hardware and software techniques permit the organization of a data base for a TIS. However, development of a sophisticated data base for the total intelligence system is yet to be realized and is subject to advancement in other fields such as biochemistry and psychology.

CHAPTER V

ORGANIZING A DATA BASE

Chapter IV demonstrated that a data base is the most essential part of a total information system and of a total intelligence system. The objective of this chapter is to discuss briefly the concept of data base and its hardware and software requirements. This is deemed to be necessary because of the complexity of Chapter VI.

Structure of Data Base

The traditional approach to data processing requires that each application program use only the bulk of data applicable to the particular operation. Therefore, if another application needed the use of the same data items within a given file, a new program had to be written or the old program had to be modified. In such an environment, the data and program were interdependent. This resulted in high programming cost, low turn around, and naturally inefficient systems.

An alternative suggested to the above approach was involved with the establishing of a "general file" or a common pool of data available to all the applications at any point in time. Since the entire programming activity is performed around this bulk of data, the unified code or data identifier would be used by all the programs. Therefore, there would not be any dependency between the data and the programs. This situation of course is an ideal one, but it serves as a useful vehicle for developing a data base. The crucial question at this point is the possibility of storing all relevant data in a given storage and of retrieving the data as the needs arise.

The validity of the above question rests on the information requirements of different types of decisions with regard to the management control process. Since strategic planning problems are unstructured, it would require storage of a large volume of data for occasional use. However, the operational control type of decisions are capable of being programmed and of utilizing the limited sets of data continuously. In the latter case the fields layout remain unchanged, but the data value may vary according to the nature of a given item.

Data Base Defined

The base normally refers to a bottom which holds or stabilizes "something." The same meaning is implied by data base, since it provides a basis for producing information and intelligence created as a result of receiving the relevant information.

In order to design a data base, one has to define the concept and its different connotations. Although it is generally considered a single reservoir of all the data within a given system, a more concrete approach has to be developed in order for the concept to be useful. Therefore, for developing a data base, the "information space"[1] concept is regarded as an important milestone. Accordingly, any piece of information with reference to a particular "thing"

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[1] John K. Lyon, An Introduction to Data Base, (New York, N.Y.: Wiley-Interscience, 1971), p. 10.

can be described in terms of three elements: (a) entities, (b) attributes, and (c) values.

Each entity can be uniquely distinguished from other entities by means of certain properties called identifers. Moreover an entity may possess other types of properties which are known as descriptors. Both identifier and descriptor with regard to a given entity can be demonstrated in three dimensional space. The first axis represents a given entity, while the two other axises describe the attributes and values of that entity. Any particular node in this three dimensional space is representative of certain descriptors or an identifier. It should be noted that a particular node is created as a result of the intersection of three planes which vertically cut through each axis. For instance, a plane which is vertical to the entity axis may represent an account within the General Ledger entity. The other plane going through the attributes axis may represent the status of each account, namely debit or credit. Finally, the third plane which passes through the value axis will describe a particular value such as $2500. Therefore, existence of "2500" at a particular node within the entire information space may be indicative of the "$2500 credit balance of Tax Payable Account."

Although this study does not accept the concept of the information space, entirely due to the lack of universality, it is still considered to be a very powerful communication means for conveying the data base concept. Thus, if a data base is assumed to be a subset of that information space, it can be defined as Martin suggests:

> "A collection of interrelated data stored together with as little redundancy as possible to serve one or more applications in an optimal fashion; the data are stored so that they are independent of programs which use the data; a common and controlled approach is used in adding new data and in modifying and retrieving existing data within the data base...."[2]

A data base that is suggested by the above definition is deemed to be highly complex and, at least, very difficult to design at the present time. Therefore, a more pragmatic approach would be a step-by-step development of it based on certain long-range objectives.

The Objectives of a Data Base

The effectiveness of a data base will be guaranteed if the proper goals or objectives are established. During the goal-setting process special attention should be given to the structure of the files both from physical and logical standpoints. The following are regarded as the most important set of goals which, if selected, would be helpful in designing a data base:[3]

Make Data Generally Accessible

This goal implies the establishing of a dictionary mechanism and other procedures which facilitate access to the files consistently and effectively.

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[2]James Martin, Computer Data-Base Organization, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1975), p. 19.

[3]A detail description of the goals and objectives is cited in Edgar H. Sibley and John A. Turner, "Data Base Management: A Framework for Effective Uses," paper presented on the second Jerusalem Conference on Information Technology, (July 29-August 1), 1974, pp. 7-12 and James Martin, Ibid., pp. 31-39.

Control the Data

The control of data is a twofold function. That is, the data should be controlled from both the privacy and security points of view. Privacy refers to the constitutional rights of people and organizations. Thus, guidelines must be determined as to the extent that information about individuals can be revealed to other individuals.

Security of data on the other hand has protective implications. Data must be shielded from accidents such as fire or other types of destruction. Unauthorized use of data base also should be prevented, including both unauthorized retrieval from the data base and unauthorized change or updating of it. The above risks are normally minimized by designing a system which is easily reconstructable, or by inserting security codes and passwords into the system for each particular user.

Minimize Redundancy

Similar data items which are repeated in different files should be eliminated as much as possible. Theoretically, if similar data in various files are updated constantly in order for the data base to be consistent, there should not be any major problem with the data base. However, as the number of files increases, this problem becomes a serious one. Even if the data processing division were able to keep up with all of the required updating, eventually major computer time would be devoted to updating activities. Therefore, there would be very little time available for retrieval and extraction of the available data.

Reduce Response Time

The time elapsed from the moment that a request or an inquiry is made and the moment that the requested information is provided is very crucial. If the time interval is too long, an alternative source of information would be sought by the users, and in an extreme case the need for information might have disappeared.

Performance of the storage devices has a great impact on the elapse time and throughput of the system. The traffic volume of data and the throughput of the system are the major determinants for choosing a physical storage. Some physical storage will provide very fast and efficient response to a given inquiry, while others lack this capability.

Minimize Cost

This objective is highly interrelated to the previous one. Choice of a slow and/or smaller physical storage may reduce the costs of a data base; but it may result in longer elapse time and, in some cases, the loss of opportunity. Therefore, local reduction of costs is produced at the expense of others. This is normally referred to as suboptimization of a problem. However, it should be kept in mind that storage costs are sharply decreasing with the improvements in technology occurring everyday.

Other Objectives

The above mentioned objectives somehow were considered to be the major concern of a data base designer. Still other objectives or sub-goals must be observed in the design process.

Since different application programmers use different logical files, the data management system must be able to construct the logical files from the stored data so that the programming tasks are fa·ilitated. Moreover, different search criteria must be developed based on the physical data organization to respond to the fast inquiries made through the on-line terminal and through the normal organization channel.

If the data base has many diverse users, the association between the data items must be protected with regard to all the procedural steps of storing, updating, and interrogating. Furthermore, a newly designed data base software must not only be capable of adjustment to the old structure of data processing, but also be able to adapt itself to future needs without modification of the application programs.

It is quite normal for some sets of data to be more in demand than others. Therefore, storage of data becomes a function of its popularity. Suitable storage has to be provided for different groups of data, since there are direct relationships between the type of storage and the characteristics of various kinds of decisions.

Data Administration

Since the inception of electronic data processing, many new and challenging positions such as programmers, system analysts, have been created. A solid knowledge of only one field of study frequently is not enough to fill some of the positions. Consequently, there has been a great deal of controversy about the necessary qualifications of a person assuming such positions. For instance, accountants, management scientists, and operation research groups are still arguing about their own unique qualifications to occupy a position of head of an information system. Nevertheless, data base management has created a new task for a "data administrator" who is charged with the responsibility of controlling the data flow within the data base.

Chapter II pointed out that information is very similar to material resources. Both types of resources can be produced, are perishable, and have utility. Thus, in reality, information and its supporting data must be regarded as an asset of an organization and subject to the same type of treatment. However, a prevalent problem is the determination of the cost of this type of asset for reporting purposes. Nevertheless, in some organizations, data is regarded as a valuable asset; and the data administrator is responsible for the custodianship of data.

Since the complete independence of data from application programs is a primary concern of a data base, a main function of a data administrator is to establish a data dictionary. An application programmer is provided with only the required data name already defined by the dictionary. Another function of a data administrator is to protect data from unauthorized use and furnish each group of users with permissible passwords or security codes.

In order to guarantee the most effective type of internal control, the person in charge of data administration must be provided only with the layout of the data base and the logical organization of different files. His knowledge of the contents of the data base and specifically of the value of data items[4] is a hindrance factor to the system of internal control.

Software Requirements

One of the characteristics of the computer of an earlier generation was sequential file organization. In order for a program to process a data item, on the average at least half of the record in a given file had to be read until the desired record and data items were found. Moreover, the application program had to refer to the exact physical location of a stored data item. In this type of environment the mode of data also had to be determined by the program.

Introduction of the higher level programming languages, such as COBOL, helped to overcome some of the above problems. That is, several programs could use the same data items by causing the automatic mode change during access times, if the situation warranted.[5] This condition normally is referred to as "data independence," which means a high degree of independence between the way that a data item is stored and the method that a program utilizes that particular data item. Although complete data independence is a goal that a designer of a data base would want to achieve, with the current state of technology the objective of total data independence is unattainable.

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[4]James Martin, Ibid., p. 30.

[5]Edgar H. Sibley et al., "Implementation of a generalized data base management system within an organization," Management Informatics, Vol. 2, (1973), p. 21.

Generalized Data Base Management System

Generalized Data Base Management System (GDBMS), sometimes referred as "file management," is defined by Byrnes et al. as

> "a stand-alone method of producing reports, establishing and updating files from user-supplied specifications of (1) file characteristics and relationships and (2) report contents and formats."[6]

This type of system is basically developed for users who do not know programming; or if they do, their knowledge is not very thorough.

A GDBMS typically consists of two different types of softwares. First are those which enable a system programmer to organize and structure the data elements somehow, so as to minimize or eliminate the redundancy of data items and, at the same time, optimize the operating cost of the system. Second is the high-level programming language capable of processing the data contained in a data base. This type of software also solves various problems, produces reports, and generally provides an answer to the ad hoc programs.[7]

GDBMS's in general are created for establishing new files, updating and restructuring the file already existent in the system, and producing the report both according to predetermined specifications or on an ad hoc basis. Many brands of GDBMS's are created by the hardware manufacturers and software developers. Although some

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[6]Carolyn J. Byrness et al., "File Management Systems: A Current Summary," Datamation, (November 1969), p. 138.

[7]Richard D. Nolan, "Computer data bases: the future is know," Harvard Business Review, (September-October 1973), p. 105.

of the software packages do not automatically maintain files, they help the programmers in establishing and maintaining them.[8] Therefore, it would help the programmer to concentrate on the complexity of the problem rather than to be concerned about the routine tasks of file structure and maintenance of those files.

On the market a variety of GDBMS's are available which can save the programming and debugging time considerably. A few are as follows:[9]

System's Name	Company
SCORE III	Atlantic Software, Inc.
QUERY 3	Azrex, Inc.
IFAM	Cambridge Computer Association, Inc.
MODEL 204	Cambridge Computer Association, Inc.
IMARS	Interactive Science Corporation
EXTRACTO	Computing and Software, Inc.

In the development of a data base all organizations do not use GDBMS packages. There are four alternatives for organizing a data base management[10] system of which GDBMS packages are considered a part.

First, an organization may utilize the data management techniques of an operating system such as data accessing and scheduling. The

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[8]Carolyn J. Byrness et al., "File Management Systems: A Current Summary," op. cit., p. 138.

[9]More complete and further details are discussed in Lawrence, Welk, "Review of File Management Systems," Datamation, (October 1972), pp. 52-54.

[10]Edgar H. Sibley et al., "Data Base Management: A Framework for Effective Use," op. cit., pp. 13-16.

advantages of this type of system are its efficiency and ease in programming. Alleged disadvantages of such a system are incompatibility in usage of data and the cost of integration. The second approach is association of data with special application program. This type of system is relatively efficient and at the same time "custom made" for particular organizations. The custom-made feature of this system is like a blade with two edges which can cut for or against, since the system might become obsolete as some changes occur in the environment. Also this system is very costly to integrate.

The third alternative is the use of GDBMS in the form most readily available from software and hardware vendors. Since the costs of developing such systems are prorated to many different users, it would be very inexpensive to buy such types of systems. Moreover, they can be maintained through operating systems. Finally, the fourth alternative is to adopt a GDBMS based on a particular organization's needs or objectives. Although the maintenance of this system is more expensive than the above mentioned systems, it is more efficient and faster to operate.

Conference on Data Description Language

In order to improve the quality of the data base management systems, the Association for Computing Machinery in 1969 formed the Conference on Data Description Languages called CODASYL. Several committees have been formed within this conference to enhance the quality of the different languages. The Programming Language Committee, which coordinates the activities of the Data Base Task

Group,[11] has specified the Data Description Language (DDL) for improving the programming languages. COBOL is the first language to be considered for improvement. Therefore, the objective of the Data Base Task Group is to define a network or graph-type data structure which is not currently available in various COBOL versions. Moreover, the objectives are extended to develop a data manipulation language to access or process the data previously defined by the Data Description Language.

The scheme developed in the CODASYL Data Description Language consists of four types of entries:[12] (a) scheme entry, (b) area entries, (c) record entries, and (d) set entries. The format of the statements for this language is similar to the data division of the COBOL language. It should be emphasized at this point that the entire effort toward development of GDBMS, DDL, or similar types of software is to create more independence between the data items and application programs.

Hardware Requirements

Introduction of random access devices such as drum, disk, and CRAM (Card Random Access Memory) must be regarded as a major step toward development of GDBMS. Prior to these alternatives, the file management systems were almost nonexistent. Because the nature of sequential files created a situation where the data items completely depended on the application program, they could not be available for

[11]Edgar H. Sibley et al., "A Data Definition and Mapping Language," Communication of the ACM, (December 1973), p. 751.

[12]Detail description is given by James Martin, op. cit., pp. 112-128.

other purposes. In this type of system the amount of duplication was naturally high, thus resulting in a high cost of storage, programming, and processing.

Random access equipment has overcome this problem by allowing the data item to become more independent and readily available to more application programs within the system. The only disadvantage of this type of device is the high cost of storage which sometimes makes the system economically impossible to operate.

Some major breakthroughs have occurred in the field of hardware which have created a new era for development of GDBMS. The introduction of new storage facilities called Mass Storage System (MSS) has reduced the storage cost dramatically. That is, the monthly cost of storing a megabyte of data has decreased from approximately $7.00 to a fraction of dollars. Moreover, a system has a capability of storing 50 million byte in a small cartridge approximately two inches in diameter. This can increase the on-line capacity of the computer up to 472 billion byte.[13]

The MSS system creates the image of many more disk drives than are actually available by continuously transforming data from cartridges to the disk for computer use.[14] In summary, MSS brings together the low-cost advantage of sequential storage (such as tape) and efficiency of the disks. Therefore, it can be concluded that the

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[13]"New IBM Systems give direct access to massive amount of stored data," Datamation, (November 1974), pp. 126-127.

[14]"IBM 3850 Extends VS to Tape Cartridge," Computer World, (October 16, 1974), p. 1.

hardware development has kept up with the paths of GDBMS, while the development of software has not advanced so rapidly.

The only prevalent problem in hardware is that usually the generalized data base management systems are made by both hardware and software vendors. Therefore, those systems which are generated by the hardware manufacturers are normally restricted to certain operating environments created by the same manufacturers. Thus, it will reduce the flexibility of the systems tremendously.

Summary

A data base was considered as a necessary part of TIS and TINTS in Chapter IV. The objective of this chapter has been to present a brief description of data base and the operating environment which is required to make the concept operational.

In order to develop a data base, first the concept of information space was presented. Then the main objectives for designing a data base were suggested. The most important objective was the reduction of redundancy of the data items within the system and the creation of a safe environment for all the system users with maximum security. Moreover, the goal of the system designer would be to make the data items independent of application programs or *ad hoc* users of a system.

In order to achieve all the objectives stated, in a given organization a new position must be created known as "data administrator" who has the responsibility of protecting the stored data from misuse and of coordinating the storage and retrieval activities.

Several major breakthroughs have occurred in the software and hardware areas which have had a great impact on the creation of a more efficient and effective data base. The development of Generalized Data Base Management Systems in the software area and Mass Storage Systems in the hardware field are good examples. Although the hardware manufacturers have been able to keep up with the new challenging concept of GDBMS, the softwares seem to be some steps behind the hardware.

CHAPTER VI

DESIGN OF A TOTAL INFORMATION SYSTEM

A theoretical model of a total information system (TIS) was discussed in Chapter IV. The objective of this chapter is to develop a TIS for an actual organization in order to justify the practical implications of such a system.

The East Baton Rouge Parish School Board System especially has been selected for this purpose. Therefore, in the first part of this chapter the existing information system of the organization is presented. The second part of this chapter discusses the development of a TIS for the same organization.

Description of an Actual System: Public Educational System[1]

The Louisiana Constitution provides an elected State Board of Education of eleven members with powers to supervise and control public elementary and secondary schools. The State Superintendent of Education--elected by the people--is the Chief Officer and Ex Officio Secretary of the State Board of Education. Policies established by the State Board are administered by the State Superintendent:

At the local level the school board is the administrative unit of the public schools. The local boards are granted certain general and specific powers.

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[1]Source: Handbook, East Baton Rouge Parish Public Schools, Baton Rouge, Louisiana, April 1966.

East Baton Rouge Parish
School Board (EBRPSB)

EBRPSB is created by Legislative enactment. The Board consists of twelve members elected at the Congressional election on six-year staggered terms. Seven members are elected from the city of Baton Rouge (Ward 1), three from Ward 2, and two from Ward 3.

Duties of the Board

The Board is responsible for the operation, improvement, and evaluation of public education in East Baton Rouge Parish. It is both a deliberative and a legislative body. It is part of the Board's duty to formulate policies and to legislate to make these policies effective. It also evaluates and acts on recommendations concerning the progress and improvement of schools. Knowledge of educational principles and policies is essential to the Board to make decisions and resolve issues. The function of the Board is not to operate the schools, but to see that they are operated in the best interests of the children and taxpayers within the provision of Louisiana Law. The final responsibility of the Board is educational planning. Therefore, it is highly desirable that the Board use the finest professional assistance available.

The Superintendent

The Superintendent of schools is elected by the School Board for a term of four years. He is the executive officer of and the professional advisor to the School Board, and as such, is responsible for administering the parish public school system.

The major responsibility areas of the Superintendent are:

1. the instructional program
2. school administration
3. business affairs and auxiliary services
4. plans and recommendations for school facilities
5. nomination of all school personnel
6. dissemination of current information concerning the program of public education in the East Baton Rouge Parish to the Board and the public.

The organizational chart is included in Figure 1.[2]

Some Facts About East Baton Rouge Parish School System[3]

East Baton Rouge Parish is located on the east bank of the Mississippi, 240 miles inland from the Gulf of Mexico, and 85 miles northwest of New Orleans. Parish population is approximately 300,000. More than half of the population lives in the cities of Baton Rouge, Baker, Zachary, Pride, and Central. The Parish covers an area of 462 square miles.

There are 65,165 students enrolled in the public school system as of March 1975. These students attend various grades from kindergarten through high school.

Approximately 6000 persons of various ranks are employed by the EBRPSB. They serve the School Board in the following capacities:

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[2] All the figures in this section are illustrated in Appendix.

[3] Facts and Figures, East Baton Rouge Parish Public School Board, Baton Rouge, Louisiana, July 1973.

1. Staff of the Superintendent
2. Teaching staff consisting of:
    a. Principals and assistant principals
    b. Classroom teachers
    c. Guidance counselors
    d. Librarians
    e. Helping teachers
    f. Teachers of special education classes
    g. Teachers of home-
    h. Coaches
    i. Band directors
    j. Teachers in the adult education program
3. Maintenance
4. Bus drivers
5. School lunch program

EBRPSB uses the following facilities for various purposes:

School Board office building located at 1050 South Foster Drive, Baton Rouge, Louisiana;

Service Centers located at 6013 Choctaw Drive, Baton Rouge, Louisiana;

Material Center located at 6003 Choctaw Drive, Baton Rouge, Louisiana;

One hundred and five school buildings are located throughout the parish.

High School	11
Junior High School	14
Elementary School	75
Jr.-Sr. High	2
Middle School	1
Combination Kindergarten-12	2
Total	105

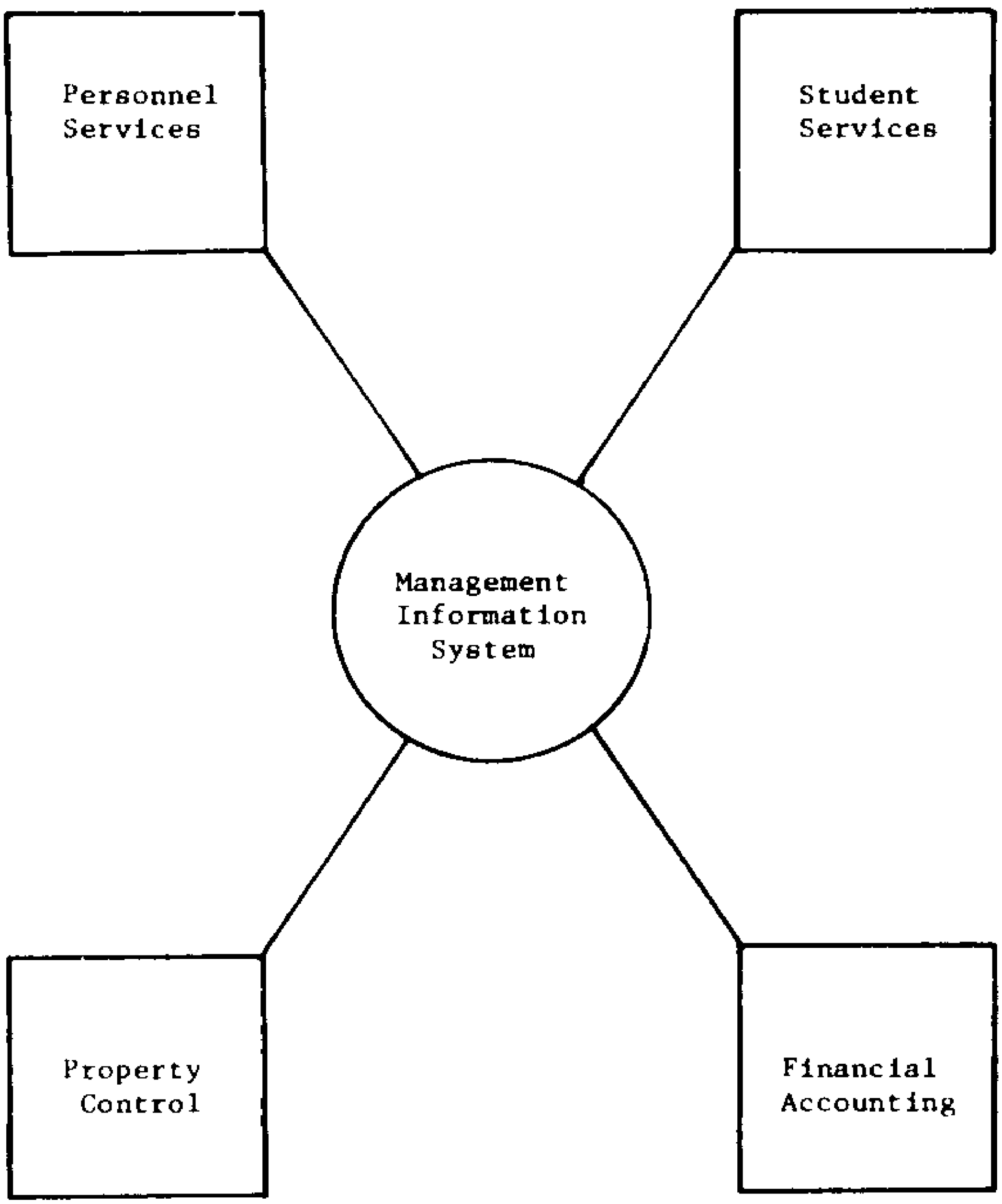
Data Processing Department

The Data Processing Department which directly reports to the Superintendent is charged with the responsibility of providing the organization with necessary information for planning and control. The goal of the Department is the development of a Management Information System (Illustration 1) which serves four general areas of personnel, student body, finance, and property control.

Currently the total number of personnel in this department is twenty-two who serve in different capacities. The breakdown of employees according to the organizational chart of data processing (Figure 2):

Position	Number
Manager of DP	1
Assistant Manager	1
Systems and Programming:	
System Analyst	1
Programmer Analyst	2
Programmers	3
Trainee	1

ILLUSTRATION VI-1. MANAGEMENT INFORMATION SYSTEM OF EBRPSB.



Operations

Operation supervisor	1
Operators	3
Key punch operator	8
Data control clerk	1
	22

Hardware System

The hardware equipment is basically a System 3500, manufactured by Burroughs. The speed and flexibility of the system is very impressive, processing by some of the hardware being measured in millionth of a second. Also the system is capable of performing many unrelated jobs at the same time in a multiprocessing mode and capable of continuing them without interruption. Although the multiprogramming feature permits compilation of both COBOL, FORTRAN, or any other language, all the programs in the Data Processing Department are written in COBOL.

The hardware and peripheral equipment of the system consists of:

(a) A Central Processing Unit with a capacity of 180 K.

(b) A System Memory with a capacity of 2,000 K. The Master Control Program (MCP), which is equivalent to the Operating System in the IBM's system, is stored in this unit. MPC actually is in charge of the control of multiprogramming activity. The access time of this storage on the average is 17 millisecond.

(c) A Head Per Track (Fixed Disk) for storing various data files. The capacity of this unit is 100,000 K and access time amounts to 40 millisecond. The history files are stored on magnetic tape and kept off-line.

(d) Two Disk Pack Drives with the capacity of 190,000 K and the average access time of 43 millisecond.

All the data files, except history files of various subsystems, are stored in the hardware equipment mentioned in (a), (b), (c) and (d) above. The nature of each application determines which of the above equipment is to be used for storage purposes.

(e) Four Tape Drives

(f) One Line Printer

(g) One Card Reader

(h) One Optical Mark Scanner

(i) One Univac Keypunch and interpreter machine

(j) Eight Univac CADE (Computer Assisted Data Entry) input terminals. The CADE system edits various data items before they actually enter into the on-line computer system.

(k) Eight CRT (Cathode Ray Tube) terminals. These terminals are primarily used for instant reply to various inquiries. However, they may be used as input terminals for purposes of correcting and updating.

System Description

Since EBRPSB is a public organization and is created by the power of legislators, it is accountable to the general public. Thus, a record of various activities must be maintained and secured constantly, in case that any type of review is warranted. In order to meet the requirement of various governmental agencies, as well as fulfilling the internal planning and control requirements, Management Information System of EBRPSB is designed around four subsystems. These subsystems are Payroll and Personnel, General Accounting, Student body, and Property Control. The functions and capabilities of each subsystem are described in the following sections.

Payroll and Personnel Subsystem

The objectives:

1. To provide input to the general ledger system, maintain the accounting system, and the student services systems.
2. To provide timely, accurate personnel reports (contracts, employee directories, statistical analyses, and others).
3. To provide rapid and accurate preparation of payrolls and associated reports.
4. To provide on-line inquiry and provision for updating the basic files.

Ninety-four different programs are written for this subsystem. The complete list of these is included in Figure 3. All of the above programs do not necessarily produce a written report or any type of useful output. There are a few service or utility programs which are mainly written to facilitate other data processing tasks.

Characteristics of the Subsystem

The payroll and personnel subsystem is capable of handling various terms of employment in the school system payroll. Currently there are twenty four different types of payrolls in the EBRPSBS. The various types of payrolls are determined by combining the type of position, the number of months that employee should serve according to the contract, and the number of payment periods.

Position Code	Payroll Type	Pay period per year	Months in service
0010	AA	26	12
0020 - 0500	AB	26	12
0510 - 0990	AC	26	12
1000 - 1800	AD	26	12
1950 - 1990	AE	26	12
2000 - 2740	AF	26	12
2750 - 2850	AG	26	12
2950 - 3000	AH	26	12
3010 - 3730	BA/BB	10	09
3740 - 3880	BE/BF	10	10
3900 - 3990	BC/BD	10	09
4010 - 4010	CD	18	09
4020 - 4050	CF	20	10
4110 - 4150	CE	18	09
4160 - 4200	CC	18	09
4510 - 4750	CA/CB	10	09
5000 - 5990	DA	26	12
6000 - 6990	DD	18	09
7000 - 7100	DB	26	12
7110 - 7500	DC	18	09

The programs use a position code to determine the number of working days in a particular employment year. The present employment term includes 260 days, 200 days, 180 days, and daily part-time and hourly part-time.

Employees may choose any combination of authorized payroll deductions (minimum of 12 per employee). Current deductions are made for seventeen different tax sheltered annuity plans, two separate income protection programs, two credit unions, bonds, United Givers, rent, service station purchases, tax levies, garnishments, and unlimited miscellaneous deductions. In addition to the above voluntary deductions, group insurance, retirement, Federal, State and city income tax and FICA are computed and withheld.

An employee may choose to receive his income within 9, 10, or 12 months, subject to the provisions and terms stated in his or her contract. Since the basic payroll system uses the exception payment method, an employee is paid his normal daily rate of pay, times the number of days in the current pay period unless exceptions are reported. The exceptions that can be handled automatically are as follows: (a) late starters and terminations in a given pay period; (b) sabbatical leave deductions and payments; (c) updating sick leave and annual leaves; (d) salary increases due to experience and/or degree change; (e) calculation of overtime for all the eligible classes of employees.

Moreover, employees may choose to receive their checks at their work locations, have the pay deposited into a bank account or credit union of their choice, or have it mailed directly to their homes.

In addition to the above features that culminate in the generation of some type of report in the form of a hard copy, an on-line inquiry system has been built into the payroll/personnel subsystem. The Payroll and Personnel Department are able to ask for certain types of information that can be answered instantaneously by computer via the Cathode Ray Tube (CRT). This information is of two types:

(a) Inquiry - Basic data on any employee on the file.

(b) Updating - Updating certain data fields in the master record via CRT terminals.

Inputs to the Subsystem

The Payroll/Personnel subsystem is structured according to the exception principle. That is, it never requires any type of input to the system, unless some part of data already stored in a given file needs modification. Otherwise, the subsystem will automatically pursue the procedures for which it is programmed, without the use of any type of input. The only system requirement is that proper files must be established when the subsystem is originally designed. Record description for each file in this system has been described elsewhere in this report.

Exceptions that necessitate modification of the master files are cf the following types:

1. charging an employee's salary to a fund or ledger other than the one which normally appears in his record.
2. splitting charges in the same pay period due to change in position, fund, ledger, salary.
3. paying an employee with a group other than his normal one.
4. correcting the errors (especially those which cannot be held until the next normal payroll), e.g. refunding money withheld as an adjustment for absence or sabbatical deduction, adjustment for an employee who was paid at the incorrect rate of pay.

It is necessary that the above exceptions be reported to the Data-Processing Department as soon as the events occur. For instance, a special form (Figure 4) is used to announce retirement or death of any employee, or an Absence Report form (Figure 5) is used to report the absentee situation. The information about the substitute person will be provided in the same form. Therefore, the payroll for substitutes can be prepared.

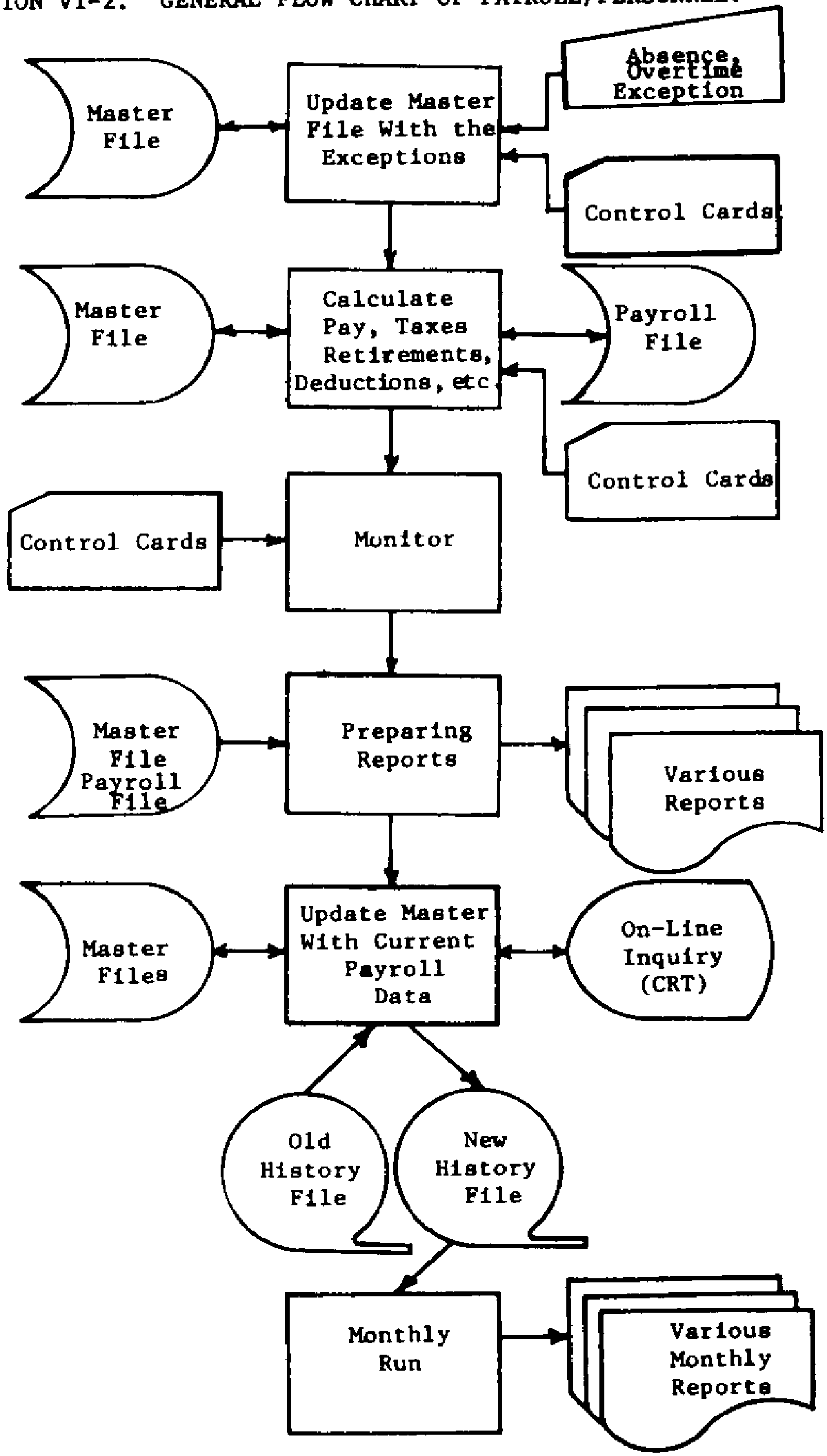
For any of the above changes, the name, social security number, position, location will be punched and fed into the system. Then it is possible for the subsystem to handle exceptions along with normal cases simultaneously. The usual type of payroll and information included in the report is exhibited on Figure 6.

Output of the Subsystem

A complete list of the output of this subsystem is illustrated in Figures7 through 38. The variety of reports ranges from simple payroll register to statistical breakdown of employees according to sex and race. The format of reports are designed in order to fulfill the requirement of various regulatory agencies such as State Department of Education and Department of Health, Education and Welfare. Moreover, these reports provide information for adequate amounts of control over the entire payroll and personnel activities of the School Board.

The general flow chart of the payroll/personnel subsystem (Illustration 2) gives an adequate overview of the subsystem operation. The master file must be updated by use of exception information. Then all the necessary calculations, such as pay, taxes, retirement, deduction are performed and the system is available to generate any type of report which it is programmed to do. At this point, the Monitor Program will take over the control for the entire system. A

ILLUSTRATION VI-2. GENERAL FLOW CHART OF PAYROLL/PERSONNEL.



sequence of report generation and updating will be followed sequentially. After all the reports are printed, the history file will be updated. The history file later produces various types of monthly reports. On-line inquiry service is available at all times on CRT units. The format of the on-line retrieval system and the types of information which are available is illustrated in Figure 39.

File Structure

There are a large number of files in the Payroll/Personnel subsystem. Combination of one or more files is necessary in order to run any application. The file structure and format of the most important file are described in Figures 40 through 50.

General Accounting Subsystem

Characteristics of the Subsystem

The general accounting system is composed of the following applications:

1. Accounts Payable
2. General Ledger
3. Accounting for Payroll
4. School Lunch

Several files are involved in processing the information in this area. The structure and organization of each of these files will be discussed separately for each application.

There are twenty-five different programs in this subsystem (Figure 51). Some of these programs are, in fact, utility or service types of programs. But the majority of the programs cause the creation of some sort of report for planning and control purposes.

Accounts Payable

The objective of this application may be summarized as follows:

1. To handle the writing of checks to the vendors and employees (for travel expenses).
2. To post the summarized transition to the respecting ledger.
3. To prepare various types of reports concerning audit trail, budgetary control, and periodical summaries.

Input, output, and procedures (Illustration 3). Invoices which are ready for payment are received by the Accounting Department. After the accuracy of invoices are checked, they will be coded for data processing purposes. This coding will be done directly on the invoice or Accounts Payable Charge Voucher. Charge vouchers and invoices are accumulated in the Accounting Department until a reasonable batch size is obtained. A batch control total will be prepared for the entire batch. Then a batch number will be assigned by the Accounting Control Clerk, to each batch, and the batch will be turned over to the Data Processing Department.

Batches are keypunched and verified in the Data Processing Department. Then each batch must pass through the edit run. A listing is prepared if any error is found in the batch. Also a list of all the transactions will be printed and sent to the Accounting Control Clerk where they are checked against original invoices or charge vouchers (Figure 52).

Approved batches are returned to Data Processing. Any corrections noted are punched and run against Accounts Payable file. If the correction is minor, it will be handled by Data Processing. A

ILLUSTRATION VI-3. ACCOUNTS PAYABLE FLOW CHART.

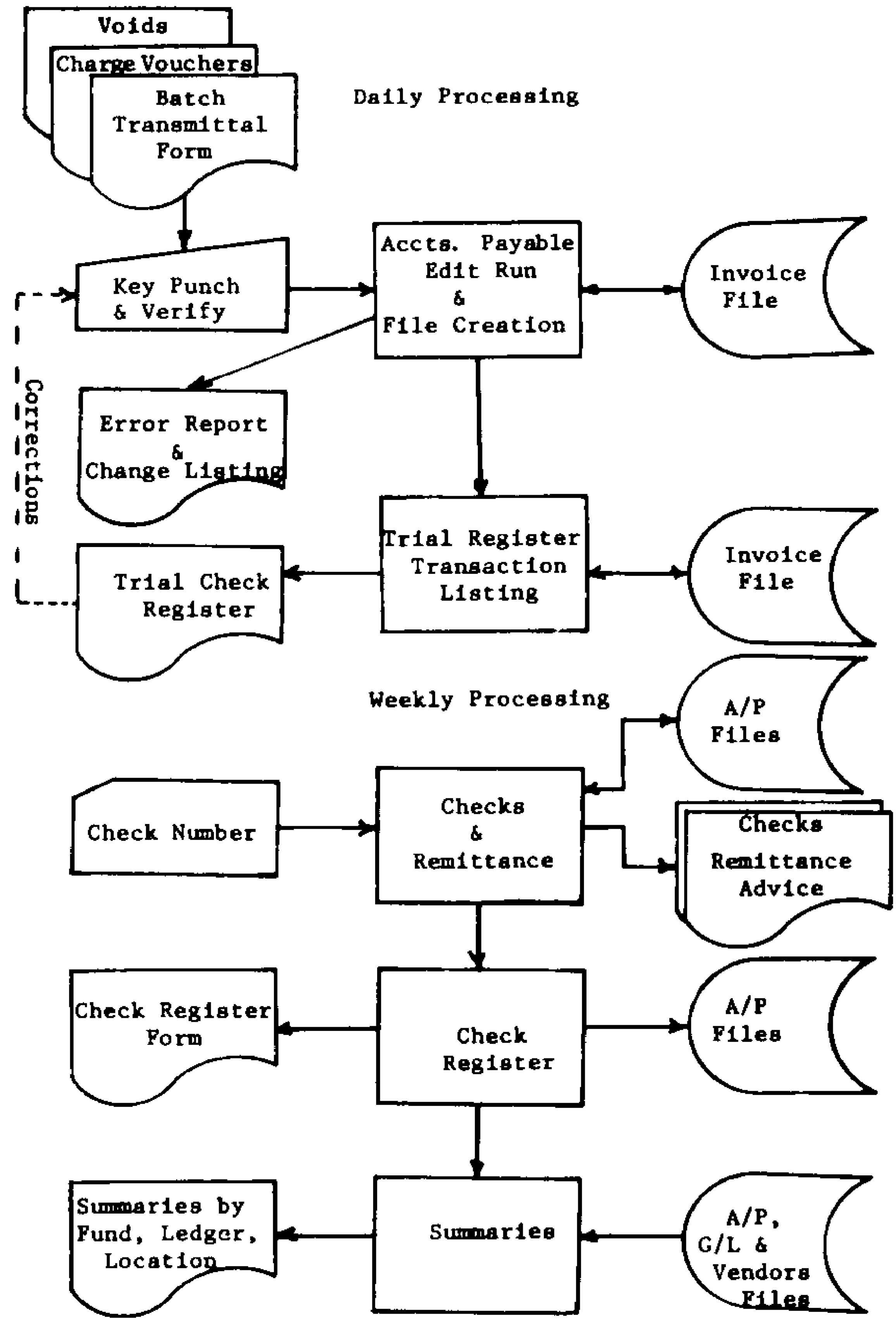


ILLUSTRATION VI-3 cont.

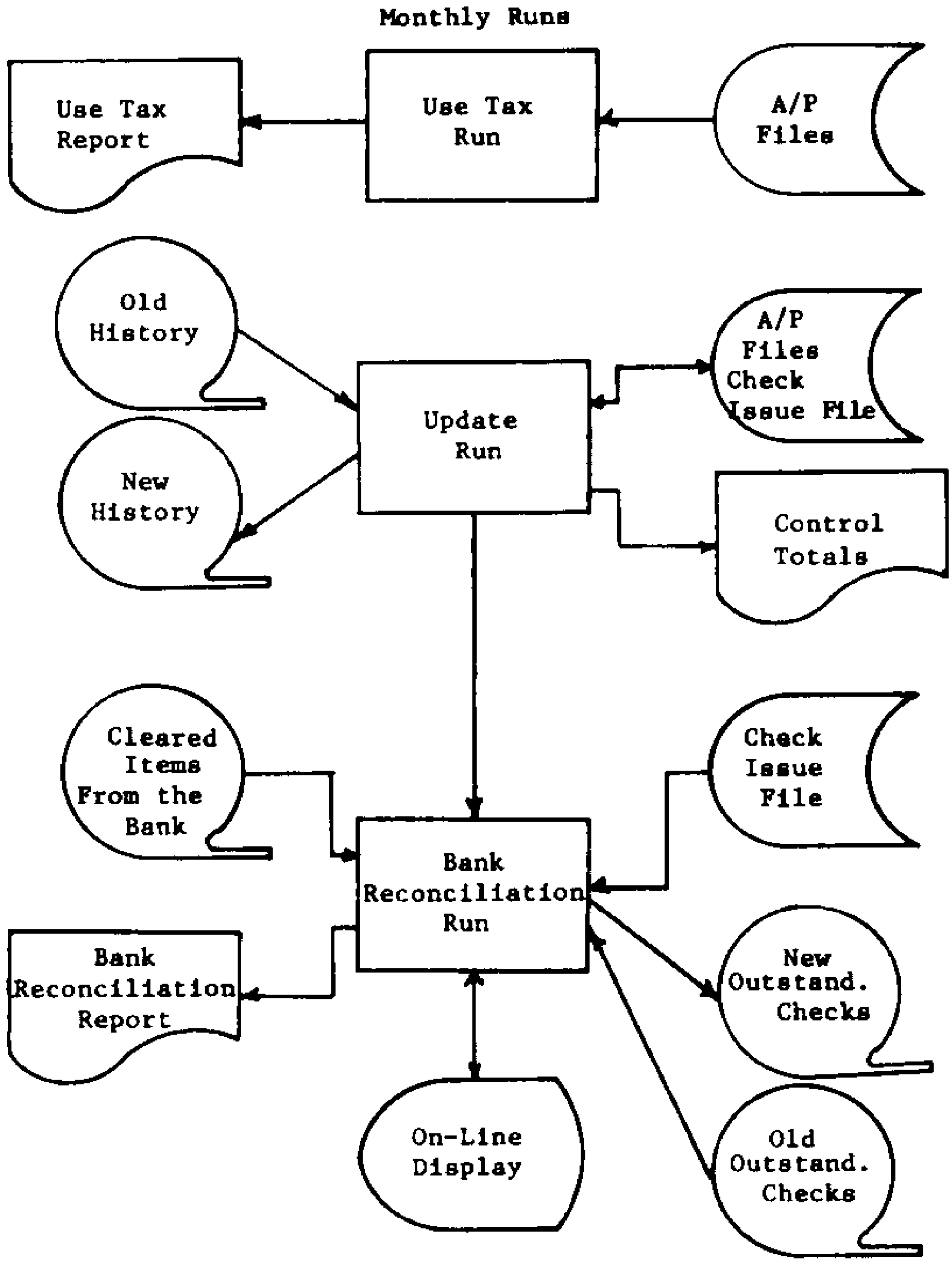
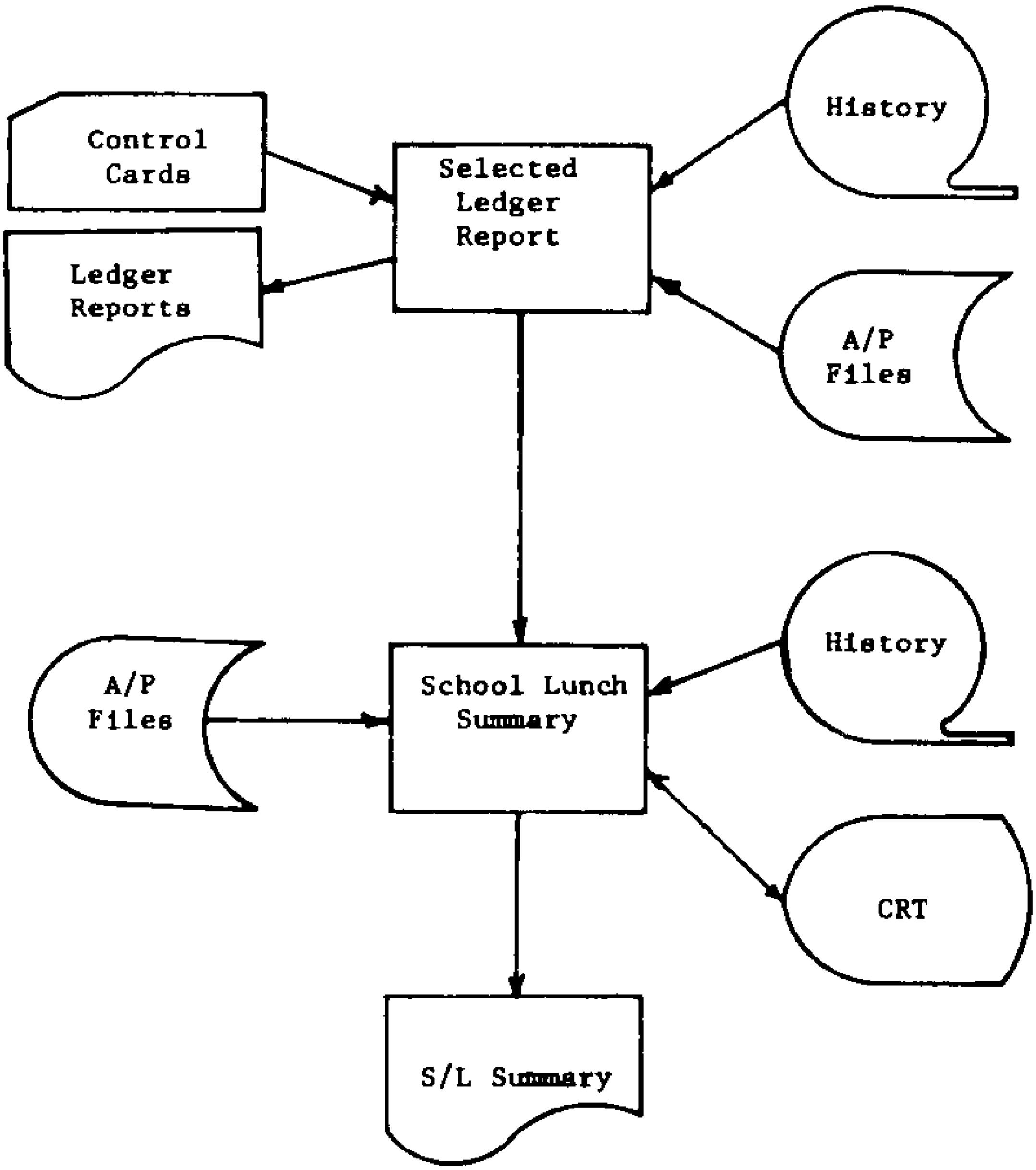


ILLUSTRATION VI-3 cont.

A/P Miscellaneous Reports



new list (of correct transactions) will be prepared and sent to the Accounting Control Clerk for the final approval. When all corrections have been made, batch approval cards are loaded for all batches which are ready to run.

The checks and remittance advise form (Figure 53) will be printed once a week by reading the Accounts Payable file and approved batches of transactions. Check and journal register will be printed immediately after this run (Figure 54). Then all the summaries and posting to general ledgers will be prepared (Figure 55 and 55-1).

At the end of each month tax reports (Figure 56 and 57), list of vendors, number of checks written to each one, and a monthly summary for each location will be prepared. After preparation of these reports, the year-to-date (History) tape is updated and all records stored on the history tape will be cleared from the Accounts Payable file. This procedure will make the master file ready for the next month activity. Work file for bank reconciliation will be created, and bank reconciliation (Figure 58) will be prepared after the necessary data are received from the bank.

At frequent intervals some selected ledger report (Figure 59) are generated. Also summary of the School Lunch Program is another output of this application (Figure 60).

On-line inquiry system is also available at any point of time for the verification of each account balance.

File structure. The two main files that are used throughout the Accounts Payable processing are Accounts Payable File and Accounts Payable History File. The layout of both files is illustrated in Figures 61 and 62.

General Ledger

This system as an integral part of the accounting package handles those accounting procedures which are not performed by Accounts Payable and Payroll/Personnel systems. The objectives of the system are:

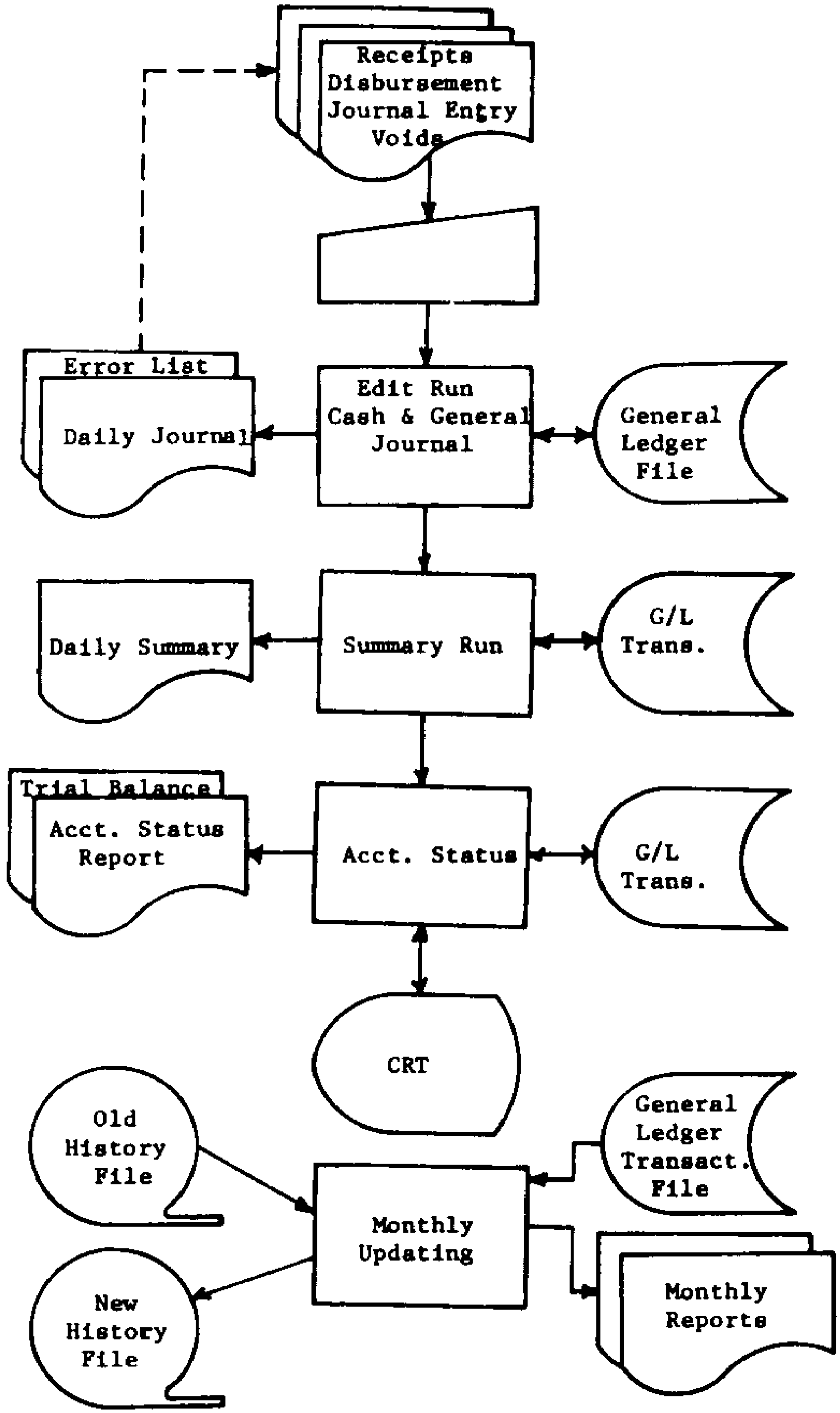
1. To process the receipts and disbursements
2. To prepare cash and general journals
3. To handle the procedures to be followed for voided checks
4. To prepare summary reports of actual posting to the general ledger.

Input, output and procedures (Illustration 4). The Accounting Department is responsible for preparation of all source documents according to the requirements which are specified for the system. These requirements vary in different situations as follows:

1. Receipts. All funds which are received by the School Board are deposited into the bank account on the same day. The Accounting Department prepares a deposit voucher (Figure 63) which includes the following data: (a) fund name, (b) payor, (c) ledger code, (d) debit and credit amount(s) of each transaction. If the payor is one of the School Board employees, his or her Social Security number will be entered instead of the payor's name. If the payor is a frequent source of receipts and disbursements, a vendor number is assigned and will be used instead of the name.

2. Disbursements. As the checks are written, a carbon copy is produced. This copy shows the payee's name, check number, date, and amount of check. Accounting Department will add debits or credits

ILLUSTRATION VI-4. GENERAL LEDGER FLOW CHART.



and vendor number (if assigned) to each copy and send to data processing.

3. Journal entries. Journal entries can be made by completing the special form (Figure 64).

4. Voided checks. A Voided Check Form (Figure 65) must be filled by the Accounting Departments.

All receipts, disbursements, journal entries, and voided checks are batched for each working day. A batch transmittal form is prepared (Figure 66) showing predetermined totals of all debits and credits (Total of debits must be equal to the total of credits). After the accounting control clerk assigns a number to the batch, the batch will be forwarded to the Data Processing Department.

The batch immediately after receipt will be punched and verified. Then will be sent through the edit run. The edit program prints an error list, adds the valid transaction to the transaction file, and prints the daily journals (Figure 67).

Batch of source documents, error list, and daily journals are sent to the accounting control clerk. Journals and errors are checked, corrected and approved and returned to the Data Processing Department.

The Data Processing Department makes any necessary corrections; and if batch totals balance, a Summary Report (Figure 68) will be prepared and all the day's transactions will be posted in the ledger. Then an Account Status Report (Figure 69) and Trial Balance (Figure 70) will be printed.

At the beginning of every day, before the above procedures are followed, a trial balance will be prepared to check the Data

Processing files. By doing so, any problem can be located and corrected before the current day processing is begun.

At the end of each calendar month, the current month's transactions will be added to the history tape. Then a monthly journal which supercedes all the daily journals will be printed. This journal will become part of the permanent record of the system.

The CRT terminal for instant reply to various inquiries is also available. Rapid inquiry is usually made to check the balance of various amounts at any given point of time.

File structure. Three files which are used in the processing of the General Ledger are illustrated in Figures 71, 72 and 73.

Accounting for Payroll

Most of the input to this system is generated by the Payroll/ Personnel subsystem. Therefore, in this part of the processing, inputs from Payroll/Personnel and other input from the accounting department will provide necessary tools for handling an efficient method of Fund Accounting.

Salary and wage expenses of employees of EBRPSB are paid through approximately 30 different funds. In order to pay the net pay and make the various deductions, it is required to issue a great number of checks for each fund at each pay period. In order to facilitate this type of clerical work, an accounting system is devised to issue only one check for every deduction to all funds. A simple example will show how the system actually works. Two different funds are established for this purpose, Consolidated Fund and Net Payroll Fund.

Suppose that a $1000 salary should be paid from General Fund and the total deduction for Federal Tax, FICA, Retirement is $200. Charging this amount to general fund and payment of this amount are shown as follows:

Entries in General Fund

Salary Expense	
(1) $1,000	

Salary Payable	
(2) $1,000	$1,000

Cash	
	$1,000 (2)

Entries in Consolidated Fund

Due from General Fund	
(1) $1,000	$1,000 (2)

Deductions	
(3) $ 200	$ 200 (1)

Net Pay	
(4) $ 800	$ 800 (1)

Cash	
(2) $1,000	$ 200 (3)
	$ 800 (4)

Entries in Net Payroll Fund

Net Pay	
(1) $ 800	$ 800 (4)

Cash	
(4) $ 800	$ 800 (1)

A series of journal entry reports is generated at this stage, which will be used later on in the general ledger accounting system. The file structure of payroll accounting is illustrated as part of the Payroll/Personnel subsystem.

School Lunch

The objective of the system is to facilitate collection of the school lunch money. It also relieves some duties of the schools' accounting department.

Input, output and procedures. A computer run will be made once a week, in addition to a monthly report that will be prepared at the end of each month.

Each school is given a choice of selecting their own bank. Deposits, NSF checks, and withdrawals will be accounted for cash, school and bank account separately. The daily school lunch bank balance will be controlled regularly. Date of the transactions that are received later than the dead line must be adjusted before being sent through the system. In the school lunch file, there is no record for those schools that have no lunch program.

A weekly batch of transactions will be keypunched and verified as they are received. The system can handle multiple batches. If all the batches are in balance with the batch total, which was prepared previously, the transaction will be sent through the system. Otherwise, a transaction list will be printed for those batches which are off balance. After the correction has been made and all batches are in balance, the weekly result of operation will be prepared and the history files will be updated (Illustration 5).

ILLUSTRATION VI-5. SCHOOL LUNCH FLOW CHART.

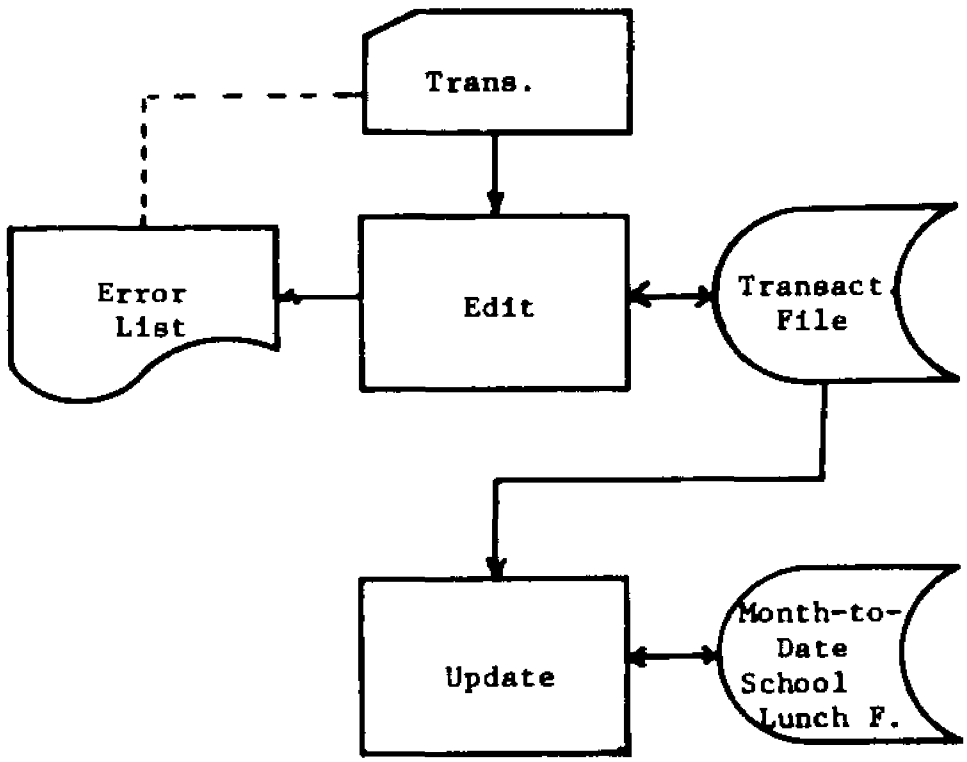
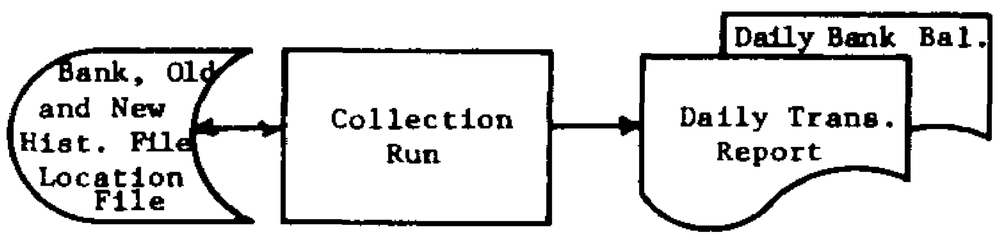
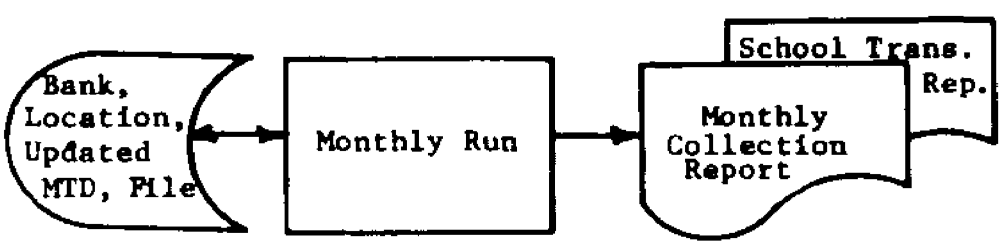


ILLUSTRATION VI-6. SCHOOL LUNCH COLLECTION FLOW CHART.



Monthly Report



The system produces daily, weekly and monthly reports for bank balances and other transactions that have occurred in the school lunch program (Illustration 6).

File structure. Three files are primarily used in this part of processing. They are Bank File, History File, and Month to Date Transaction File which is shown on Figure 74.

Student(s) Subsystem

The objectives of this subsystem can be summarized as follows:

1. To establish a standard record for each student in the parish.
2. To maintain complete and accurate student data--both current and historical.
3. To provide assistance in the areas of:
    A. Student class scheduling
    B. Attendance reporting and accounting for it
    C. Reporting of grades
    D. Cumulative record keeping
    E. Standardized test reporting and analyzing
    F. School district assignment and adjustment
    G. Student information retrieval
4. To operate as one centralized source of information to meet all reporting requirements of local, state, and Federal agencies.

Characteristics of the Subsystem

An on-line file, to include one record for every student, is organized to permit simple retrieval procedures. Thus, it makes efficient use of the storage medium readily available. Data which are common to all students and which are used frequently are kept on magnetic disk storage with random access capability. Other data are stored on magnetic tapes as well as on micro-fiche and roll microfilm. In addition to the above data, each school maintains a file folder for each student which contains all pertinent data needed by the school. Also included in this folder are the registration forms completed at the time of enrollment, which makes available such infrequently used data as natural father's name, mother's maiden name.

Inputs and Outputs of
the Subsystem

The major part of the input to the system is provided by a Student Information Sheet form (Figure 75). This form provides necessary data about the new students, changes in students' status, drop or transfer of students from the Parish. Additional source documents are used as an input to the system as the need arises, depending on the nature of each application. An optical mark reader is used to capture student absences, grades, schedule requests.

The following are the major applications which are run by the student subsystem:

Class scheduling. Computerized scheduling of students into classes is accomplished for all junior and senior high schools in the parish. Numerous options are available to the school principal to assist him in developing the optimum schedule for his students (Illustration 7).

ILLUSTRATION VI-7. STUDENT SCHEDULING FLOW CHART.

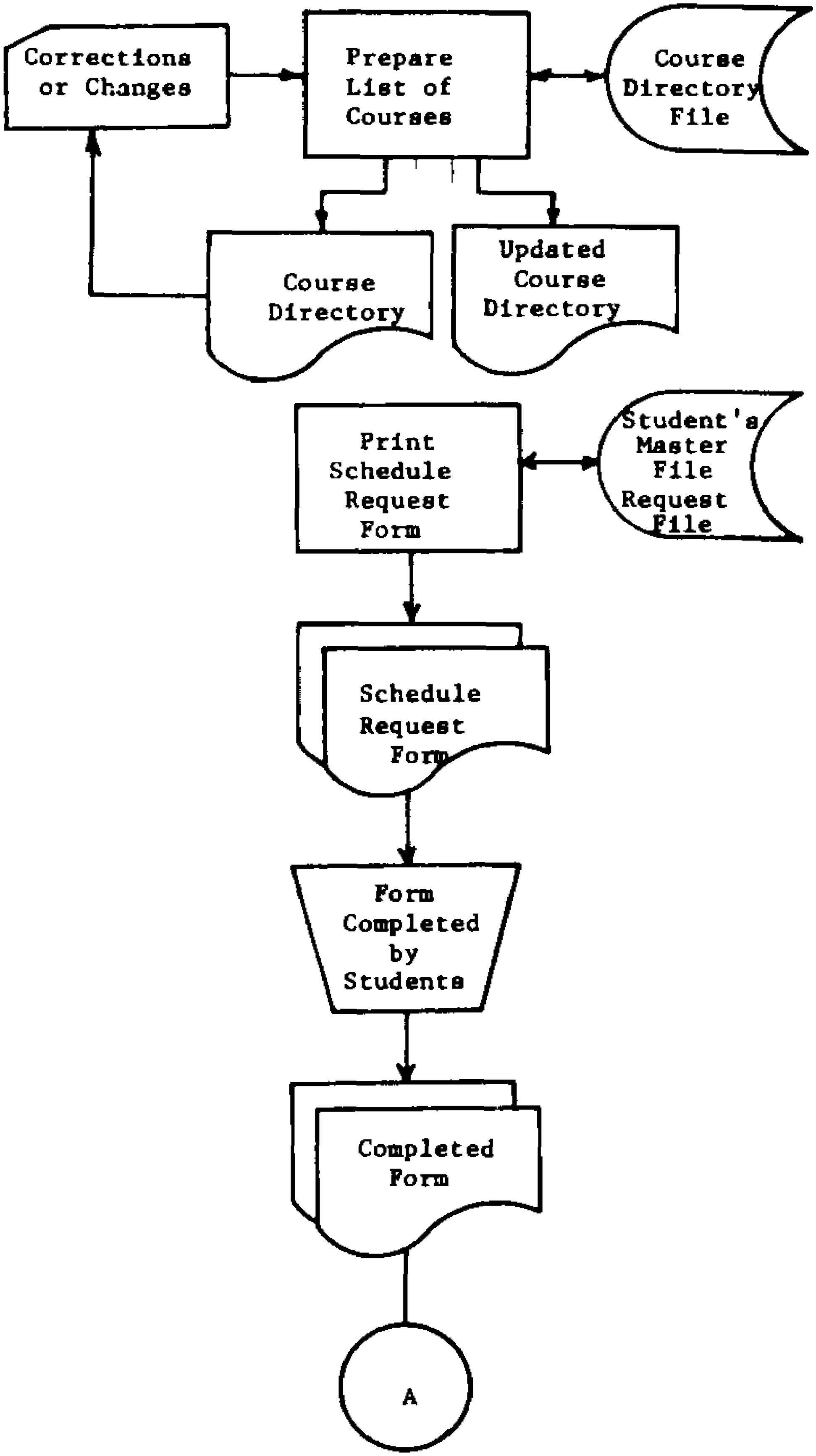


ILLUSTRATION VI-7 cont.

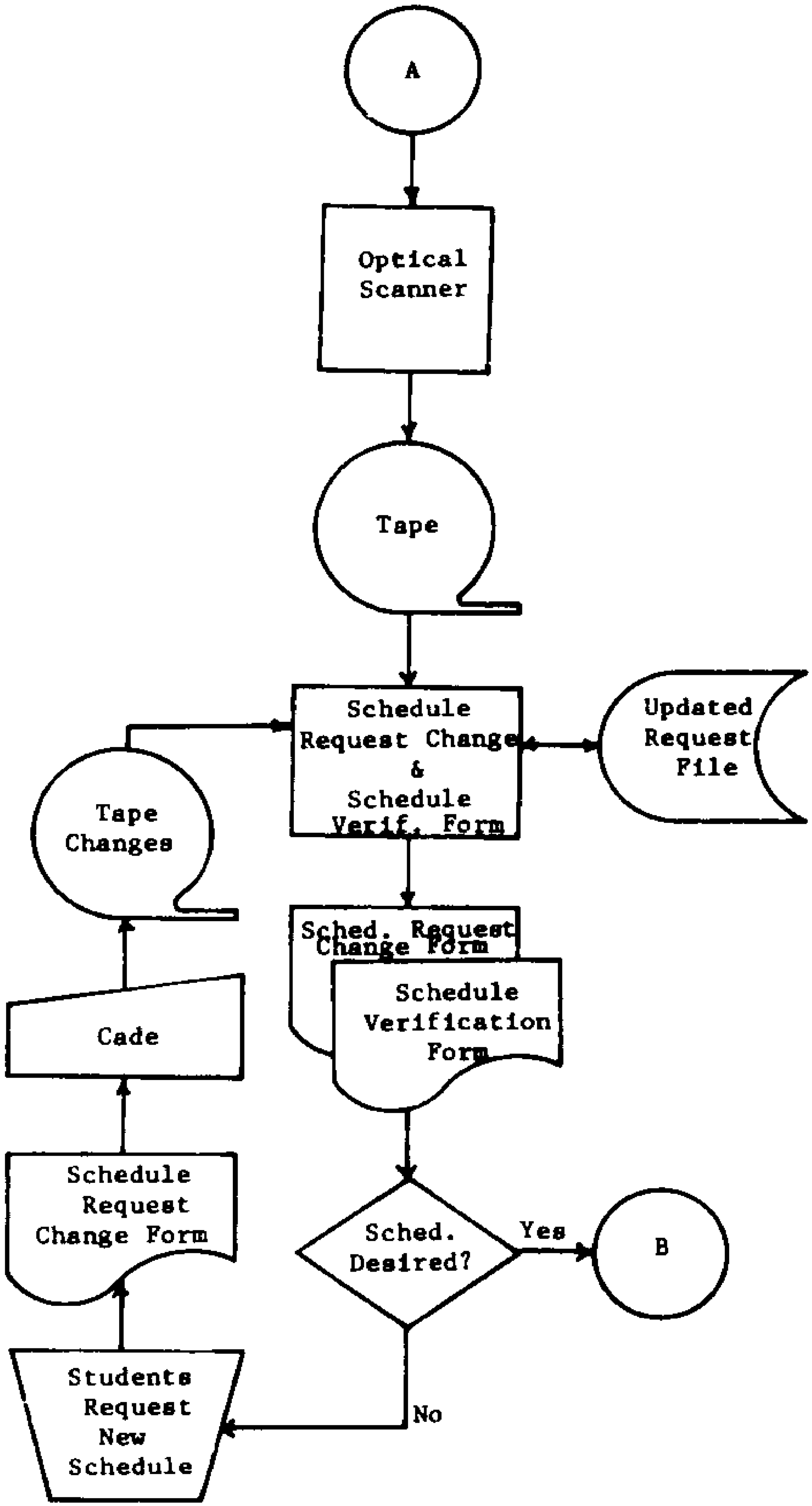


ILLUSTRATION VI-7 cont.

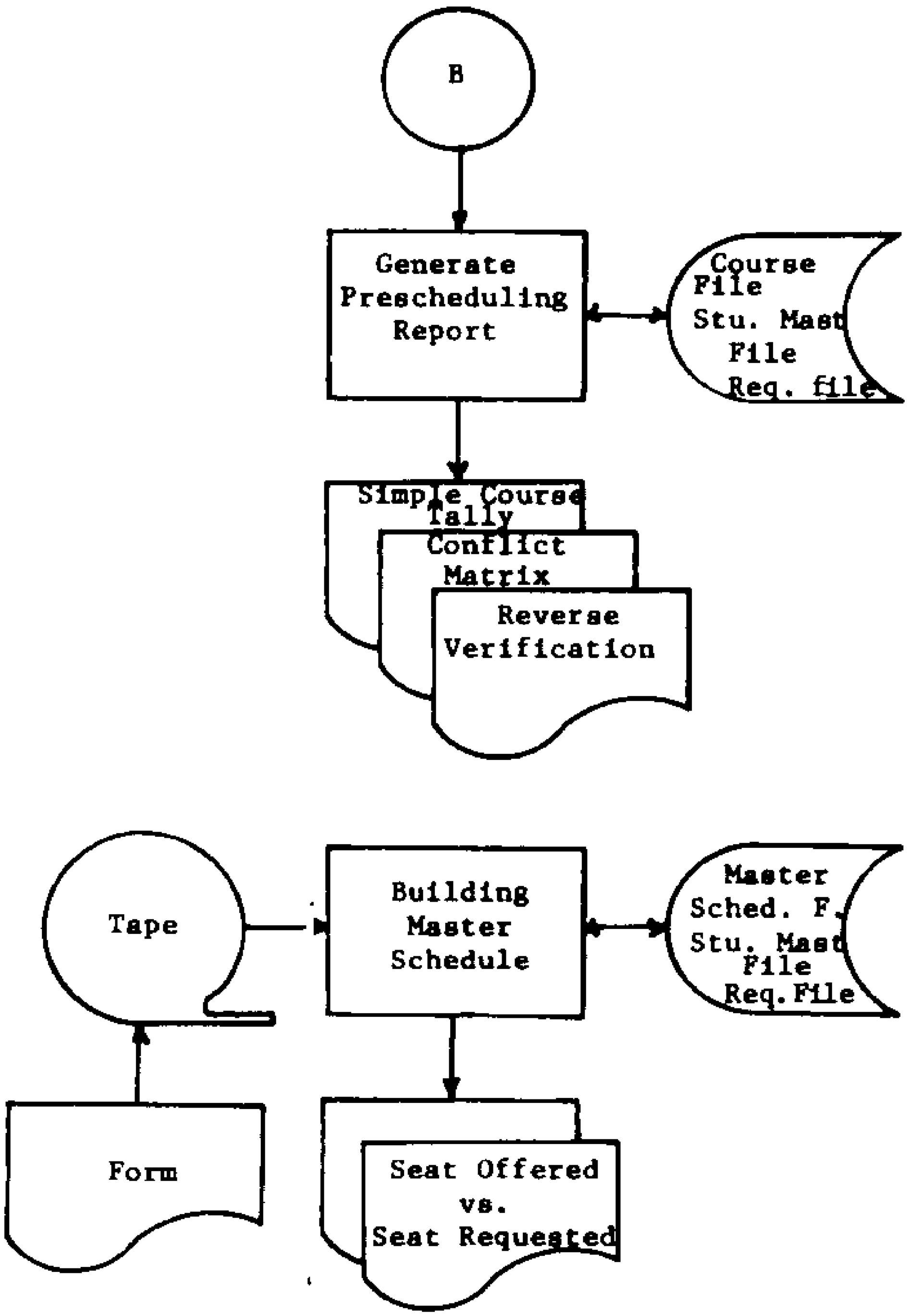
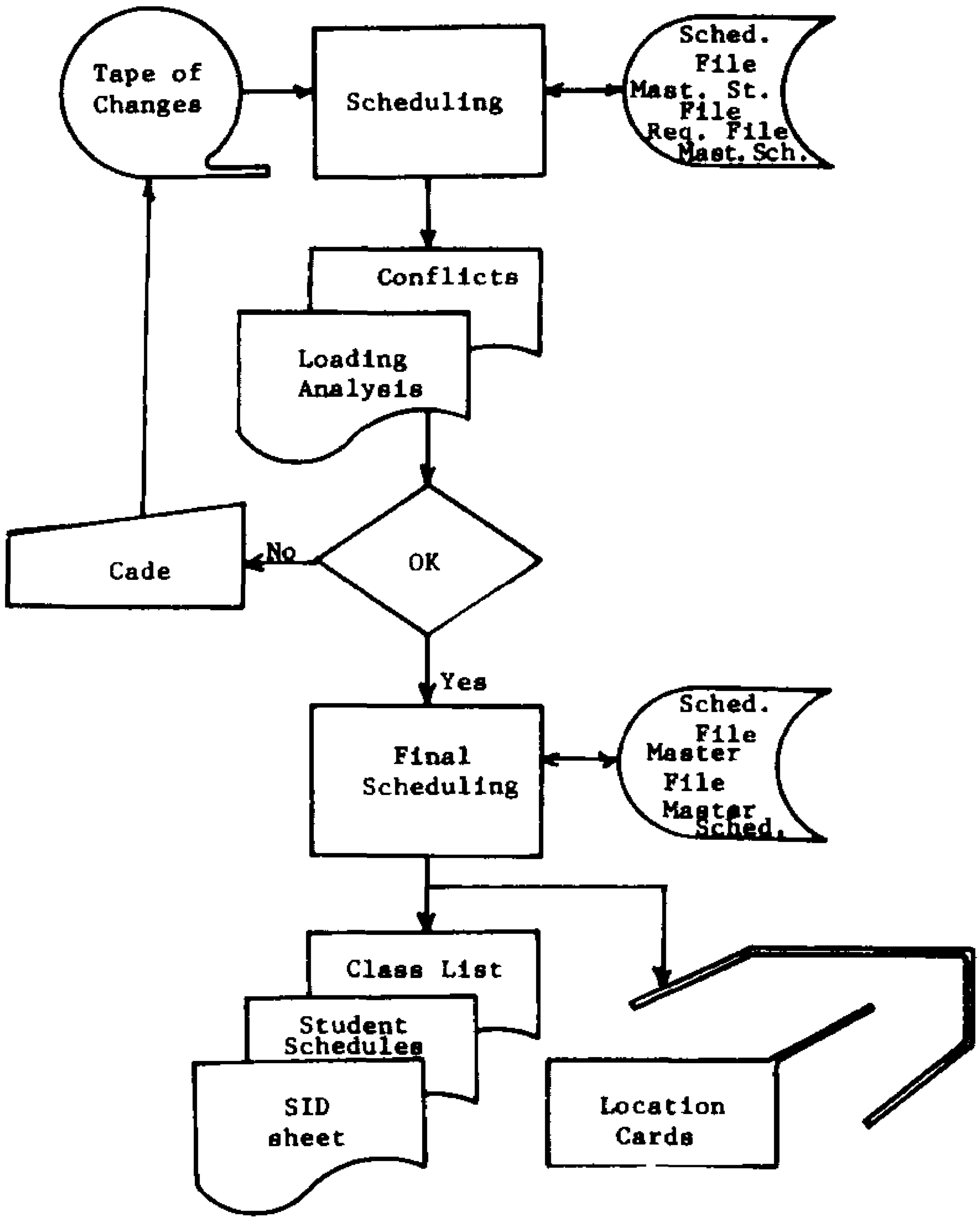


ILLUSTRATION VI-7 cont.



The generalized form inherent in this subsystem will allow the schools in the district to have totally different ways of offering classes. It is not necessary for each school to conform to the same program. The subsystem is also capable of scheduling traditional six and seven period days.

Before scheduling any run, a list of courses offered in each school will be prepared. This list includes just the course number and course title. Then the Schedule Request Form (Figure 76) will be printed from the student's master file. This form, after being completed by the student and his advisor, will be sent to the Data Processing Department for further processing. The form, which is designed on an optical scanner sheet, will be read and stored on a magnetic tape. In a separate computer run the schedule will be verified and two forms--Schedule Verification Form and Schedule Request Change Form (Figure 77)--will be prepared. Schedule Verification Form and Schedule Request Change Form have basically the same format. Except in the former one, a space has been provided for the signature of students. If the schedule is acceptable by the student, he signs the form and returns it to the school. Otherwise, the desired changes are made on a Schedule Request Change Form and sent to Data Processing Department for further processing. After all the changes are made and entered in the system by means of CADE input devices, three reports will be prepared. These are a simple course tally (Figure 78), a Conflict Matrix (Figure 79), and a Reverse Verification (Figure 80).

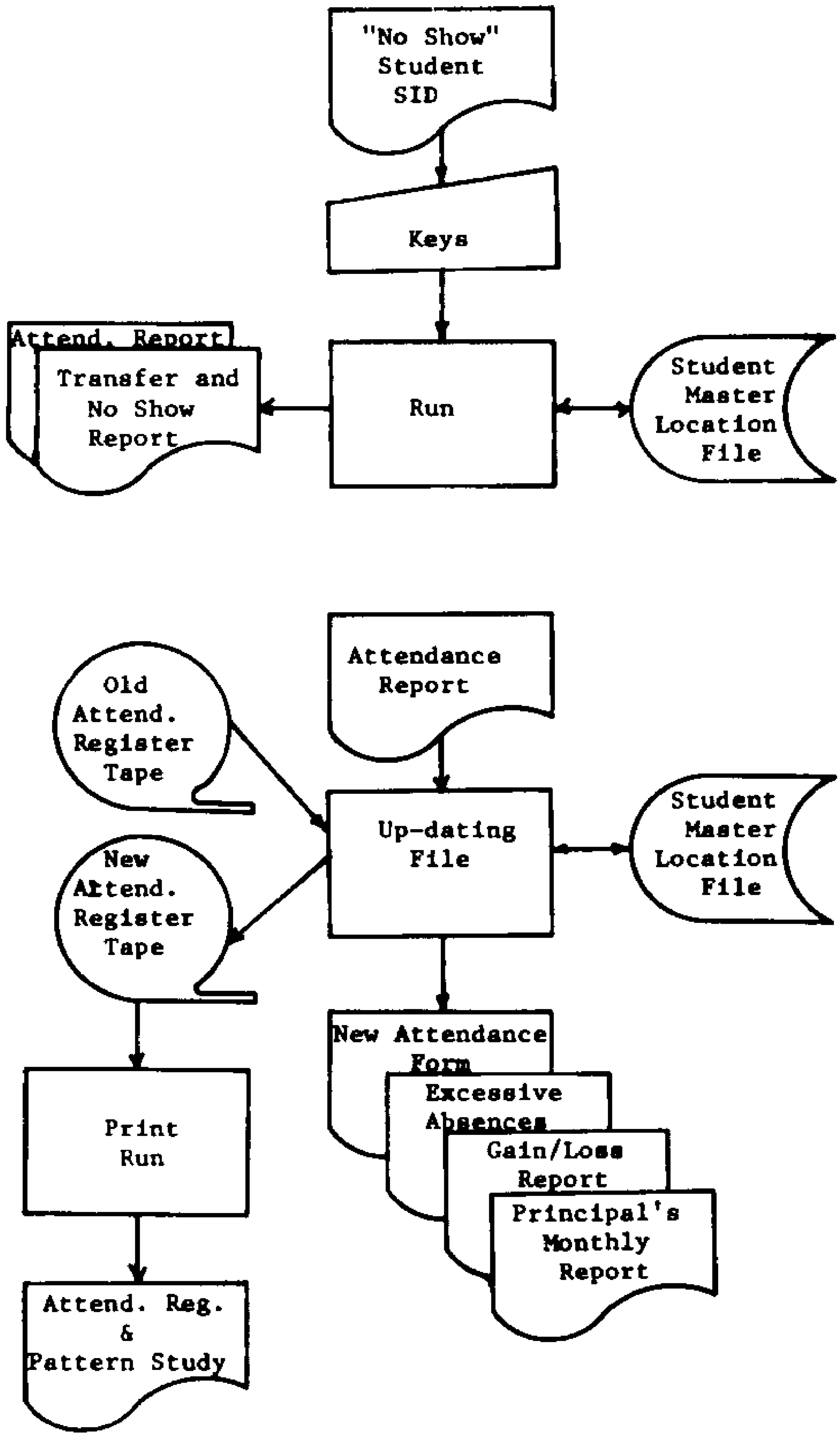
Building the master schedule file is the next step. The input to this run is prepared by the individual school (Figure 81). The output of this run is master schedule file and Seat Offered vs. Seat Requested report (Figure 82). Then the Conflicts Report and Loading Analysis will be printed. Each school must review all these three reports and suggest any necessary changes. After the changes are made, the final scheduling program will be run.

The outputs of final run are: (1) class lists, (2) Student Schedule form, to be handed to each student (Figure 83), (3) Locator cards, and (4) an updated Student Information Sheet (SID) (Figure 75, which has already been described).

Attendance reporting and accounting. The producers allow a simple and accurate reporting of student absences (Illustration 8). The registration period at the beginning of the school year is set by the Census Department, usually done in the first two weeks of school. During this time attendance forms are not printed; therefore, the school has to keep roll by some other means. At the end of the registration period, the students who were enrolled in school but did not ever attend are considered as "No-Show." These students are removed from the school's active files and are not used in the enrollment calculations.

A special report (called C-2) will be prepared for those students transferred from one school to another within the Parish (Figure 84). This report basically includes the student's name, race, grade, and name of school from which he has moved. In the last page of the report a summary of the number of students transferred

ILLUSTRATION VI-8. ATTENDANCE REPORTING.



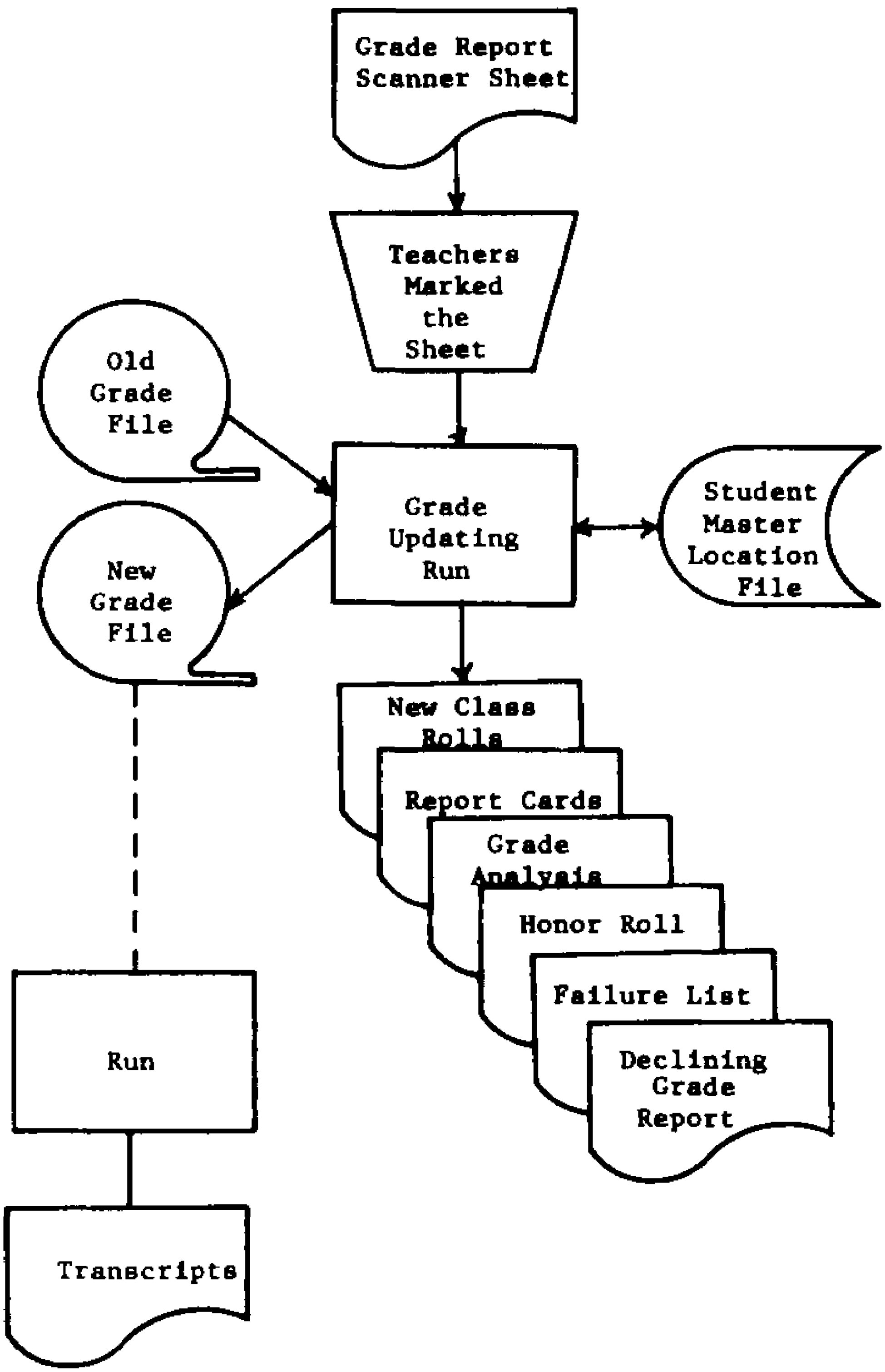
within the Parish according to the grade and race is given. Optical scanner sheets are prepared for each school to account for the attendance (Figure 85). The school attendance clerk posts absences on these sheets each day and submits them to the Data Processing Department at the end of each cycle. By processing these data, Student Master File and Location File, the principals' monthly report (Figure 86), Gain and Loss report (Figure 87), Excessive absence report (Figure 88) and new attendance sheet will be prepared.

The student attendance register tape will be updated in the same run. This tape is used to prepare some pattern study and attendance register report (Figure 89).

Mark reporting. The logical extension of computerized scheduling is grade reports (Illustration 9). The Grade Reporting subsystem provides a complete and efficient system for capturing and reporting individual student progress. Optical scanner sheets are prepared for each teacher to use in recording the student's grade (Figure 90). A variety of reports is prepared including Declining Grade Report (Figure 91), Failure List, Honor List (Figure 92), Grade Analysis Report (Figure 93), Report Card (Figure 94), and New Class Rolls.

Cumulative record keeping. At the end of each semester, each student's grades are printed on a gummed label for use in posting the individual cumulative record card. The same records are added to the history file (magnetic tape) for use in preparation of transcripts. At the end of each year, all records of graduating seniors are microfilmed and maintained for future reference (Illustration 9).

ILLUSTRATION VI-9. PERFORMANCE REPORTING.



<u>Standardized test scoring</u>. The East Baton Rouge Parish School System administers a variety of standardized achievement, aptitude, and diagnostic tests to its students. All tests which are given on a parish-wide basis are processed by computer. Results of these tests are reported back to schools in the form of listings, labels, and statistical analysis. Also these test results are maintained in summary form for use in program evaluations.

<u>School district assignment and adjustment</u>. The entire Parish of East Baton Rouge has been divided into small residential areas called map zones, each zone containing approximately 50 students. In turn, each student's record contains the code number which corresponds to the area in which he resides. Authorized transfers to the schools outside of each district are captured through a cathode ray terminal. The boundaries of each school district will be determined by considering the school's capacity in a given area, grade ranges. The school districts are simulated in the computer in the form of map zones. By use of the terminal, it can be determined what effect proposed district changes would have on school enrollments. Numerous reports are prepared for the administration in order to make meaningful projections of student enrollment.

<u>Student information retrieval</u>. Requests for information by individual students or specific groups of students are continually received. Instantaneous retrieval of current enrollment data is achieved through on-line inquiry. The layout of the CRT unit is shown in Figure 95. Enrollment data for each year are stored in the form of microfiche thus providing rapid retrieval of past years

enrollment data. Full records of graduating seniors are available on roll micro-film as a protection against loss or fire in the school.

Reporting requirements. Reporting requirements are easily met with through retrieval of data maintained in student files. Examples of the type of information supplied are as follows:

1. Scheduling statistics (class sizes, room utilization)
2. Average Daily Attendance and Average Daily Membership statistics (by school and parish)
3. Suspension reports (by reason, school, race)
4. Dropout reports
5. HEW integration reports
6. Grading statistics (GPA, rank in class)
7. Test score analysis
8. Student population studies by area, race, grade)
9. Student and/or parent listing in every conceivable sequence and selection criteria.

While all state and federal reports are not prepared directly by the computer, basic data are supplied by Data Processing Department in order to prepare a report according to the formats requiested.

File structure. The total number of the programs written for this subsystem amounted to 126 (Figure 96). This is a good indication of the volume of data processing in the student's subsystem. Therefore, there are several files that have to be established in order to make the processing of this subsystem possible. The description of all the files which are involved in this subsystem and the layout of the most important files are illustrated in Figures 97 through 109.

Property Control/ Maintenance Subsystem

Property control and maintenance is the last subsystem in the Management Information System of EBRPSB. This subsystem at the present time is in the design stage. Therefore, the information which is supposed to be generated for both planning and control is yet to materialize. However, the data processing personnel are pursuing the design stage constantly, and they plan to implement this subsystem in five different phases:

Phase 1

1. Establish basic data files
2. Implement purchase orders and receiving report preparations
3. Implement encumbrance of funds
4. Implement revised warehouse inventory systems

Phase 2

1. Implement stock requisition procedures
2. Automate warehouse distribution process

Phase 3

1. Implement bidding and quotation procedures
2. Incorporate repetitive purchase procedures

Phase 4

1. Implement textbook ordering, distribution, and inventory
2. Implement property control system
3. Control and tag all school property

Phase 5

Implement library book ordering procedures

Proposed System

In order to design an effective yet economically efficient information system, the first step is to define the objectives of the organization for which the system will be designed. The next step is to match the informational need of that organization with the sources of information. Then based on the informational requirements of the different users, a system will be designed. Since the objectives of the EBRPSB have already been defined in the previous section, they will not be repeated in this part.

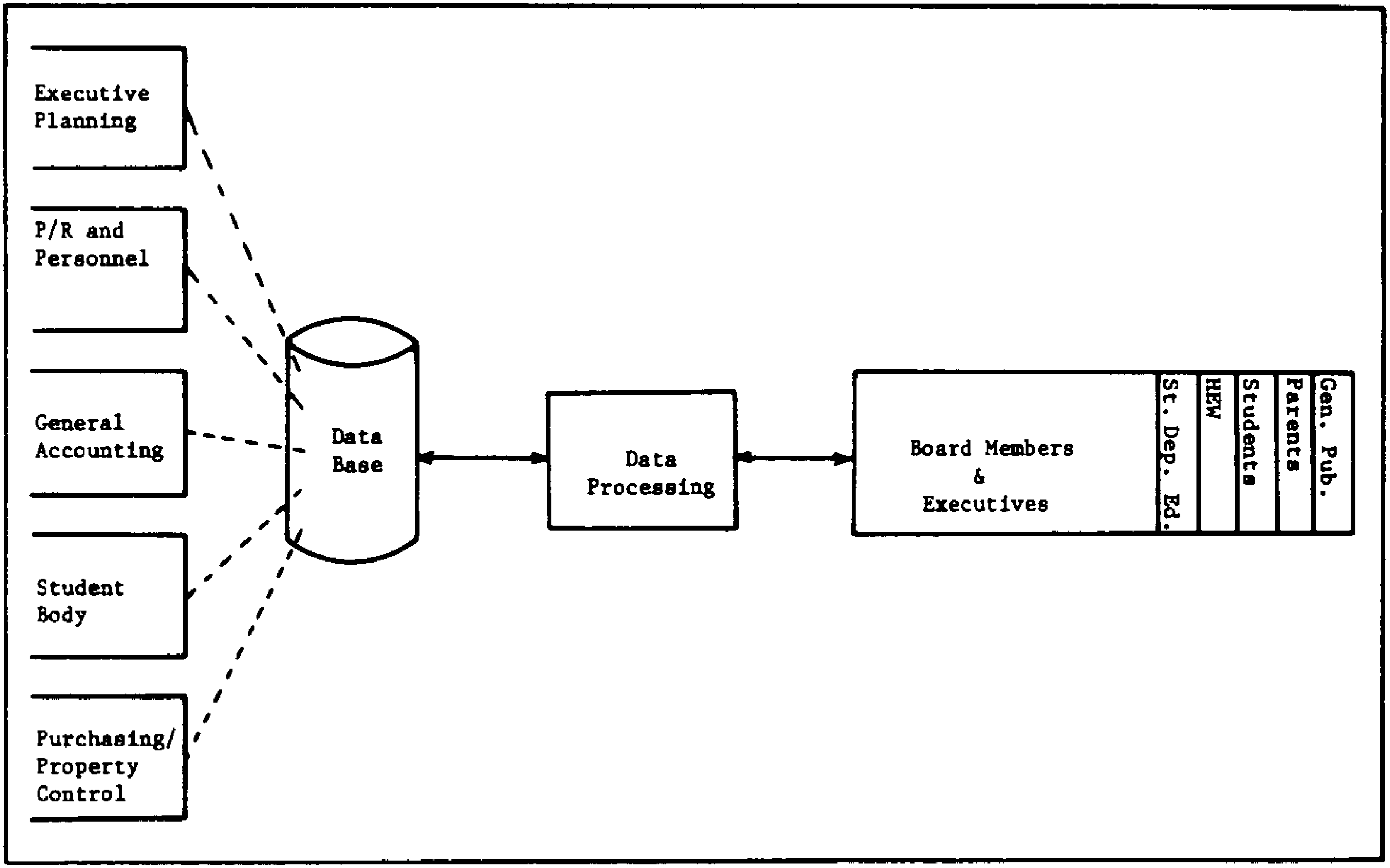
An exploratory questionnaire has been prepared and distributed among approximately 25 key members of the School Board (Members of Policy Committee and the Board Members). The primary objective of the above survey was the attainment of more insight to the system and the determination of information requirements for different positions. The format of the questionnaire is illustrated by Figure 100.

Since the responses on the above-mentioned questionnaire were not completely satisfactory, an attempt was made to interview those executives who were considered the major users of the system. Therefore, the proposed Total Information System is designed based on the results of the afore mentioned interviews and this author's inputs.

East Baton Rouge Parish School Board
TIS

The proposed TIS for the EBRPSB is shown in Illustration IV-10. According to this model the primary users of the system are Members of the Board, the ranking administrative officers of the School Board

ILLUSTRATION VI-10. EAST BATON ROUGE PARISH SCHOOL BOARD TOTAL INFORMATION SYSTEM.



such as the superintendent, and School Masters. The secondary users of the system respectively are State Department of Education; Department of Health, Education and Welfare; Students; Parents; and general public, mainly, taxpayers.

The Data Processing Department will provide the needed information for all the interested groups mentioned earlier. A data base is designed as an integral part of the system which hosts different types of data. The data storage is allocated proportionally to five subsystems of payroll/personnel, general accounting, student body, purchasing/property control/maintenance, and finally executive planning.

Since the first three subsystems are designed and, in fact, implemented, a proposed design will only include purchasing, property control, and executive planning. Also included in this design, a few segments that should be added to the subsystems are discussed in the previous section.

Property Control/Purchasing and Inventory/Maintenance

Although the applications within this subsystem, to a certain degree, are interrelated to each other and to other subsystems, each of the three applications is discussed separately.

Property Control

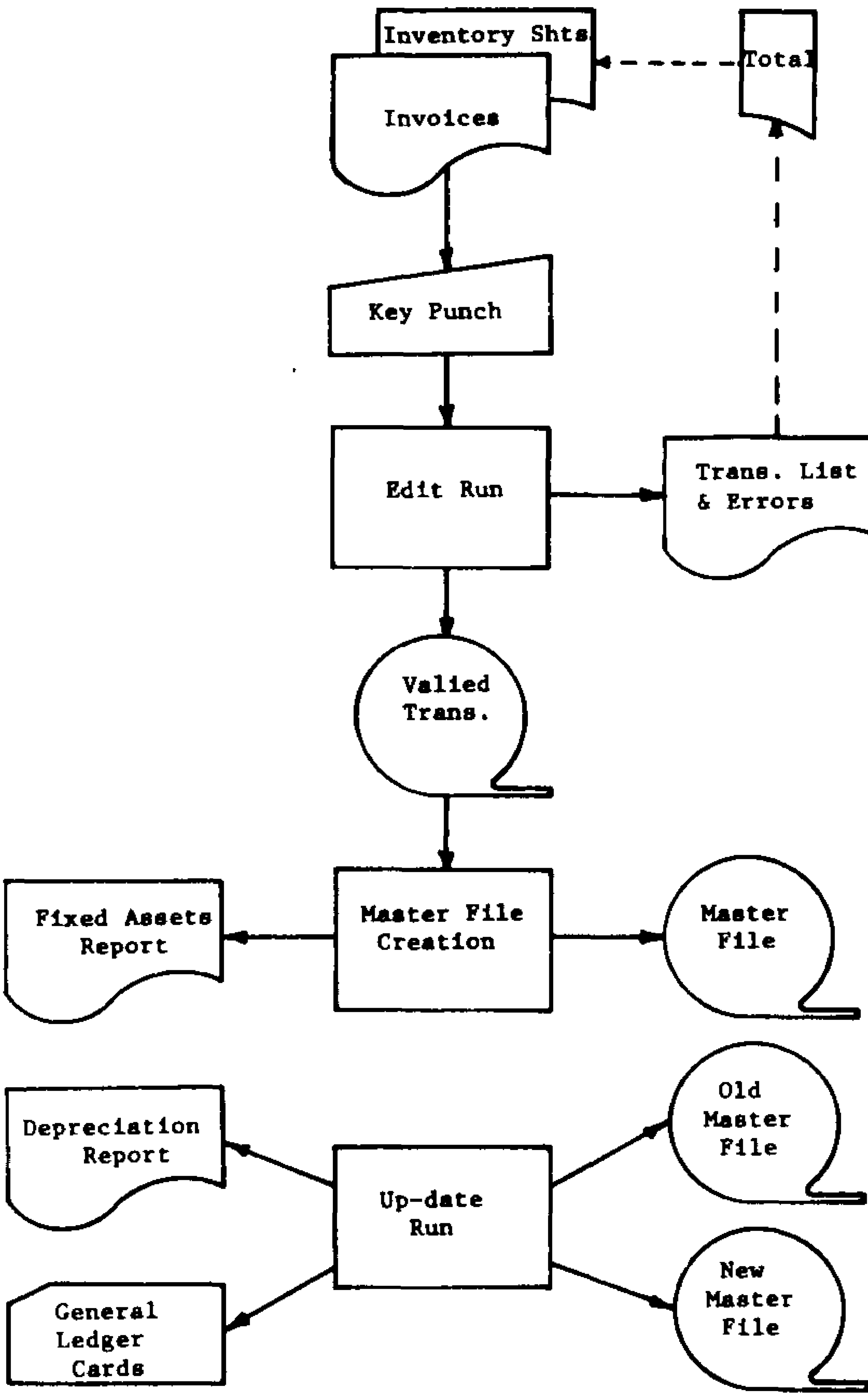
The term "property" normally refers to all types of assets which are transferable. But in the context of this application the word property connotes all types of assets (resources) except the inventories in the warehouse of the EBRPSB. These assets include schools and administrative buildings, instructional equipments, office furniture, and library materials. Management information needs with regard to these assets are information about the acquisition, utilization, and retirement. Diversity in the nature of these types of assets precludes the system analyst from designing an all-inclusive system. However, data with regard to the identification, description, location, manufacturer, estimated useful life, estimated scrap value, date of acquisition, cost and depreciation of an item must be kept in any asset file.

Property control application consists of three different runs: (1) Generating the master file, (2) Updating the master file, and (3) Maintaining the master file. Illustration VI-11 shows this application's flow chart.

Generating master file. Since no master file of the property exists in the EBRPSB, the first step is to establish one. Therefore, the source documents of this run are the invoices of the newly acquired assets and the list of the inventory of the assets in each location.

Cost of the new item should be determined based on the "cost principle," and the cost of used equipment should be determined through appraisal. A scrap value and estimated useful life for each item must be calculated in order to determine a depreciation rate. The master file layout is illustrated in Figure 101. This file is sequentially ordered by the location code. The item number will be assigned to each piece of property by use of special nomenclature developed for EBRPSB.

ILLUSTRATION VI-11. PROPERTY CONTROL FLOW CHART.



According to Illustration VI-11, after the invoices and other source documents were keypunched, all the transactions will be sent through an edit run. The validity, consistency, and other types of tests will be performed on different fields of each record. A valid list of transactions will result after all the errors have been recycled. A master file tape will be prepared and a fixed assets report will be generated by the computer.

The fixed assets list shows the description of each item and other relevant information with regard to different types of assets within each location. This list also provides a basis for spot check of any audit work.

Up-dating the master file. At the end of each fiscal period the master file will be updated and the depreciation costs will be calculated for each item of assets. Although the calculation of depreciation for non-profit organizations is not highly recommended, having this type of information available will facilitate acquisition of an economical insurance policy. Moreover, the decision with regard to replacement of assets will be made based on the facts already available and not merely on intuition.

The outputs of the up-date run are a new master file, depreciation report, and a set of summary cards for general ledger accounting system.

Maintaining the master file. Fixed assets master file must be currently maintained against the changes that affect the bulk of the assets in EBRPSB. These changes include: (1) deletion of assets in case of retirement or sale, (2) revision of useful life, (3) revision of scrap value, (4) change of location of given assets and, finally (5) purchase of new assets. All the changes of this nature must be authorized by a high ranking officer in the EBRPSB. Moreover, the record of any changes should be reviewed carefully by the same authority.

Procedural steps of creating the inputs and outputs of this run are similar to any other maintenance run. The important feature of this run is the Master File Change Report which is illustrated in Figure 102.

Purchasing and Inventory

Information about the physical flow of the goods and supplies, generally known as logistics, is of interest to the management of both public and private organizations. In the EBRPSB, since there is not any physical goods for resale, most of the attention must be paid to the control over the process of acquisition and usage of the supplies. Therefore, information with regard to the quantity of different items on hand, quantity ordered, economic order quantity, minimum quantity level, sources of supplies, usage of supplies, and cost of supplies are deemed to be valuable for management. The supplies' inventory consists of more than 5500 different items which are currently used for instructional and maintenance tasks. These items include textbooks and other educational supplies and different items for maintenance department and repair of the buildings and facilities.

The flow chart of the purchasing and inventory application is shown in Illustration VI-12. The input of this application is the orders already placed by purchasing department, receipts, and request

ILLUSTRATION VI-12. PURCHASING AND INVENTORY FLOW CHART.

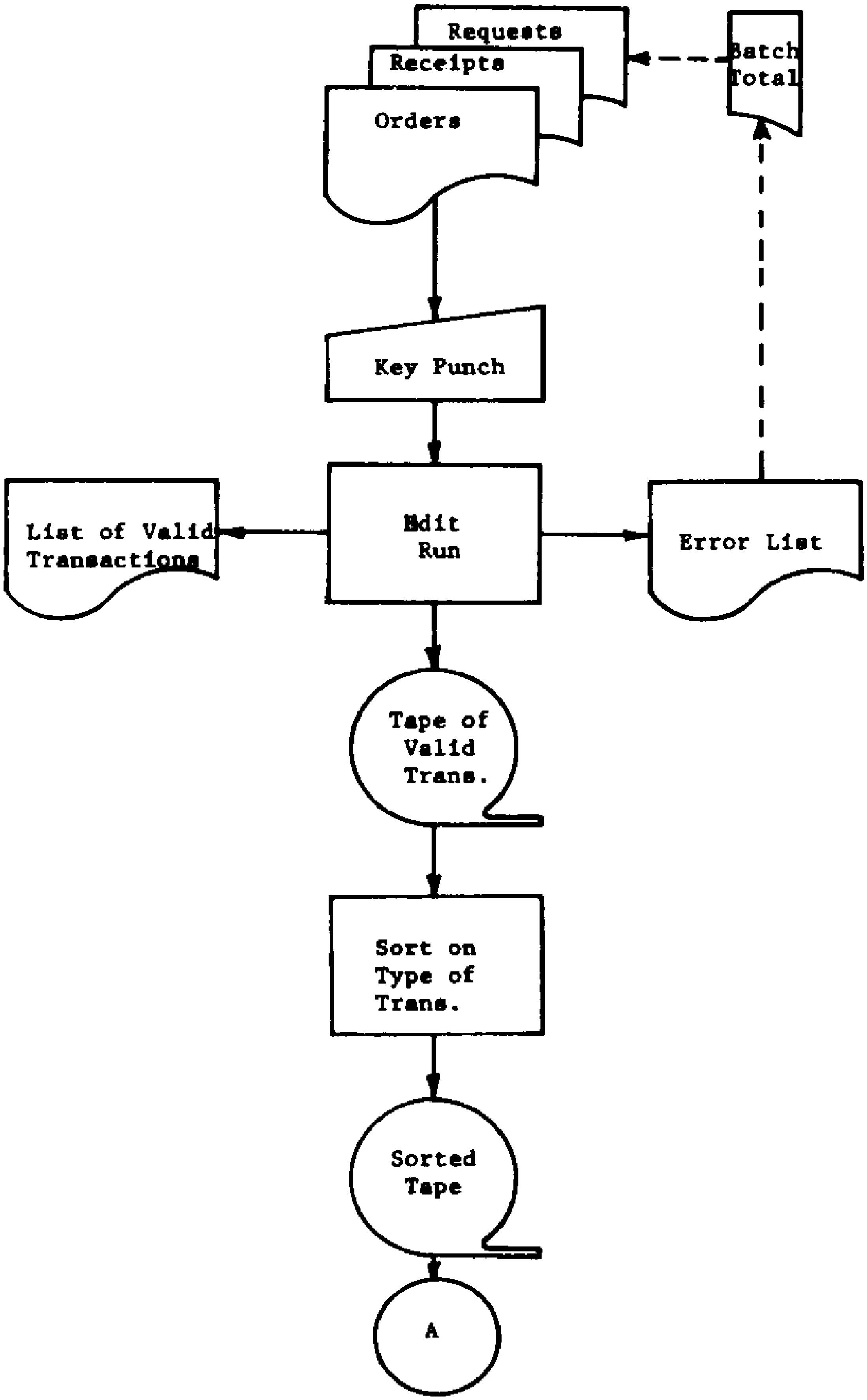
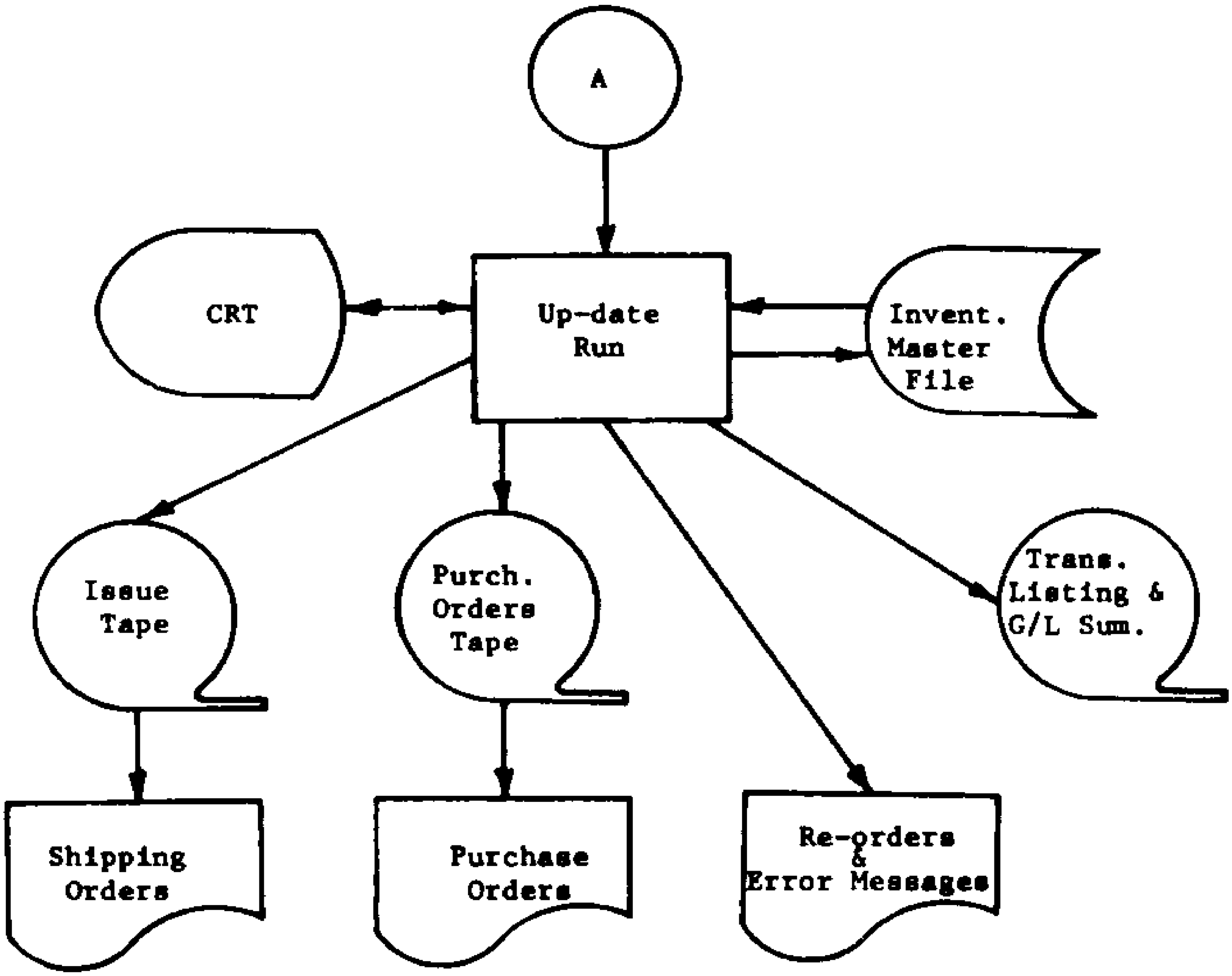


ILLUSTRATION VI-12 cont.



for the items in the inventory. The requests normally are made by different instructional units and the Maintenance Department. After a reasonable batch is collected, a batch total should be prepared. Then the batch will be keypunched and sent through the edit run to test the validity of the transaction for each of the above groups of inputs. The tests include consistency, completeness, and other acceptable tests which seem necessary in these circumstances. The list of all the valid transactions and errors is prepared at this stage. The erroneous transactions will be recycled, and a tape of valid transactions will be prepared.

Tape of valid transactions then must be sorted according to the transaction code. Orders must be processed before receipts and requests. This procedure forbids the system from making any unwarranted reorder for the items that have already been requisitioned.

The sorted tape will be used as an input for the "up-date" run. The inventory master file is stored on the random access device. The content of the inventory record is exhibited in Figure 103. Based on operation research techniques, an economic order quantity (EOQ) will be calculated for each item. The inventory costing will be prepared by employing the "moving average" method; that is, after any receipt the new unit cost will be calculated. This unit cost will be used later to compute the total price of supplies issued to different units.

The output of up-date run is as follows:

1. Up-dated inventory master file.

2. Issue tape of those requests which could readily be processed. The shipping orders will be printed later from this tape,

and the requested supplies will be delivered to the specified location.

3. Purchase order tape which will be used to print the purchase order form for the buyer's office. The purchase orders will be classified according to the purchasing procedures of government agencies, namely, by biding or other methods.

4. Print out of those items that have to be reordered and the error messages of up-date run. The edit run may not detect all the possible errors in the batch. The undetected errors, therefore, will be discovered at this stage. For instance, the message "Record does not exist" may be the indication of invalid identification which has not been detected by the edit run.

Comparison of this list and the purchase order frequently seems to be necessary in order to adjust the EOQ for each item depending on the market and economic outlook.

5. Transaction list and General Ledger summary tape. A list of all the issues for each period (Journal) will be printed from this tape. Also the summary of charges to individual accounts of the General Ledger and the summary of the appropriations are made for outstanding orders included in this tape, which will be used as an input to the General Ledger accounting subsystem.

The on-line CRT terminal will provide instant interaction with the system. The entire record will be available to those personnel who are authorized to use the terminal.

Maintenance

Some information with regard to the maintenance of buildings and vehicles is already available. For instance, the Data Processing Department currently provides information about the maintenance cost of each location and total cost of maintenance for the school system. Also repair cost of each bus and rating of them based on cost efficiency for disposal purposes are currently available.

The additional information requested by different managerial positions can be readily prepared from the currently organized file. For instance, the breakdown of the cost of maintenance for each location should be provided. Furthermore, reporting the utility cost, such as of electricity and telephones, will enhance the decisions involved with any type of cost savings.

Executive Planning

Executive Planning subsystems must be created because of ever-increasing needs of top ranking officers for strategic types of information. Strategic decisions normally are unstructured and irregular in nature. Generally, the operating decisions are repetitive; therefore, they can be programmed based on certain rules or guidelines. The strategic decisions do not benefit from this characteristic and are not repetitive. This is the main reason that sometimes the label of "non-programmable" is attached to this type of decision.

The information requirements of strategic decisions are very diverse. Therefore, a data base for strategic planning requires a tremendous amount of storage to satisfy the diversified informational needs of the users in an infrequent pattern. The operating decisions, on the other hand, use very little storage in comparison with the strategic decisions and the data base will be used more frequently. Thus the storage cost is one of the forbidding factors in design of any type of strategic planning subsystem.

Although the design of such a system possibly could not be all inclusive, a reasonably adequate system is proposed for East Baton Rouge Parish School Board. It should be mentioned that neither the survey questionnaire nor the interviews revealed the necessity for such a system. However, the following applications are proposed based on the facts that the users will adapt themselves to the proposed system.

Clustering Techniques

Clustering techniques usually imply similarity, that is, n-dimentional comparison of properties in some formal and conceptual frame of reference. Clustering is defined as "the general logic, formulated as a procedure, by which we objectively sort or group together entities or variables on the basis of their similarities and differences."[1]

The application of clustering can solve many problems that have policy implications. Management of a business firm may employ these techniques in order to establish a new set of marketing policies for a new market area. Same techniques can be used in any educational system for devising various policies to suit the needs of different school districts based on particular characteristics of a given district.

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[1]George R. Bruha, Effects of Strategic Planning Decisions on the Design of a Coding Process in An Advanced Information System, op. cit., pp. 85-86.

The cultural heterogeneity of any given state often prevents governmental authorities from devising a state-wide policy for the educational system. Therefore, each state or even each school district must develop its own policy. Frequently it is noted that a single set of policies could not be implemented even within a small district or city. This situation causes many problems in the effectiveness of a school system's policies.

Clustering can solve some of this problem. A given school district may be divided into smaller zones. Then various types of data such as parents' income, size of the family, value of the residence, parents' achievements and aspirations, quality of the language and reading opportunity at home, variety and quality of family activities, and structure of planning the work at home can be collected. After coding the collected data by use of clustering techniques, it would be possible to determine the similarities of various school zones (S_1 through S_n). For instance, the results of analysis may reveal the similarity between S_2, S_8, and S_{12}; S_1, S_3, S_7, S_{13}, and S_{15}. Therefore, a uniform set of policies should be developed for zones S_1, S_8, and S_{12}. By the same token, another set of policies must be designed for zones S_1, S_3, S_7, S_{13}, and S_{15}.

Another implication of these techniques could be the exchange of information between various school districts throughout the country. If certain sets of policies were considered effective in a given zone of one state, a similar degree of effectiveness should have been observed as a result of implementing the same policies in a zone within another state, given the existence of similarity between the two zones.

Comparative costs of each grade

Analysis of the costs of educational systems can be used as an effective method for the performance evaluation. Normally, the lack of quantified measure in the educational system creates tremendous problems with regard to the evaluation of performance. In this environment, the monetary value of the resources consumed seems to be the only available alternative for this purpose.

The objective in this section is to calculate the costs of each grade for each school. The comparative analysis of these costs can be used as valuable information for both planning and control. For instance, the management may be interested to know the marginal costs of opening a new grade in a given school. Moreover, it may reveal which grade costs more; therefore, the resources used for more expensive grades could be controlled efficiently. Another implication of the comparative analysis of the costs is to find out whether a given school system operates on an acceptable range in comparison to the other school systems.

Most of the data used to produce this kind of cost report have already been stored in data base. Therefore, the only requirement is to set up certain procedures for allocating the costs between various segments or, in this case, the "grades." In this context, the entire educational cost can be divided into two groups of semi-variable and fixed. Then based on certain criterion, these costs should be allocated to the grades. For example, teachers' salaries should be allocated based on number of hours that they teach each grade, while the heating and cooling costs may be allocated by the square footage of each class or functional area.

A possible method of providing the costs information for the management is shown by Illustration VI-13. In order to implement this application a thorough study of the costs and determination of nature of each item is a necessary step.

ILLUSTRATION VI-13

COMPARATIVE ANALYSIS OF COSTS OF FIRST GRADES

	School A	School B	School C
Teachers' salaries	xxxx	xxxx	xxxx
Maintenance	xxxx	xxxx	xxxx
Supplies	xxxx	xxxx	xxxx
Heating/Cooling	xxxx	xxxx	xxxx
School's Overhead	xxxx	xxxx	xxxx
Share of School Board Expenses	xxxx	xxxx	xxxx
Total	xxxx	xxxx	xxxx

Migration Pattern

The study of migration of population can be considered as a major planning tool of an educational system. This type of information will help the official to make decisions with regard to expansion or building a new school as the needs arise.

Although this type of information, in a very crude form, can be obtained from the city or state planning commissions, school boards' information systems must be capable of providing more refined and useful information in this area. Therefore, for implementing this type of application, a maping of the school district on the computer is necessary. Each school zone will show the number of residences and the estimated value of each. Addition of the newly constructed residences and the estimated value of those will provide valuable information for the management with regard to the necessity of additional school capacity for each individual zone or a group of zones.

Forecasting Models

Any school system must be interested in the forecasting of the enrollment for the future academic periods. Although the study of migration of population can provide some relevant information, certainly that alone may not be sufficient. Therefore, in order to forecast the enrollment, the educational system must rely heavily on statistical analysis. A variety of forecasting models is available in the form of software canned programs for different purposes. Regression and correlation model is one example. In this type of model the value of dependent variable (enrollment in this case) will be determined based on the mathematical model which is built around the number of independent variables (for example, the number of people in a household, disposable income of household, and other variables). Similar types of models have been used successfully in the business organizations. Therefore, their value for the educational systems seems to be unquestionable.

The above applications are merely a sample of models that can be included in the Executive Planning subsystem. The most restricting factors in this area seem to be (1) the lack of knowledge about the decision model that will be used by executives, and (2) the storage space for the retention of data. The latter problem seems to be almost non existent as a result of the development of a mass storage system; however, the first problem continues to exist.

Evaluation of Proposed System

Evaluation of any system must be done based on the quality of the information provided by that system. The quality of the information is a factor which will be reflected by the quality of the decisions made at any given point of time. A possible approach for determining the quality of a decision is the analysis of expected monetary value (EMV) of the outcome of that decision. The value of information can be measured by the difference of EMV with information minus EMV without information. The summation of the value of all the information provided for an organization, theoretically, should reflect the value of the information system for that organization. Since the determination of the outcome of each decision and measuring those outcomes is very difficult, if not impossible, other approaches should be considered.

More approaches for the evaluation of information systems are cited by Charles H. Kriebel.[2] For instance, use of integer linear programming for design of data processing is regarded as one acceptable method. In this approach, data requirements, report content and interrelations, data flows, processing capacities, and other factors should be specified in the form of constraints. The objective of this model is to maximize the function of net benefits. In contrast

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[2]Charles H. Kriebel, "The Evaluation of Management Information Systems", IAG Journal, Vol. 4, (1971), pp. 1-14.

to the above model, the next alternative is soliciting competitive bids of different manufacturers for a system configuration. This configuration will be determined by the manufacturer based on the statement of system requirement prepared by the management.

The cost-effective method is another technique which is suggested by McRae.[3] This method assumes that the objective of any computer system is to produce a "quantum of symbols" within a given time period. The configuration which produces the same quantum of symbols with least cost should be regarded favorably.

Although the above methods and many other approaches suggest some type of evaluation for an information system, it may be concluded that all of them are based on some sort of subjective criteria and "to some degree the dark art of 'magic'."[4]

Since an objective method of evaluation of information systems has not been developed yet, in order to determine the effectiveness of EBRPSB total information systems, the opinions of some of the executives were sought. The personal interviews indicated no degree of dissatisfaction with regard to the existing system.

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[3]T. W. McRae, "The Evaluation of Investment in Computers," Abacus, (September, 1970), p. 63.

[4]Charles H. Kriebel, "The Evaluation of Management Information Systems," op. cit., p. 9.

CHAPTER VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE STUDIES

Summary and Conclusion

Total system means different things to different people at different points in time primarily due to the problem of general semantics. Therefore, the first objective of this study is to examine the concept of "total system" which is regarded as a controversial issue in the area of information processing.

In Chapter II, the relevant literature with regard to the system approach, General Systems Theory, Information Theory, Management Information System and "total system" has been reviewed. Also discussed was the idea that the semantical problems have existed constantly throughout the development of the total system concept. For instance, the term "system" is used, at least, in three different senses: (1) system as theory, (2) system as method, and (3) system as an entity.

Introduction of General Systems Theory by Bertalanffy helped to overcome some of the problems by encouraging the interdisciplinary approach and by formulating a principle which holds for systems in general. Then application of GST was extended to social sciences by Kenneth Boulding. The information theory and its basic concepts--information value and optimum quantity of information--coupled with GST created a new era for information processing and a milestone for management information system. The latter concept (MIS) also was not free from conceptual and semantical problems. While it was considered as a part of an advance system by some, others believed that MIS <u>is</u> an advance system. Still, according to some authors, MIS is neither an advance system nor part of it, but it is merely a "mirage". However, a MIS should be regarded as a system for aiding the management in their decision-making process.

Inclusion of the computer as a necessary part of any information system culminated in the creation of a new idea which is called Integrated Data Processing (IDP). IDP in this sense means integration of all hardware and processing equipment in order to facilitate the efficient use of a system. Gradually, the term IDP changed to Total Information System (TIS) and Total System. The latter term is used by many authors to describe a system from a very naive system to a more advanced one. However, the description of "total system" and the meaning which is attached to it have a high correlation with the background of the individual author who used it.

Those authors with the technical background have considered a total system as an extension of IDP, which is in a sense an operational reality. Also, they used the term total system, TIS, integrated system and other such terms interchangeably. The characteristics assigned by them to a total system were either readily available or operationally feasible. However, the word "total" has a special meaning to some of them, since, at least in one case, "total" is used to mean "step-by-step".

Academicians who normally advocate information systems, offer more diverse opinion about the total system. The majority of them do not believe in reality of total system or TIS. As a matter of fact, some of them explicitly resent the concept to the degree that they consider it untrue, superficial, and impractical. However, the academician's approach to total system had more theoretical support than the system specialist's approach. According to Prince, an advanced information system must benefit from certain characteristics or phases. These phases are planning, control, system processing, monitoring information gathering, and long-range planning.

However, those academicians who believe in pragmatism are inclined to suggest that a total system is merely an integration of the subsystems within a given organization. Still another group uses the word "total" to emphasize the importance of system approach. Therefore, it is likely that most of the misconceptions are caused by a lack of communication among various authors.

This study, however, has examined the problems of total system in four different areas:

1. Semantical problems and use of inappropriate terminology. This problem is well exposed by the review of the opinions suggested by 38 authors (26 system specialists, and 12 academicians). Very little concensus was observed among these authors concerning the total system concept. For instance, of 27 different captions that are suggested for total system, most of them have basically similar meaning. The same type of discrepancy was noted with the characteristics or attributes of a total system proposed by those authors.

There are 44 characteristics. Some of the suggested attributes truly have little or, in some cases, no impact on the total system concept. However, this study made an attempt to classify the above-mentioned characteristics into five groups:

(a) Those characteristics which suggest some sort of integration;

(b) Those characteristics which emphasize the hardware aspect of a total system;

(c) Those characteristics which put some weight on information providing capability of a total system;

(d) Those characteristics which facilitate management control process;

(e) Those characteristics which suggest some sort of data base.

The analysis of the above characteristics reveals that the first group--some form of integration--is considered to be the most important aspects of a total system by the majority of the authors (73% of practitioners and 83% of academicians). Hardware, evidently, has equal importance according to the system specialists, but the academician entitles less importance for this characteristic. Information-providing characteristic, surprisingly, is considered more important by practitioners. Facilitating the management control process, however, is regarded by academicians as the more important attribute. Data base characteristic is the least important characteristic according to the academicians, but system specialists consider this attribute of little importance.

Furthermore, it was revealed that all the five above-mentioned characteristics do not have to exist in a system in order to qualify it as "total." Among 26 system specialists, only one (3% of the population) advocated the necessity of all five characteristics for a total system. The majority of practitioners (43%) have proposed only two characteristics for a total system. The view of the academicians is narrower in this context, since the majority of them (42%) believe in existence of only one characteristic for such a system. It has been further observed that the proponents of the concept of total system were mainly system specialists, and the academicians constitute the opposition front.

Therefore, it is concluded that no universal concept of "total system" or "total information system" was observed due to the semantical problem. Moreover, it is likely that the list of attributes will approach infinity if the boundaries of a total system are not defined.

2. Hardware and its capability. Some of the problems of total systems are assumed to be caused by the lack of capacity and speed of the hardware equipment. However, these problems are almost non-existent at the present. The computer capacity has become more ample; the processing and transmitting speed of data has increased substantially, with tremendous cost reduction. Thus, hardware's impact on total system should not be regarded as significant.

3. Software and its development. Software has benefited from the same degree of advancement as hardware. However, there still are some limitations in the use of software that have to be

overcome. For instance, sequential capability of the computer languages such as FORTRAN and COBOL. and environment boundaries of software developed by hardware vendors.

4. Development of data base as an alternative. Due to the above-mentioned problems, the total system concept is regarded by many authors as nonoperational and infeasible. Therefore, according to them, it would be most beneficial to any organization to discard the concept as a goal and adopt an alternative approach by designing a data base.

The second objective of this study is to define a total system based on the characteristics suggested by various authors and to adopt or introduce other attributes which are regarded necessary for the system. In order to accomplish this goal, it should be noted that most of the problems mentioned earlier are caused by misconceptions or an inappropriate use of the "wholism" or "totality" attribute of a system. The terms Integrated Data Processing, Total System, Total Informaiton System and other terms proposed in Chapter III were used to represent the same phenomena. This study concludes that the above terms do not have an identical meaning and the meaning and connotations drawn from them must be considered within a defined environment. Moreover, this study suggests that the term "total system" is not a meaningful term per se. Thus, the term must be employed rather cautiously with a specific reference made by the users to a system's hierarchy or intended level of abstraction.

A meaningful definition of total system can be made if the component of a system and the relationships between those components are known. Based on this criteria, this study has made an attempt to define the term "total system" at three different levels of abstraction.

First, Total Data Processing System (TDPS), which is a "hardware oriented" system, can be designed at both division level and corporation-wide scale. During the design task, the principles of divisional performance for decentralized organization must be observed. However, most of the attention is paid to the data processing capability of the system by including into the configuration the most sophisticated hardware. The users of TDPS are somewhat isolated environments and do not have any interaction with the system. Therefore, based on the definition of a system, they should not be regarded as part of the system.

Second, Total Information System (TIS) is designed to provide merely information for all parties who have substantial interest in the present as well as future of an organization. Based on informational needs of their decision models, the users of TIS can interact with the computer system through the available feedback loops which are an important feature of this system. Another feature of this system is a data base which stores all types of data for producing desirable forms of information.

Third, Total Intelligence System (TINTS). Generally, the relevant information is regarded as negative of entropy or uncertainty. According to this assumption, TINTS is designed to provide <u>all</u> types of information for making an intelligent decision. The decision models which are structured upon predetermined specifications of management will provide the organization with an optimal solution to any type of problem. The data base of this system is designed to store operating and strategic planning data as well as the management's decision models.

The third objective of this study is to examine whether the data base approach should be regarded as an alternative for a TIS.

According to Bertalanffy, there are certain general principles which hold for systems, irrespective of the nature of the component elements and the relationships between them. In this context, the similarity among living systems, TIS, and TINTS are quite noticeable.

Learning and memory deal with handling of information in the animal system. Among the theories suggested to express this phenomena, two have more popularity than others. First, the psychological approach suggests that learning occurs as a result of interaction or enforcement between the "law of effect". The information extracted from the learning experience is added to the preexisting meaning structure within the memory system causing it to expand and to become elaborated. This process is very similar to updating a data base.

The second theory discusses the learning and memory through the chemical compound. According to this theory, the genetic information stored in DNA may be transferred by RNA to the surrounding protoplasm.

Based on the above theory, it can be deduced that the learning process is the ability to retrieve pre-stored data from the memory system. Since intelligence is created as a result of learning, it is a function of the relevant data already stored in the memory. Thus, the more relevant data stored in the memory, the more intelligence will result. Therefore, the memory system provides a response to different stimuli and execution of those responses.

Due to the similarity of data base with the memory of animal system, it can be concluded that a data base is a necessary part of TIS and TINTS. Thus, it should not be regarded as an alternative to a total information system.

Ultimately, this study presents an actual case of a total information system designed for East Baton Rouge Parish School Board. This organization is selected due to the fact that their TIS is the best sorrogate of the model suggested by this study.

Recommendations for Future Research

Semantical problems which were noted in the so-called "total system" area seem to be inherent in the system approach. Therefore, more research should be directed toward solving the communication problems and possibly suggesting a "dictionary of information processing." The most urgent need is to develop the dictionary for the data base approach which apparently is passing through the same evolutionary process that "total system" has passed.

The decision models of the users of a system are the important parts of TIS and TINTS. The system analysts are normally aware of some of the decision models which are to some extent trivial. Therefore, more research should be done in this area to learn about the structure of sophisticated decision models especially from the behavioral standpoint.

Information value definitely should be regarded as the function of the value of data which is used to produce that information.

This should be used as a basis to establish a valuation technique for data that belongs to a given organization, thereby, causing a data base to be reported as an asset of the organization.

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APPENDIX

FIGURE 1. EAST BATON ROUGE PARISH SCHOOL BOARD'S ORGANIZATIONAL CHART.

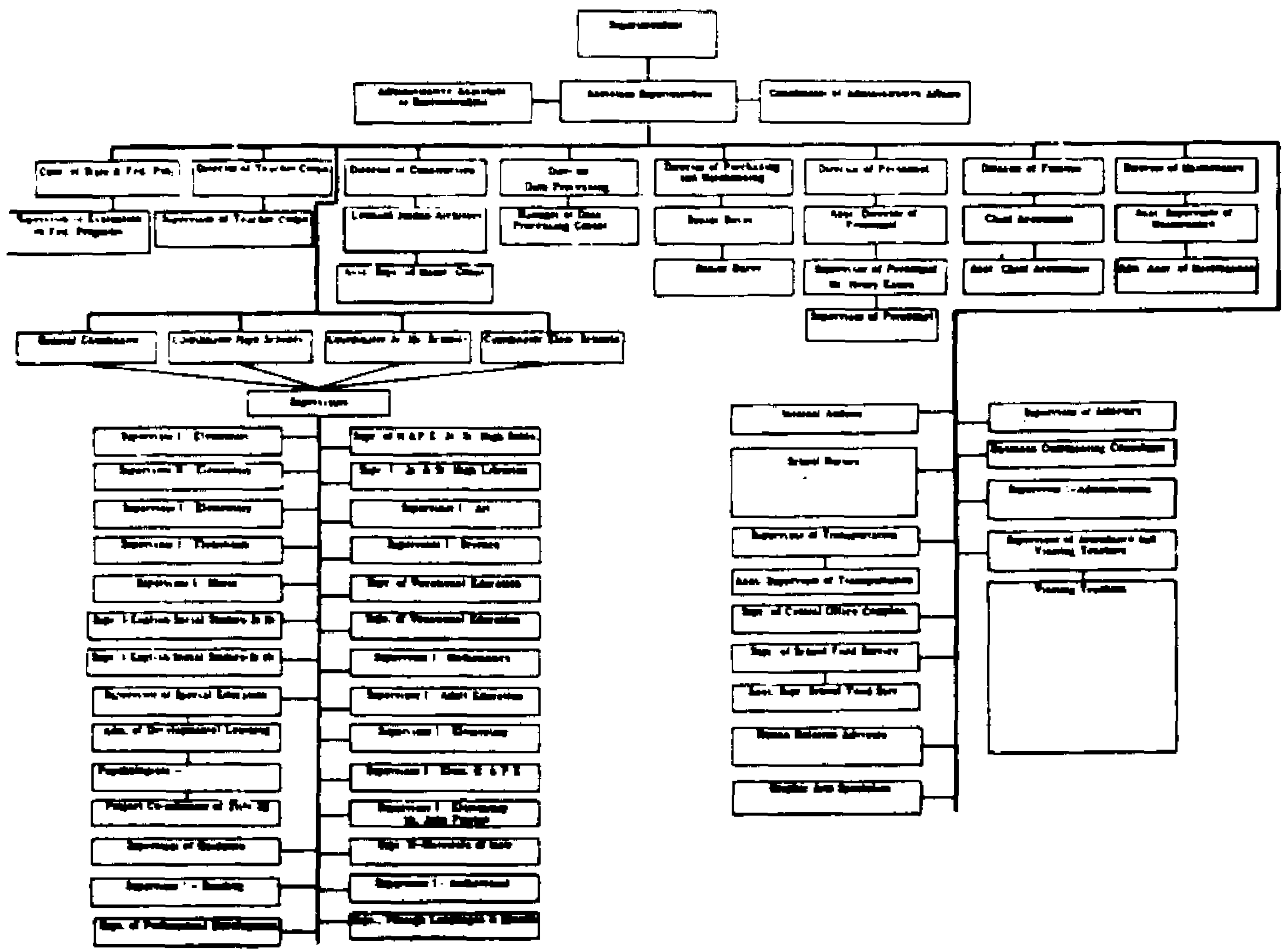
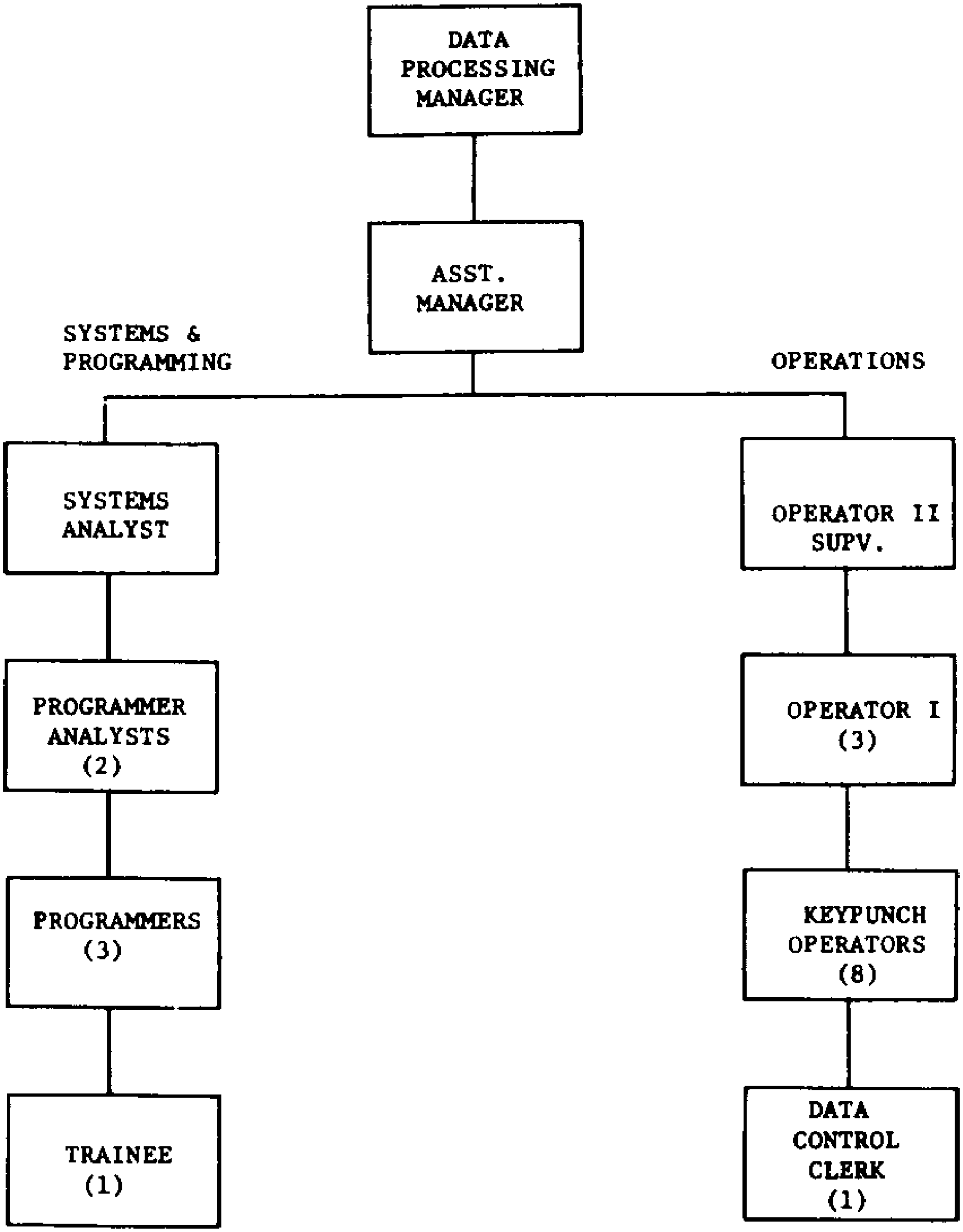


FIGURE 2. DATA PROCESSING DEPARTMENT ORGANIZATIONAL CHART.



Source: Memo to Assistant Superintendent, from Data Processing Manager, East Baton Rouge Parish School Board, June 6, 1973.

FIGURE 3. PAYROLL SYSTEM'S PROGRAMS.

TITLE	
Library FD's and Common Routines	
Addition to Master	
Changes to Master	
Changes to Payroll File	
Changes to History	
Changes SSNO - Master	
Changes SSNO - History	
Disk File Maintenance	
Disk File Re-Organize	
Load Utility Files	
Maintain Authorized Position File	Position File
Create Salary Schedule File	
Record Print Utility	
Print Payroll File	
Print History File	
Audit File Dump Print	
Absence and Overtime	
Create Payroll File	
Calculate Payroll	
Register	
Monitor	
Checks	
Check Transmitted	
Deduction Reports	
Summaries	
Credit Union Change Report	
Update	
Totals Accumulator	
Sort Tags - Check Sequence	
Sort Tags - Register Sequence	
Alpha List for Micro fiche	
Create Micro fiche Input	
Sort History File	
Update History Files	
Create and Balance Report Files	
Print Monthly Report	
Contract Bus Driver Report	
Group Insurance Report	
New Life Insurance Statistics	
Create and Edit Bank Reco	
Bank Reco Reports	
School Lunch Distribution	
Quarterly FICS School Lunch FICA by Location	
Retired Insurance Statements	
Print UGF Collection Cards	
UGF Report and Update	

TITLE
Budget Report - Teacher/Principals
Create Tags for Selected W-2's
W-2's
Check Retirement Number
School Lunch Retirement Tally List
Non-Tchrs. and Tchrs. Retirement
Employee Count by Retirement System Fund
School Employees Retirement Checklist
School Lunch Retirement Checklist/ Teachers Retirement Checklists
Fiscal Conversion
Courtesy Fund
Time Clock Labels
Teacher Budgetary Data
Budget Estimates - Classified
Minimum Wage Cost Estimates
S/L Budget List
Gummed Labels by Position
Employee Listing
Race - Sex Report
Address Labels
Instructional Mailing Labels
YTD Travel by Employee
Selected Ledger Report
Vacancy Overstaff Report
Voc. Ed. Forms
Location Labels
Address Labels by Social Security Number
Salary Updates
Principal Salary Checklist
Rate of Pay Notification
Teacher Contracts
Employee Directory
Longevity Service
10-12 CK/CK Disp. Preference
Annual Leave Cutoff Notice
Bus Driver Doctor Preference
Teacher Listings - Subject in Location
3-Up Utility Labels
Personnel Cards
12 Month Employee Listing
Teacher-Principal Listing
Teachers Retirement Poll List
Teachers Absence Over 20 Days
Evaluate Listing
Statistical Analysis
Annual Statistical Report (Personnel Program)
Create Micro fiche Tapes (Datagraphix)
Amortization Schedule Generation
Create Authorization Position File & New Position File - PRPOZD

FIGURE 4. AUTURIZATION FORM.

EAST BATON ROUGE PARISH SCHOOL BOARD

AUTHORIZATION FOR PAYING UNUSED SICK LEAVE UPON DEATH OR RETIREMENT

Memo to: Data Processing Department

From: Payroll Department

The following employee retired ( ) died ( ) on

____________________. ______________________________
Date NAME OF EMPLOYEE

In conformance with the Board's policy of paying unused sick leave in an amount not to exceed 25 days, please issue a check to

______________________________, ______________________________
ADDRESS

in the amount of ____________(________ days at $______________ daily rate).

EMPLOYEE #____________________LOC.__________POS.____________

______________________________ ______________________________
Date Payroll Clerk

______________________________ ______________________________
Date Director of Finance

FIGURE 5. ABSENCE REPORT.

LOCATION NUMBER AND NAME

EAST BATON ROUGE PARISH SCHOOL BOARD

ABSENCE REPORT

SIGNED ______________________
Principal

ABSENCE REPORT DUE

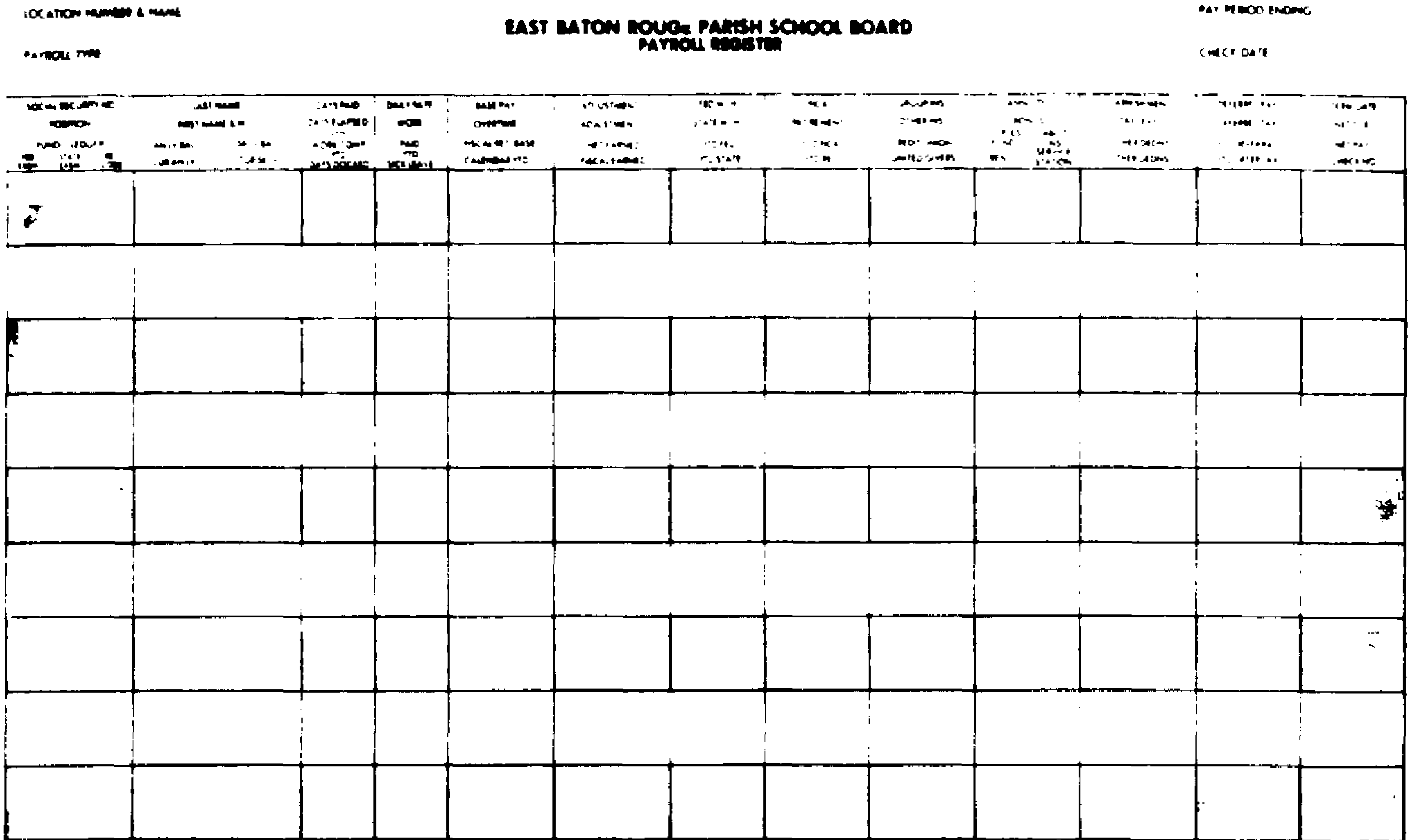
PAYROLL GROUP

THIS REPORT MUST BE TYPED

APPROVED ______________________
Director of Finance

SOC. SEC. NO. POSITION FUND LEDGER	LAST NAME FIRST NAME & M.I. DAILY RATE	[illegible] DAYS DOCKED	1 BEGINNING OF [illegible] DATE	2	3	4	5	6	7	8	9	10	[illegible]	[illegible]	NAME OF SUBSTITUTE LAST NAME FIRST M.I.	SUBSTITUTE SOC. SEC. NUMBER	DATES SUBSTITUTE EMPLOYED	TOTAL DAYS WORKED BY SUBST.

FIGURE 6. PAYROLL REGISTER.


LOCATION NUMBER & NAME

PAYROLL TYPE

EAST BATON ROUGE PARISH SCHOOL BOARD
PAYROLL REGISTER

PAY PERIOD ENDING

CHECK DATE

FIGURE 7. TRANSMITTAL LIST OF PAYROLL CHECKS AND DEPOSITS (CHECK REGISTER) FOR EACH TYPE OF PAYROLL, AT EACH PAY PERIOD.

Contents:

Name
SSNO
Location (code)
Position (code)
Account Number (For each group of expense)
Deposit slip number for those employees who have asked their salary be deposited in their bank account
Net Pay
Signature of an officer in charge of each section to the fact that all the credit amounts have been deposited in employees' account.
Total number of personnel who receive check or deposit.

FIGURE 8. DEDUCTION LIST FOR BATON ROUGE TEACHERS FEDERAL CREDIT UNION, FOR EACH PAY PERIOD. (DATE)

Contents:

Name
SSNO
Location (code)
Position (code)
Amount of deductions
Summary total for each page and grand total.

FIGURE 9. EXTENDED SICK LEAVE EARNING REPORT PAID TO EACH EMPLOYEE*

Contents:

Employee's SSNO
Employee's Name
Location (code)
Position (code)
Fund (from which the pay has been allocated)
Gross Pay
Number of days the sick payment is paid

*This type of report is prepared for those who receive the death payment benefit.

FIGURE 10. CREDIT UNION CHANGE REPORT (PREPARED FOR EACH PAY PERIOD).*

Preparation of Micro fiche card for reference. Information included in the Micro fiche are:

Name
SSNO
Location of employment
Position
Status
Total Salary
Total Salary (last year)
Date of Original Employment
Date of Re-employment
Number of Pay Period (selected by employee)

*This is an exception report prepared for teacher's credit union. Information included in this report relates to those who have experienced salary change or joined the school system for the first time. Also it provides necessary information for Credit Union to update and control their files constantly.

FIGURE 11. ANNUITY DEDUCTION REPORT PREPARED MONTHLY FOR EACH LIFE INSURANCE COMPANY SHOWING THE AMOUNT OF DEDUCTION FOR EACH EMPLOYEE.

Contents:

Name of life insurance company (as a title of report)
Address of life insurance company
Period covered by the report
List of employees in each report which include following data:
  Employee's SSNO
  Employee's Name
  Location (code)
  Number of pay period
  Fund (from which deduction has been allocated)
  Amount of deduction

FIGURE 12. GRAND TOTALS OF ANNUITY FOR INSURANCE COMPANIES AND TOTAL AMOUNT PAID TO THEM FOR EACH MONTH.*

Contents:

Name of insurance company
Number of employees insured by each company
Amount paid to each company
Grand total paid to all companies for the month.

*Same type of report is prepared for the payment made to insurance companies for other types of insurance.

FIGURE 13. FEDERAL GOVERNMENT REPORT FOR THOSE EMPLOYEES WHO ARE BEING PAID BY FEDERAL GOVERNMENT FUND.

Contents:

Employee's SSNO
Employee's Name
Location (code)
Position (code)
General Ledger (code)
Net amount earned (for each employee)
Grand total for all employees

FIGURE 14. ABSENCE AND OVERTIME SUMMARIES BY POSITION.*

Contents:

Position (code)
Title of the position
Number of absents in that position
Number of days (personal illness) for each position
Number of days (death or family illness) for each position
Number of days (other reasons) for each position
Number of days (professional leave) for each position
Number of days (without pay) for each position
Number of days (annual leave) for each position
Number of days that substitute used for each position

*Same type of report is prepared for each location.

FIGURE 15. OVERTIME REGISTER FOR EACH LOCATION.

Contents:

Location (code)
Name of employee
SSNO
Position (code)
Number of hours worked
Overtime rate
Gross amount of overtime
General Ledger code
Fund (code)
Sum of the overtime paid in each location charged to given General Ledger account
Grant total of overtime charged to each fund

FIGURE 16. MONTHLY REPORT OF SERVICE STATION DEDUCTIONS AND USAGE ON CONTRACT BUS DRIVERS.

Contents:

Name
Employee Number
Bus Number
Annual Allotment
YTD usage
Current Withholding
Estimated Date of Exhaustion

FIGURE 17. SUMMARY REPORT ALLOCATED TO EACH FUND.

Contents:

Fund's Name	(For each Fund)
Number of Employees	"
Total Deductions	"
Current Escrow	"
Fiscal Year to Date	"
Current Due by Employee	"
Current Due by Employer	"
Total Funds Due	"

FIGURE 18. SUMMARY REPORT FOR THE MONTH.

Contents:

Employee life insurance coverage:	# of Employee	Total Coverage	Monthly Premium
Coverage for $12000			
Coverage for $7000			
Coverage for $4000			
Coverage for Total Salary			
Total			

$$\left.\begin{array}{l}\text{Total Deduction}\\ \text{Current Escrow}\\ \text{Fiscal Year to Date}\\ \text{Current Due by Employee}\\ \text{Current Due by Employer}\\ \text{Total Fund Due}\end{array}\right\}\ \text{for each class of coverage}$$

FIGURE 19. DETAILED INSURANCE REPORT FOR THE MONTH.

Contents:

Name
SSNO
Location (code)
Position (code)
Insurance (code)
No. of Pay Period
Total Deduction (for the month)
Current Escrow
Fiscal Year to Date Escrow
Current Due by Employee
Current Due by Employer
Total Due

FIGURE 20. BREAKDOWN OF THE VARIOUS SCHOOL LUNCH EXPENSES BY LOCATION (SCHOOL).

Contents:

Location (code)
Name of Location
Percentage of total expense which is assigned to each location
Total expenses assigned to each location
Breakdown of total based on various types of expense

FIGURE 21. QUARTERLY REPORT ON FICA DEDUCTION.

Contents:

Employee's SSNO
Name of the Employee
Taxable FICA Wages
Total Wages paid in this quarter

FIGURE 22. RETIRED EMPLOYEE'S GROUP INSURANCE BILLING.

Contents:

Name of Retired Employee
SSNO
Location (code)
Position (code)
Insurance (code)
Date Retired
Escrow Balance
Quarterly Premium
Amount due this quarter

FIGURE 23. UNITED GIVERS FUND DEDUCTION, LISTING OF THESE DEDUCTIONS AND LOCATION TOTAL PER PERIOD FOR BALANCING PURPOSE.

Contents:

Location Name
Within each location:
- Name of employee
- SSNO
- Location (code)
- Position (code)
- Payroll Type
- Amount Pledge
- Number of pay periods
- Amount deducted this period
- Total number of people in each location
- Total amount pledged in each location
- Total amount deducted in each location

FIGURE 24. SCHOOL EMPLOYEES RETIREMENT CHECKLIST (PREPARED YEARLY).*

Contents:

SSNO
Name
Actual Earnable Compensation
Total Retirement Deduction
Percentage of Year Employed
Remarks (Date of employment, termination or retirement)

*Same type of information is prepared for school lunch employees.

FIGURE 25. COURTESY FUND DEDUCTION REPORT FOR EACH LOCATION (PREPARED ON REQUEST).

Contents:

SSNO
Position (code)
Name
Amount of Deduction

FIGURE 26. REPORT ON THE SEX AND RACE BY PAYROLL TYPE (PREPARED ON REQUEST).

Contents:

Descriptions of Classes of Employment	(23 different classes)
Number of White Male	(in each class)
Number of White Female	(" " ")
Number of Black Male	(" " ")
Number of Black Female	(" " ")
Total Active	(" " ")
Total on Leave	(" " ")
Total Number of White	
Total Number of Black	

FIGURE 27. REPORT ON YEAR TO DATE TRAVEL PAID TO EMPLOYEES.

Contents:

Name of employee
SSNO
Location (code)
Position (code)
Year to date travel paid

FIGURE 28. PREPARATION OF VOCATIONAL EDUCATION FORM FOR STATE OF LOUISIANA, PREPARED IN OCTOBER OF EACH YEAR.

Contents:

Name of the employer
Name of the school (location)
Salary per academic year
Degree Held
Yearsof Experience
Teaching Schedule:
- Class period
- Subject taught
- Length of period (minutes)
- Number of students enrolled

FIGURE 29. SALARY CHECKLIST OF THE PRINCIPALS (PREPARED ON REQUEST).

Contents:

Name of School
Name of Principal
Degree Held
Years Experience
Nine-month Salary
Extra Compensation
Total Annual Salary
Approximate number of teachers under principal's supervision

FIGURE 30. LONGEVITY SERVICE AWARDS REPORTS FOR THOSE WHO HAVE SERVED THE SYSTEM MORE THAN TWENTY YEARS.

Contents:

Name
Location of employment
Position
Date of original employment

FIGURE 31. LIST OF TEACHERS BY LOCATION OF EMPLOYMENT (PREPARED ON REQUEST).

Contents:

Name of the location
Name of the employee
Address of employee
Phone Number
Salary
Degree Held
Years Experience

FIGURE 32. PRINCIPALS AND TEACHERS LISTING (PREPARED YEARLY).

Contents:

Name
SSNO
Position (code)
Number of pay periods
Fund
Ledger Account Number
Race and Sex
Degree Held
Years Experience
Total Salary
Subject Taught

FIGURE 33. INDEX CARDS PRINTED ON REQUEST FOR PERSONNEL DEPARTMENT.

Contents:

Name
SSNO
Date of Birth
Address
Phone
Sex
Race
Marital Status
Position
Location
Salary
Number of Pay Period
Step
Payroll Type
Fund
Ledger Account Number
Number of Federal Exemptions
Number of State Exemptions
Total years of experience
Type of retirement program

FIGURE 34. TEACHERS AND PRINCIPAL LIST FOR EACH LOCATION PREPARED ON REQUEST FOR THE SCHOOL PRINCIPAL.

Contents:

Name of the school
Name of the employer
Tenure code
Subject taught
Teachers on leave
Total active teachers
Total teachers on leave

FIGURE 35. NUMBER OF PRINCIPALS AND TEACHERS INCLUDING FEDERAL PROGRAM PERSONNEL.

Contents:

Type of Employment:
- White
  - Number of Men
  - Number of Women
  - Total
- Negro
  - Number of Men
  - Number of Women
  - Total
- Total
  - Number of Men
  - Number of Women
  - Total
- Total by each group of teachers and principals.

FIGURE 36. PROFESSIONAL TRAINING OF PRINCIPALS AND CLASSROOM TEACHERS LEVEL OF TRAINING.

Contents:

- White
  - Number of principals
  - Number of kindergarden teachers
  - Number of elementary school teachers
  - Number of high school teachers
  - Total
- Negro
  - Number of principals
  - Number of kindergarden teachers
  - Number of elementary school teachers
  - Number of high school teachers
  - Total
- Total of each group

FIGURE 37. EXPERIENCE OF PRINCIPALS AND CLASSROOM TEACHERS YEARS EXPERIENCE.

Contents:

- White
  - Number of principals
  - Number of kindergarden teachers
  - Number of elementary school teachers
  - Number of high school teachers
  - Total
- Negro
  - Number of principals
  - Number of kindergarden teachers
  - Number of elementary school teachers
  - Number of high school teachers
  - Total
- Total of each group

FIGURE 38. LIST OF MISCELLANEOUS REPORTS AND ACTIVITIES OF P/P SUBSYSTEM.

1. Preparation of United Givers Pledge Card for each year
2. List of teachers who are being paid by State of Louisiana
3. Preparation of W-2 Form
4. Bank reconciliation for each month
5. Teachers' contracts
6. Employees' Directory
7. Series of race and sex report
8. Distribution of salaries of administrative and supervisory personnel
9. Distribution of salaries of principals
10. Distribution of salaries of classroom teachers

FIGURE 39. CRT LAYOUT.

FØRMAT 1

```
LNAM               FNAM        M LØC  PØS
ADRESS                      ƀ999-99-9999
CITY                 99999 PHØN: 999-9999
SLUB:ƀƀƀ.99
ALUB:

STSL:              DØEM:            RACE:
PHSL:              DREM:            SEX:
EXCM:              DTRM:            STAT:
EXCP:              BGST:            MART:
TSAL:              ENST:            RETC:
                   RETD:            FICC:
FDCD:     PPYR:       RETN:        SABD:
STCD:     CKDS:       BANK ACCT:
INSC:     TRAVEL FUND/LEDGER:


DEG:     SUB1:      CSUB:     CSUB:
EXP:     SUB2:      CSUB:     CSUB:
STP:     SUB3:      CSUB:     CØLB:
TEN:     SUB4:      CSUB:     CØLM:
DØB:                NTES:     CØLP:
CER:           CERN:          CERT:
```

FØRMAT 2

```
LNAM               FNAM        M LØC  PØS
ADRESS                      ƀ999-99-9999
CITY                 99999 PHØN: 999-9999

FND/LDG:                PCT:
DØB:               DTRM:          SLUB
DØEM:              BGST:          ALUB
DREM:              ENST           ALPP

MINS:          DRTE:        TSAL
FEIN:                CANN:
INS:                 FSLW           FICC:
                                    STEP:
                                    INSC:
                                    FDCD:
                                    STCD:
                                    PPYR:
                                    MØNT:
                                    PRTY:
                                    RACE:
                                    SEX:
                                    STAT:
                                    MART:
                                    RETC:
```

FIGURE 40. PAYROLL FILE LAYOUT.

PURPOSE:	To allow multiple charges per check and multiple payment types to any employee on given payroll.
CONTENTS:	Four types of data are available: 1. Identification and sort field 2. Charge data (fund, ledger, etc.) 3. Current payroll data (gross, adjustment, etc.) 4. Control data (type of payment) The above data will be used to prepare payroll checks, registers, and the associated reports.
ORGANIZATION:	File is organized sequentially based on Social Security Number.

PAYROLL FILE DATA ITEMS

SSNØP	Social Security Number.
LØCP	Reporting Location. Contains the location that reports this individual.
PØSP	Position.
CKDSP	Check Disposition. Contains the check disposition code chosen by the employee.
FUNDP	Fund. Indicates the fund to which this portion of the employee's check is to be charged.
LDGRP	Ledger. Indicates the ledger to which this portion of an employee's check is to be charged.
LØCCHGP	Location Charged. Used to pro-rate salary to the various locations (presently used for multiple school lunch managers).
PERCENTP	Percent. Contains a figure which denotes the % of an employee's total normal earnings that is to be charged to the Fund-ledger-location contained in this record.
DWØRKP	Days Worked. Contains the days worked (or elapsed) during this pay period.
PAIDP	Days Paid. Contains the number of days this employee is being paid this payday.
HRPDP	Hours Paid. Used only for part-time substitutes who are paid by the hour.

FIGURE 40 cont.

DRATE	Daily Rate. Used for calculating gross pay.
∅THRSP	Overtime Hours at Straight Time.
∅THRHP	Overtime Hours at Time and 1/2.
∅TP	Overtime Amount.
ADICP	Adjustment code 1. Indicates type of adjustment for ADJ1P in this record.
ADJ1P	Adjustment amount 1.
AD2CP	Adjustment code 2.
ADJ2P	Adjustment amount 2.
NOTE ON ADJUSTMENTS	ADJ1 and AD1C from the master record may not necessarily show up in ADJ1P and AD1CP in the payroll record. They may be shifted to the adjustment 2 fields in the payroll record depending on the type of that adjustment and the other types of adjustments the employee may have. If an employee has 2 adjustments of the same type, the amounts are added together into one adjustment field.
GROSP	Gross (Base) Pay.
ABWOP	Absence without pay. Contains the total number of days to be docked.
FDWHP	Federal withholding tax.
STWHP	State withholding tax.
CTWHP	Reserved for city withholding tax. (Not used at this time).
MEALP	Meals. Contains the amount to be added to taxable earnings for S/L employees only.
DFERP	Deferred net pay. Contains 1/6 of net due for 12 check teachers and Bus Drivers.
DFWP	Deferred federal withholding. Contains 1/6 of calculated federal withholding for 12 check teachers and bus drivers.

FIGURE 40 cont.

RETP	Retirement amount. Contains the employee's contribution for retirement in this check.
FICAP	F. I. C. A. amount.
NETP	Net pay. Contains the check amount for this individual (GROSP ± adjustments + O.T. - deductions (taxes, retirement, deductions, etc.) - deferred pay + travel).
CKNUM	Check number.
PPEND	Pay period ending date.
INSP	Insurance amount.
RECNUM	Master record number.
REGSSNO	S.S. # of regular employee.
REGLOC	Location of regular employee.
REGPOS	Position of regular employer.
PAYTYPCD	Payment type code. Inserted by create program, this code indicates whether this record is: 1 - normal payments, 2 - Substitute payment, 3 - Mass Deferred Pay Refund, 4 - Individual Deferred Pay Refund, 5 - Retirement Payoff, 6 - Death Payoff, 7 - Extended Sick Leave Payoff, 8 - Adult Education, 9 - Summer payroll, 0 - Special payroll.
LASTREC	Last record code.
TRAVP	Travel amount.
EXREC	Exception record address. This field is used as the actual key to access the employee's record in the exception file.
SØRT - LOC	Sort location. Used to sort tags in check disposition sequence (alpha within bank, alpha by location for individual disposition).
EX - CHG	Exception charge code.
FICCP	Fica code.

FIGURE 40 cont.

DEDAMTP AND DEDCDP	Voluntary deduction codes and amounts.
INSCP	Insurance code.
RETCP	Retirement code.
EQFCT	Equated factor.
SØRT-FACT	Sort factor.
LNAMP	Last name.
FNAMP	First name.
MIP	Middle initial.
CKDATEP	Check date.

FIGURE 41. PAYROLL/PERSONNEL MASTER FILE.

CONTENTS: This file consists of all bank personal data plus calendar and fiscal year to date (YTD) information. Also included in the file the required current payroll data.

ORGANIZATION: File is index random in nature with digits extracted from the Social Security Number, used for index key.

ADDITIONS: New employee's data record is introduced to the system by means of punch card. This record will be added to the next available location.

CHANGES: Changes in the records will be handled by punch card. An audit trail is provided by means of printing all the changes which may have occurred.

DISK FILE MAINTENANCE: After each addition and/or change run, the disk file maintenance program will be executed. This program edits each record, and prints an error sheet for correction.

MASTER FILE

DATA ITEM DESCRIPTIONS:

SSNO The SSNO is the primary identifier of the employee.

LOC This field contains the employee's reporting location code.

POS This field contains the position code of the employee.

ALTLOC This field contains an alternate location code to be used for special purposes only (Summer School, etc.).

ALTPOS Contains an alternate position code to be used for special purposes only, (Summer School, Adult Ed., etc.).

LNAM Employee's last name plus appendages (Jr., etc.)

FNAM Employee's first name.

MI Employee's middle initial.

STRE Employee's mailing address.

CITY City and State.

FIGURE 41 cont.

ZIPC	Zip Code.
PHON	Telephone Number.
DOB	Employee's date of birth.
RACE	Race: W = White N = Negro I = American Indian O = Oriental S = Spanish American X = Other
SEX	Sex: M = Male F = Female
MAR	Marital Status: M = Married S = Single D = Divorced W = Widowed
STAT	Status Code: A or 1 = Active; J or 2 = Maternity Leave; 3 = Sabbatical Leave; K or 4 = Military Leave; L or 5 = Leave Without Pay; B or 6 = Appointed Substitute; M or 7 = Terminated; 8 = Substitute; N = Payoff - changing position (converted to 1); 9 = Non-Usable Record.
BEGSTAT	Beginning status date.
ENDSTAT	Ending status date used in same way as BEGSTAT.
EMPDATE	Date of original employment.
REMPDATE	Date of re-employment.
TERMDATE	Date of termination.
TERMREAS	Reason for termination code.
COLB COLM COLP	College Code of school granting batch, masters, specialist, or PHD.
TENU	Tenure Code.
DEG	Contains Degree Code.
EXO1	Experience in other school systems (actual).
EXO2	Experience (military)while at other systems.
EXT1	Experience in this school system (actual).
EXT2	Experience (military) while at this system.

FIGURE 41 cont.

TOTEXP	Total years of experience.
CONTSERV	Years of Continuous service updated at fiscal year end (as EXT1 & TOTEXP).
STEP	Contains salary step of Non-Teacher Personnel.
YRSTEP	Contains the number of years employee has been on this step of the salary schedule.
STEPDATE	Contains the date of the last step increase of this employee.
CERTYP	Certificate type.
CERNUM	Certificate Number.
CERDATE	Date Certificate issued.
CERTEXP	Date certificate expires.
NTESCOR	National Teachers Exam Score.
TSAL	Contains the total annual salary for this individual.
STSL	State Salary (teacher personnel only) contains that portion of total salary paid by the Parish.
PHSL	Parish Salary (teacher personnel only) contains that portion of total salary paid by the Parish.
EXCM	Extra Compensation for months employed.
EXCP	Extra compensation for position held.
PYSL	Previous year's salary.
DRTE	Daily Rate of Pay.
SUB1 SUB2 SUB3 SUB4	These fields contain the subject codes of current assignments.

FIGURE 41 cont.

CSUB1 CSUB2 CSUB3 CSUB4 CSUB5 CSUB6	These fields contain the subject codes of all certified areas of this particular teacher.
ALPP	Annual leave per pay period.
ALUB	Annual leave unused balance.
SLUB	Sick leave unused balance.
SABD	Sabbatical leave days.
SAB	Sabbatical deduction.
PPYR	Pay periods per year - contains 10, 18, 20, 26 depending upon payroll grouping.
MØNT	Months employed this year. Contains 9.0, 10.0, or 12.0 depending upon payroll grouping.
MØNL	Months employed last year.
<u>CHARGE</u>:	
FUND 1	Contains the fund code to which the percentage of earnings is to be charged.
FUND 2	Same as fund 1.
FUND 3	Same as fund 1.
LDGR1	Contains the ledger code to which the percentage of earnings is to be charged.
LDGR2	Same as LDGR1.
LDGR3	Same as LDGR1.
PERCENT 1	Contains the percentage to be charged to Fund 1 and LDGR1.
PERCENT 2	Same as percent 1.
PERCENT 3	Same as percent 1.

FIGURE 41 cont.

LOCCHG 1	Contains the locations to be charged
LOCCHG 2	the percentage given in the respective
LOCCHG 3	PERCENTX Fields.

<u>CHARGE NOTES</u>:

CKDS	Check disposition. Contains code to indicate where check is to be sent (location, deposited, mailed, etc.).
PRTY	Payroll type.
ALTPRTY	Alternate Payroll type.
FDCD	Federal Exemption Code.
STCD	State Exemption Code.
CTCD	City Exemption Code.
RETC	Retirement Code.- Indicates which retirement system this employee belongs to. 1 or A = Teachers; 2 = School Emp.; 3 = S/L; 0 = None.
FICC	Fica Code.
RETN	Retirement Number - Assigned by retirement system.
RETF	Retirement Form.
DPNO	Deposit Number.
RETD	Date Retirement Contribution applied for (refund).
MINS	Month to Date Insurance.
CGRO	Calendar year to date gross pay (± adjustments, O.T.).
CMEA	Calendar Year To Date - Meals
CFIC	Calendar Year To Date - FICA
CFED	Calendar Year To Date - Federal Tax
CST	Calendar Year To Date - State Tax
CCTY	Calendar Year To Date - City Tax
	Updated each payroll and zeroed at year end.

FIGURE 41 cont.

CANN	Calendar Year to Date Annuity.
FBAS	Fiscal Base This Position.
FBAT	Fiscal Retirement Base.
FADJ	Fiscal Year To Date Adjustments.
FØT	Fiscal Year To Date Overtime Pay.
FDFR	Fiscal Deferred Pay. Contains year to date deferred pay.
FDFW	Fiscal Deferred Federal Tax.
FRET	Fiscal Retirement.
FEIN	Fiscal Escrow Insurance - This field contains the monies withheld in excess of monthly premiums and is used to pay premiums during summer months.
FHRS	Fiscal Year To Date Hours Paid.
FDPD	Fiscal Year To Date Days Paid.
FDAY	Fiscal Days Elapsed - Contains number of days elapsed to date.
FALT	Fiscal Annual Leave Taken.
FSLT	Fiscal Sick Leave Taken.
EXSL	Extended Sick Leave Paid.
FSLW	Fiscal Sick Leave Taken for Workman's Compensation (injury on job).
FABW	Fiscal Absence Without Pay.
FDEX	Contains fixed Federal income tax deduction.
STEX	Contains fixed State income tax deduction.
CTEX	City Tax - Same as Federal. Not used yet.
PAID	Days Paid This Pay Period.
DWORK	Days Elapsed This Pay Period.

FIGURE 41 cont.

ØTHRS	Overtime Hours at Straight Pay.
ØTHRH	Overtime Hours at Time and 1/2.
ØT	Overtime Amount.
ALT	Annual Leave Taken This Pay Period.
SLTP	Sick Leave Taken For Personal Illness.
SLTD	Sick Leave Taken For Death In Family.
SLTØ	Sick Leave Taken For Other Reasons.
SLW	Sick Leave Workman's Compensation.
ABWØ	Absence Without Pay.
PRLV	Professional Leave.
SUBD	Substitute Days - Contains the number of days a substitute has been employed for this employee.
LVWØ	Leave Without Pay.
AD1C AD2C	Adjustment Codes 1 & 2 - Contain the code to determine the type of adjustment contained in the respective ADJ field. 1 = Deduction for Absence 2 = Mileage Payment (Board Member, Contract Bus Driver, Staff Travel Allowance). 3 = Error Corrections 4 = Sabbatical Deduction 5 = Annual Leave Payoff on Termination 6 = Extended Sick Leave Payment 7 = Death or retirement payoff 9 = Multiple Adjustments (on checks)
ADJ1 ADJ2	Contain the amounts of the adjustments outlined in AD1C & AD2C.
GRØS	Contains the amount of <u>base</u> pay due each employee for this pay period.
MILE	Mileage Per Pay Period (contract Bus Drivers). Mileage Per Board Meeting (Board Members).
TRAV	Travel Expense - Contains current months travel allowance for staff personnel with expense accounts.

FIGURE 41 cont.

TFUND	Travel Fund - Contains the fund that this person's travel is to be charged.
TLDGR	Travel Ledger - Contains the ledger that this person's travel is to be charged.
UPDATE	Date of Last Update - Inserted by update program, used for internal control only.
INSC	Group Insurance Code - Reflects the class of insurance for this employee.
INS	Insurance Deduction Amount.
VOL-DEDNS	Voluntary Deduction Fields.
DEDCD	Deduction Code - The two characters code specifies the type of deduction contained in adjacent DEDAMT FIELD. The first character indicates type, the second the company, etc. A = Annuity B = Bonds C = Credit Union G = Garnishment L = Liability Ins. M = Misc. Ø = Other Ins. R = Rent S = Service T = Tax Levy U = United Givers
DEDAMT	Deduction Amount.
RET	Retirement Deduction.
EXCEPTIONS	These fields are used to handle various exception cases.
SALARY	If this field contains a "1", the normal salary calculations will be suspended and TSAL, STSL, PHSL, EXCM, EXCP will be accepted as given, the only check that will be made is the crossfooting of these fields. A report of salary exceptions will be given to Personnel for individual handling.
RETEX	Retirement Exception.
GRØSEX	Gross Pay Exception.
GARNEX	Garnishment Exception.

FIGURE 41 cont.

FIELDA FIELDB FIELDC FIELDD FIELDE	Exception fields reserved for undefined exceptions.
HISTORY	Counter of the history records present in the history file for this employee.
PAYROLL	Counter of the different payment types present in the payroll file for this employee.
HISTLY	Counter of the payroll records present in last years history record for this employee.
LFBAT	Last years fiscal retirement base.
LFDPD	Last years fiscal days paid.
CRT-PAY-KEY	Index that will be calculated by employee's ID and will facilitate further processing of personnel file.

FIGURE 42. PAYROLL HISTORY FILE.

PURPOSE:	To prepare various periodic reports (monthly, quarterly, FICA, etc.) and microfiche data.
CONTENTS:	This file contains one or more record for each check paid to the employees during the fiscal year, records for bank checks, adjustment and remarks on individual employee.
ORGANIZATION:	Void checks and banks records are kept at the beginning of the file followed by all regular history records and other remarks on employees which is filled sequentially based on Social Security Number.

PAYROLL HISTORY FILE DATA ITEMS

REC-CODEH	Record Code. Indicates what type of history record this is: 1 = Normal Payroll Record 2 = Bank Record 3 = Destroyed Check 4 = Adjustment Record 5 = Comment Record
VOID-SWH	Void Switch. Indicates the void status of this check. 0 = Normal Not Voided 1 = Void Not Replaced 2 = Void, Exact Replacement 3 = Destroyed Check (Never Issued) 4 = Replacement for a Voided Check 5 = Used (on MTD history only) to update YTD history with void not replaced. 6 = On MTD = Used to update YTD with voided & replaced 6 = On YTD = Replacement for a previous year void 7 = Voided bank check with replacement 8 = Used only on MTD history to update YTD history with voided checks and replaced with changes.
SSNOH	Social Security Number.
LOCH	Reporting Location. Used on certain monthly reports (Absence & Overtime Summary, O.T. Register) which are run in location sequence.
POSH	Position Code.

FIGURE 42 cont.

CKDSH	Check Disposition Code.
FUNDH	Fund Code.
LDGRH	Ledger Code.
LOCCHGH	Location Charged.
DWORKH	Days Worked.
PAIDH	Days Paid.
HRPDH	Hours Paid.
HRATEH	Hourly Rate.
DRATEH	Daily Rate.
OTHRSH	Overtime hours at straight time.
OTHRHH	Overtime hours at time and 1/2.
OTH	Overtime Amount.
AD1CH	Adjustment Code 1.
ADJ1H	Adjustment Amount 1.
AD2CH	Adjustment Code 2. Same as AD1CH.
ADJ2H	Adjustment Amount 2. Same as ADJ1H.
GROSH	Base Pay.
ALTH	Annual Leave Taken This Pay Period.
SLTPH	Sick Leave Taken, Personal Illness.
SLTDH	Sick Leave Taken, Death In Family.
SLTOH	Sick Leave Taken, Other Reasons.
SLWH	Sick Leave Taken, Workman's Comp.
ABWOH	Absence Without Pay.
PRLVH	Professional Leave Taken.
SUBDH	Days Substitute was Employed.

FIGURE 42 cont.

LVWOH	Leave Without Pay.
FDWHH	Federal Withholding Tax.
STWHH	State Withholding Tax.
CTWHH	City Withholding Tax.
MEALH	Meals.
DFERH DFWH	Deferred Pay.
RETH	Retirement Deduction.
FICAH	Fica Deduction.
NETH	Net Pay.
CKNUMH	Check Number.
CKDATEH	Check Date.
REP-CKNUMH	Replacement Check Number.
PPENDH	Pay Period Ending Date.
INSH	Insurance Amount.
REGSSNOH REGPOSH REGLOCH	Social Security Number. Position Location
PAYTYPH	Payment Type Code.
LASTRECH	Last Record Code.
TRAVH	Travel Amount.
FICCH	Fica Code.
DEDAMTH DEDCDH	Deduction amounts & codes. Used for certain monthly reports.
INSCH	Insurance Code.
RETCH	Retirement Code.
PRTYH	Payroll Type.

FIGURE 43. AUTHORIZED POSITION FILE.

PURPOSE:	To facilitate budgetary control over payroll/ personnel data processing.
CONTENTS:	This file contains one record for every unique location/fund/position combination authorized in this system. Data in each record includes payroll group, salary & travel ledgers, and various count fields.
ORGANIZATION:	The file is unordered and is normally accessed using Xram files & procedures. It can be accessed sequentially if desired, but records will not be in any logical sequence.

AUTHORIZED POSITION FILE DATA ITEMS

AP-LOC AP-FUND AP-POS	Location-fund-position combination authorized.
AP-LOC-KEY	Actual key of location record in student location file.
AP-POS-KEY	Actual key of position record in position file.
AP-PR-TYPE	Payroll group in which this loc-fund-pos belongs. Same as normal equated factors for payrolls: M = Main biweekly S = School biweekly T = Teachers B = Bus Drivers L = School Lunch
AP-SAL-LEGR	Normal salary ledger for this loc-fund-pos.
AP-TRAV-LEGR	Normal travel ledger.
AP-LST-ACT	Authorized (active) as of June 30th of last fiscal year.
AP-LST-SAB	Authorization (sabbatical leave) as of June 30th of last fiscal year.
AP-CUR-ACT	Current authorization-active.
AP-CUR-SAB	Current authorization - sabbatical leave.

FIGURE 43 cont.

AP CUR ASSIGN	Current assigned
AP MAT LV	Current assigned (maternity leave)
AP SAB LV	Current assigned (sabbatical leave)
AP MIL LV	Current assigned (military leave)
AP LV WOP	Current assigned (leave without pay)
AP NXT RECORD	Key of the next available record in the file.

FIGURE 44. SUBJECT FILE.

This file contains the code and title of all teacher subjects in the payroll-personnel code book. It is used mainly in various payroll-personnel reports, teacher contracts, personnel cards, etc. The file may contain up to 600 different subjects.

FIGURE 45. TEACHER SALARY SCHEDULE FILE.

This file contains the salary schedules for teachers, broken down by state and parish salaries, and by degree and experience. It is a random file, accessed by an actual key equal to a teacher's total experience (TOTEXP) + 1. There is one record for each experience level from 00 thru 49. Each record is subdivided into a state and parish salary portion for each possible degree code. This file is used for salary updating, budget reports, etc.

FIGURE 46. PAYROLL FINDER TAGS.

These are the tags created and sorted either in check disposition sequence or register sequence. They are used for rapid access to the payroll file. All that is contained in the actual tag is the address of the payroll record. They are created by a generated sort.

PRTAGD = tags in check disposition sequence.

PRREGD = tags in register sequence.

FIGURE 47. CONTROL DATA FILE.

This file contains a table of the data cards being used during a payroll run. Up to ten payrolls can be processed at one time. The file is created by the payroll monitor program at the beginning of a payroll run.

CONTROL DATA FILE DATA ITEMS

PER-END.	Pay period ending
CK-DATE	Check date
RPT-DATE	Absence report due date
PR-DESC	Payroll description
SRT-FACT	Equated factor. Used to select records by P/R groups.
B-CK-NØ	Beginning check number
B-DEP-NØ	Beginning deposit number
EARN-AMT	Net earned amt. - date card total.
NUM-AMT	Employee count - date card.
RUN-NØ	Run number
NØ-DED	No deductions option. If = "1" indicates that voluntary deductions are not being made on this payroll.
NØ-RETM	No retirement option. If = "1" indicates that retirement is not being deducted on this payroll.
NO-ALV	No annual leave option. If = "1" indicates that annual leave balance is not to be updated this pay period.
EXT-SK-LV	Extra sick leave. Used for summer payrolls.
EARN-AMT-P	Net earned amount - program total.
NUM-AMT-P	Employee count - program total.
STATUS-SW	Program status switch.
MONITOR-MASK	Mask of switch settings used for control of program executions in the job stream.

FIGURE 48. BANK DEPOSIT FILE.

This file is a temporary file created by the check program and used to supply information to other payroll jobs concerning deposited checks. It contains a record for each bank for which a check was written in a payroll run.

BANK DEPOSIT FILE DATA ITEMS

BNK-CØDE	Bank code.
BNK-NAME	Bank name. Printed on deposit slips and check transmittal.
BNK-ADDR	Bank address.
BNK-CK-NØ	Bank check number.
BEG-DEPØSIT	Beginning deposit number. Number of first deposit slip included in this bank check.
END-DEPØSIT	Ending deposit number. Number of the last deposit slip included in this bank check.
PR-INCLUDED	Payrolls included in this bank check.
BNK-EQ-FACT	Equated factor for this payroll group.
PAY-DESC	Payroll description.
NUMB-DEP	Number of deposit slips included in this check for this payroll group.
DEP-AMT	Total amount of deposits included in this check for this payroll group.

FIGURE 49. EXCEPTION FILE.

This is a temporary file created by the calculated payroll program for employees with multiple payment types and used by the register program to keep an accurate printout of fiscal and calendar year-to-date fields on the register and facsimile. It is a random file accessed by the actual key in the field called "Ex-REC" in the payroll file.

<u>EXCEPTION FILE DATA ITEMS</u>

SSNØE	Social Security Number. Primary identifier.
ALUBE & SLUBE	Annual Leave & Sick Leave balances which may change each pay period.
CALENDAR AND FISCAL YTD	All or some of fields which will be changed by this payroll.
FLAGE	
FLGE	

FIGURE 50. PAYROLL AUDIT FILE - DISK.

CONTENTS:	This file contains a record for every change made to the master file. The records contain an image of the change input card plus the data which was in the field changed prior to the change.
ORGANIZATION:	This file is random. The first record is a dummy record with social security # of all 9's and the next available record number. Periodically it is sorted and merged with a previous audit tape to create a new audit tape, then the disk file is cleared.

<u>PAYROLL AUDIT FILE - TAPE</u>

CONTENTS:	See disk audit file documentation.
ORGANIZATION:	This file is in social security number sequence.
NOTES:	The audit file provides an audit trail of all changes made. Changes made to any given field or fields may be printed out as well as changes made to any given employee's master record.

FIGURE 51. ACCOUNTING SYSTEM PROGRAMS.

TITLE
Library Accounting Files & Routines
Accounting File Maintenance
Accounts Payable File Maintenance
Accounts Payable Register
Accounts Payable Checks and Remittance Advice
Accounts Payable Summaries
Accounts Payable Monthly Update
Accounts Payable History File Totals
Use Tax Reports
Bank Reconciliation
Selected Ledger Report
Cross Referance
Summaries by Time
School Lunch Summary by Location (Monthly or Periodic)
General Journal Report by Fund
Computer Revenue Sharing
General Ledger Batch Maintenance
Cash and General Journals
Summarize and Post General Ledger
General Ledger Monthly Update
Trial Balance
Account Status/Detail Ledger Listing
Construction Fund
General Ledger Fiscal Closeout
General Ledger Inquiry
Create and Clear File
Weekly Batch Process
Update
Monthly Report

FIGURE 52. TRANSACTION LIST.

BATCH # 05600 4/02/75 257

VENDOR NO.	VENDOR NAME	PURCHASE ORDER #	INVOICE DATE	INVOICE NO.	TAX FD	LEDGER CODE	LOC. CODE	INVOICE AMOUNT	DISCOUNT AMOUNT	NET AMOUNT	ACTUAL KEY
02486	ARNON FOOD		3/19/75	05696	2	350100	200	158.91		158.91	001640
02233	CAPITAL SUPPLY	008631	2/20/75	01976	2	350100	200	63.49		63.49	001641
		008631	2/20/75	03266	2	350100	200	31.66		31.66	001642
		008139	2/06/75	01661	2	350100	200	402.49		402.49	001643
		008139	2/06/75	01692	2	350100	200	88.50		88.50	001644
		008139	2/06/75	01693	2	354100	200	3.03		3.03	001645
		008139	2/06/75	02396	2	350100	200	34.12		34.12	001646
			3/17/75	05C68	2	350100	200	25.10		25.10	001647
02495	CAPITOL CITY PRODUCE	009630	3/17/75	82460	2	350100	200	56.79		56.79	001648
		009297	3/14/75	81621	2	350100	200	20.83		20.83	001649
					2	354100	200	15.79		15.79	001650
		009297	3/03/75	81189	2	350100	200	174.26		174.26	001651
		009297	3/20/75	82601	2	350100	200	23.76		23.76	001652
02500	CRIFASI BROTHERS	009616	3/17/75	03/17/75	2	350100	200	130.83		130.83	001653
		009087	3/03/75	425872	2	350100	200	48.25		48.25	001654
		009087	3/03/75	425871	2	350100	200	257.64		257.64	001655
		009087	3/10/75	426667	2	350100	200	122.80		122.80	001656
		009087	3/13/75	426666	2	350100	200	78.17		78.17	001657
		009087	3/17/75	427674	2	350100	200	42.56		42.56	001658
		009087	3/17/75	427675	2	350100	200	148.68		148.68	001659

FIGURE 53. REMITTANCE ADVICE.

PAID TO

EAST BATON ROUGE PARISH SCHOOL BOARD

P. O. BOX 2950 BATON ROUGE, LA. [illegible]

[illegible]

REMITTANCE ADVICE FOR CHECK NO. DATE /

DIRECT QUESTIONS CONCERNING THIS PAYMENT TO THE

ACCOUNTING DEPARTMENT, AREA CODE 504, TELEPHONE 926-2790 [illegible]

INVOICE NUMBER	INVOICE DATE	PURCHASE ORDER NO.	INVOICE AMOUNT	DISCOUNT	NET AMOUNT

FIGURE 54. ACCOUNTS PAYABLE CHECK REGISTER.

EAST BATON ROUGE PARISH SCHOOL BOARD

ACCOUNTS PAYABLE CHECK REGISTER

PAGE

VENDOR NO	VENDOR NAME	PURCHASE ORDER NO	INVOICE DATE	INVOICE NO	LEDGER CODE	LOC CODE	INVOICE AMOUNT	DISCOUNT AMOUNT	NET AMOUNT	CHECK NO

FIGURE 55. LEDGER SUMMARY.

RUN DATE 4/18/75 EAST BATON ROUGE PARISH SCHOOL BOARD PAGE 1

GENERAL LEDGER TOTALS BY FUND---FOR ACCTS. PAYABLE CHECKS DATED: 4/10/75 4/15/75 4/10/75 4/11/75 4/16/75

LEDGER	LEDGER TITLE	VENDOR	VENDOR NAME		NET AMT	CK. #
012100	TRAVEL ADVANCE	99999	AERTKER, ROBERT J.		300.00	008807
012100		99999	NEWBY, IRENE M.		450.00	009452
012100		99999	MCLEAN, GEORGE S.		500.00	009455
012100		99999	BLOCKER, GARY W.		200.00	009460
012100		99999	JEANSONNE, GERARD J.		390.00	009461
012100		99999	THOMAS JR, WALKER A.		210.00-	009466
012100		99999	JEANSONNE, HARREL J.		495.00	009469
012100		99999	FLEET, DONALD R.		210.00	009476
012100		99999	PARKINO, JOHN P.		225.00-	009479
012100		99999	BROWN, ALBERT L.		150.00-	009482
				LEDGER TOTAL * * * *	1,960.00	
012102	ADVANCE - INDUSTRIAL ARTS SHOP S	00400	SCOTLANDVILLE JUNIOR HIGH		4.56	009672
				LEDGER TOTAL * * * *	4.56	
012140	TRAVEL ADVANCE-BOARD MEMBERS	99999	EGLIN, BRIDGER		350.00	008390
012140		99999	PEABODY, BEN M.		350.00	008391
012140		99999	WELLS, WALLY W.		350.00	008392
012140		99999	CLAUDEL, J. O.		350.00	008393
012140		99999	HUNT SR, DONALD D.		350.00	008394
012140		99999	LAFLEUR JR, MARTIAL J.		350.00	008395
012140		99999	GOODWIN, J. R.		300.00	008396
012140		99999	MONTGOMERY, THOMAS M.		400.00	008397
				LEDGER TOTAL * * * *	2,800.00	
040100	ACCOUNTS PAYABLE - PREVIOUS YEAR	00875	ALLYN AND BACON, INC.		25.45	009483
040100		02167	CENTRAL SCIENTIFIC	COMPANY	2.48	009531
040100		02167			14.21	
040100		02167			73.49	
040100		02167			5.19	
040100		02167			9.98	
040100		02167			19.14	
040100		01138	FISHER SCIENTIFIC CO.	STANSI ED. NAT. DIV.	60.00	009572
040100		01138			20.94	
040100		02286	INTERSTATE SCHOOL SUPPLY	COMPANY, INCORPORATED	5.08	009597
040100		00831	PANORAMIC TEACHING AIDS,	INCORPORATED	47.20	009645
				LEDGER TOTAL * * * *	283.36	

FIGURE 55-1. FUND SUMMARY.

RUN DATE 4/14/75 EAST BATON ROUGE PARISH SCHOOL BOARD PAGE 2

GENERAL FUND SUMMARY OF ACCOUNTS PAYABLE. FOR CHECKS DATED: 4/13/75 4/10/75 4/11/75 4/14/75 4/15/75

LEDGER TITLE	LEDGER	DEBIT	CREDIT
RENTAL OF OTHER OFFICE EQUIPMENT	504103	423.23	
TRANSPORTATION - SUPPLIES, REPAIRS TO BUSES, ETC.	511100	955.01	
WORKMEN'S COMPENSATION - MEDICAL PAYMENTS	530101	1,584.15	
WORKMEN'S COMPENSATION - MEDICAL PAYMENTS - SCHOOL LUNCH	530103	298.	
EMPLOYER'S PORTION - GROUP INSURANCE	533100	2,034.07	
BUILDING REPAIRS	600101	3,548.27	
GROUND IMPROVEMENTS	600102	917.30	
EQUIPMENT REPLACE - INSTRUCTIONAL AND ADMINISTRATIVE	601101	2,411.70	
EQUIPMENT REPLACE - AUTOMOTIVE AND MOWING	601102	34,486.51	
EQUIPMENT REPLACE - PLANTS AND TOOLS	601103	1,592.77	
EQUIPMENT REPLACE - STOLEN EQUIPMENT	601105	575.14	
EQUIPMENT REPAIR - INSTRUCTIONAL AND ADMINISTRATIVE	602101	3,591.35	
EQUIPMENT REPAIR - AUTOMOTIVE AND MOWING	602102	2,593.50	
EQUIPMENT REPAIR - PLANT AND TOOLS	602103	5,317.21	
SPECIAL EDUC TRAN. REIMBURSE.	714110	739.47	
ACCOUNTS PAYABLE - CURRENT YEAR	040105		111,626.45
CASH (WRITE CHECK TO - EAST BATON ROUGE PARISH SCHOOL BOARD - CONSOLIDATED ACCOUNTS PAYABLE FUND			$ 111,626.45

FIGURE 55-1 cont.

RUN DATE 4/15/75 EAST BATON ROUGE PARISH SCHOOL BOARD PAGE 1

GENERAL FUND SUMMARY OF ACCOUNTS PAYABLE, FOR CHECKS DATED 4/10/75 4/10/75 4/11/75 4/14/75 4/15/75

LEDGER TITLE	LEDGER	DEBIT	CREDIT
TRAVEL ADVANCE	012100	1,960.00	
ADVANCE - INDUSTRIAL ARTS SHOP SUPPLIES	012102	4.56	
TRAVEL ADVANCE-BOARD MEMBERS	012140	2,800.00	
ACCOUNTS PAYABLE - PREVIOUS YEAR	040100	283.36	
ACCTS PAYABLE PART B&F SUPPLIES GUID	040135	75.50	
SCHOOL BOARD TRAVEL	100100	234.10	
ADMINISTRATIVE TRAVEL	199100	527.54	
TRAVEL FOR VOCATIONAL TEACHERS	210107	70.00	
MATERIALS - SPECIAL EDUCATION	250130	579.94	
OFFICE EXPENSE	400100	22,558.18	
INSTRUCTIONAL SUPPLIES	401100	257.83	
INDUSTRIAL ARTS SUPPLIES	401102	280.44	
SPECIAL PROJECTS	401105	6,366.54	
DATA PROCESSING INSTRUCTIONAL SUPPLIES	401106	4,093.07	
ROSENWALD PROJECT	401107	385.84	
IN-SERVICE TRAINING EXPENSE CONSULTANTS, MATERIALS, ETC.	404101	16.99	
IN-SERVICE TRAVEL	404102	1,190.67	
ELEM READING PROGRAM MATERIALS	408110	2,099.43	
SR HIGH READING PROGRAM MATERIALS	408111	364.20	
ENGLISH PHASE ELECTIVE PROGRAMS	408112	1,639.36	

FIGURE 56. USE TAX REPORT.

RUN DATE [illegible] EAST BATON ROUGE PARISH SCHOOL BOARD PAGE 1

GENERAL FUND USE TAX REPORT FOR MONTH ENDING 3/31/75

LOCAL TAX

LEDGER #	CHECK #	INVOICE #	NET AMOUNT	3 % OF NET	1 % OF 3 %	AMOUNT DUE
[illegible]	[illegible]	[illegible]	25.65	.77	.01	.76
[illegible]	[illegible]	[illegible]	[illegible]	1.50	.02	1.48
[illegible]	[illegible]	CT919190	14.21	.43	.00	.43
040100	009531	CT919460	19.14	.57	.01	.56
040100	009531	CT012005	73.49	2.20	.02	2.18
040100	009531	CT919198	2.48	.07	.00	.07
040100	009531	CT91986A	5.19	.16	.00	.16
040100	009531	CT919861	9.96	.30	.00	.30
040100	009574	CT921545	1.56	.05	.00	.05
040100	008515	CT011985	4.37	.13	.00	.13
040100	008159	180319	26.28	.79	.01	.78
040100	008159	309567	15.27	.46	.00	.46
	LEDGER TOTALS:		257.62	7.73	.07	7.66
040135	009626	404M220	75.50	2.27	.02	2.25
	LEDGER TOTALS:		75.50	2.27	.02	2.25
250130	009550	69206	7.60	.23	.00	.23
250130	009550	69208	36.35	1.09	.01	1.08
250130	009550	69209	36.25	1.09	.01	1.08
250130	008526	68572	21.98	.66	.01	.65
250130	009563	27525	13.37	.40	.00	.40
250130	009546	52541	7.07	.21	.00	.21
250130	009634	18063	86.00	2.58	.03	2.55
250130	009673	5086039493	10.70	.32	.00	.32
250130	009536	404697	20.37	.61	.01	.60
250130	009536	404693	18.04	.54	.01	.53
250130	009536	404695	27.63	.83	.01	.82
250130	009623	61874	15.70	.47	.00	.47
250130	009493	53280392	20.24	.61	.01	.60
250130	009656	682934	13.34	.40	.00	.40
250130	008086	082673	19.84	.60	.01	.59
250130	008488	317606	86.65	2.60	.03	2.57
250130	009508	317807	56.30	1.69	.02	1.67
250130	008529	391756	25.73	.77	.01	.76
250130	009889	63296	35.35	1.06	.01	1.05
250130	009590	21640	18.85	.57	.01	.56

FIGURE 57. NO TAX VENDOR REPORT.

RUN DATE 4/21/75 EAST BATON ROUGE PARISH SCHOOL BOARD PAGE 1

NO TAX VENDOR**LOCAL

VENDOR NAME AND ADDRESS		FUN	ORDER #	INVOICE #	INVOICE DATE		NET AMOUNT
ALLYN AND BACON, INC.		1	009493	4N070738	11/07/74		25.65
NORTHTON MA	07647				VENDOR TOTAL	$	25.65
FISHER SCIENTIFIC CO.		1	009572	415516302	3/20/75		60.00
STANSI ED. MAT. DIV.							
P.O. BOX 445							
PITTSBURGH, PENNSYLVANIA	15230				VENDOR TOTAL	$	60.00
CENTRAL SCIENTIFIC		1	009531	CT919190	3/21/75		14.21
COMPANY		1	009531	CT919486	2/19/75		19.14
P.O.BOX 4827		1	009531	CT014005	3/19/75		73.49
CHICAGO, ILL.	60680	1	009531	CT919198	1/22/75		2.48
		1	009531	CT91948A	9/19/74		5.19
		1	009531	CT9194613	1/31/75		9.98
		1	008078	CT921565	7/31/74		1.56
		1	008515	CT011985	3/20/75		4.37
					VENDOR TOTAL	$	130.42
LITTON EDUCATIONAL		1	008159	180319	8/20/74		26.28
PUBLISHING		1	008159	309547	9/06/74		15.27
P. O. BOX 1638							
CINCINNATI, OHIO	45201				VENDOR TOTAL	$	41.55
MCGRAW-HILL BOOK CO.		1	007626	4048220	8/22/74		75.50
P. O. BOX 14586							
ST. LOUIS, MO.	63178				VENDOR TOTAL	$	75.50
DEVELOPMENTAL LEARNING		1	009550	69206	4/01/75		7.60
MATERIALS		1	009550	69206	4/02/75		36.35
7440 NORTH NATCHEZ AVENUE		1	009550	69209	4/01/75		36.25
NILES, ILLINOIS	60690	1	009526	68572	3/25/75		21.98
					VENDOR TOTAL	$	102.18
ENCYCLOPEDIA BRITANNICA		1	009563	27525	3/31/75		13.37
EDUCATIONAL CORP.							
425 NORTH MICHIGAN AVE							
CHICAGO ILL	60611				VENDOR TOTAL	$	13.37

FIGURE 58. BANK RECONCILIATION.

[illegible]
MONTH OF [illegible]/75
ERROR REPORT

[illegible]

[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	52[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
40.74	CK #	627[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
5.00	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
7.50	CK #	6601	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
90.10	CK #	6862	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
35.00	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	[illegible]	CLEARED, BUT HAS NO O/S RECORD
[illegible]	CK #	7039	CLEARED, BUT HAS NO O/S RECORD

FIGURE 59. SELECTED LEDGER REPORT.

EAST BATON ROUGE PARISH SCHOOL BOARD
SELECTED LEDGER REPORT

DATE 04/21/75 FOR THE PERIOD FROM 07/01/74 THROUGH 04/21/75 PAGE 1

FUND: GENERAL

LEDGER	CHECK NUMBER	CHECK DATE	VENDOR NUMBER	VENDOR NAME	REQ. NUMBER	INVOICE NUMBER	INVOICE DATE	LOC	AMOUNT
528110	002143	11/20/74	02736	SCHOOL LUNCH EMPLOYEES		MONTGOMERY	11/20/74		1,867.69
528110	002142	11/20/74	02736	SCHOOL LUNCH EMPLOYEES		PEABODY	11/20/74		1,867.69
528110	002145	11/20/74	02736	SCHOOL LUNCH EMPLOYEES		PERKINS	11/20/74		1,253.44
528110	002144	11/20/74	02736	SCHOOL LUNCH EMPLOYEES		W W WELLS	11/20/74		1,570.90
						TOTAL FOR LEDGER	528110		6,559.72
529100	012530	08/23/74	02725	LA. SCHOOL EMPLOYEES'		MEMO	8/19/74		937.62
529100	012587	08/23/74	02736	SCHOOL LUNCH EMPLOYEES		MEMO	9/20/74		43.75
529100	003099	12/06/74	02738	TEACHERS RETIREMENT		MEMO	12/03/74		23,162.07
529100	004031	01/09/75	02738	TEACHERS RETIREMENT		MEMO	1/06/75		103,936.42
						TOTAL FOR LEDGER	529100		128,079.86

FIGURE 60. ACCOUNTS PAYABLE FUND SUMMARY.

RUN DATE [illegible] EAST BATON ROUGE PARISH SCHOOL BOARD PAGE [illegible]

ACCOUNTS PAYABLE FUND SUMMARY FOR 3/01/75 TO 3/31/75 INCLUSIVE

FUND [illegible]	ACCOUNT	DEBIT	CREDIT
000 ** NOT SPECIFIED **			
[illegible]	0350[illegible]		98.81
	000 TOTAL		98.81
005 ALSEN ELEMENTARY			
FOOD	* 0350100	4,087.34	
DISTRIBUTED - FOOD	* 0350100	10.74	
TOTAL - FOOD	** 0350100	4,098.08	
EQUIPMENT	0352100	11.25	
KITCHEN SUPPLIES	* 0354100	75.23	
DISTRIBUTED - KITCHEN SUPPLIES	* 0354100	3.96	
TOTAL - KITCHEN SUPPLIES	** 0354100	79.19	
DISTRIBUTED - MAINTENANCE	* 0355100	6.50	
TOTAL - MAINTENANCE	** 0355100	6.50	
DISTRIBUTED - UTILITIES & PHONE	* 0357100	57.36	
TOTAL - UTILITIES & PHONE	** 0357100	57.36	
DISTRIBUTED - ADMINISTRATIVE COST	* 0358100	53.54	
TOTAL - ADMINISTRATIVE COST	** 0358100	53.54	
DISTRIBUTED - OTHER	* 0359100	.33	
TOTAL - OTHER	** 0359100	.33	
MANAGERS' TRAVEL TO MORE THAN ONE SCHOOL	0359101	6.58	
	005 TOTAL	4,312.83	
020 BAKER HEIGHTS ELEMENTARY			
FOOD	* 0350100	5,767.04	
DISTRIBUTED - FOOD	* 0350100	21.25	
TOTAL - FOOD	** 0350100	5,788.29	
KITCHEN SUPPLIES	* 0354100	105.81	
DISTRIBUTED - KITCHEN SUPPLIES	* 0354100	7.83	
TOTAL - KITCHEN SUPPLIES	** 0354100	113.64	
MAINTENANCE	* 0355100	15.90	
DISTRIBUTED - MAINTENANCE	* 0355100	12.86	
TOTAL - MAINTENANCE	** 0355100	28.76	
PEST CONTROL	0356100	6.06	
DISTRIBUTED - UTILITIES & PHONE	* 0357100	113.48	
TOTAL - UTILITIES & PHONE	** 0357100	113.48	
DISTRIBUTED - ADMINISTRATIVE COST	* 0358100	105.91	

FIGURE 61. ACCOUNTS PAYABLE FILE.

PURPOSE:	Invoices and other records which are needed for Accounts Payable and General Ledger processing are added to this file. These records are processed weekly for Accounts Payable and daily for General Ledger and remain in the file until the end of the month. After the history file updated, the file will be cleared for the next month transactions.
CONTENTS:	The file contains invoice records for the Accounts Payable; receipts, disbursement, recorded checks and journal entry records for General Ledger system. Also included in the file batch control data for both systems.
ORGANIZATION:	The file is organized in random. 100 records in the file are allocated to the "batch" record and each batch entry contains the batch number and a pointer to the first record of that batch. The first entry of the first batch record contains the number of the next available record in the file.

ACCOUNTS PAYABLE FILE DATA ITEMS

A. INVOICE RECORD

I-FUND	Fund Code
I-FUND KEY	Actual key of fund title record
I-LOC	Location Code.
I-LOC-KEY	Actual key of location record in location file.
I-LEDG	Ledger Code.
I-LEDG-KEY	Actual key of ledger title record in location file.
I-PO-NO	Purchase Order Number
I-PO-DATE	Purchase Order Date
I-VENDOR	Vendor Number
I-CK-NO	Check Number
I-CK-DATE	Check Date
I-INV-DATE	Invoice Date

FIGURE 61 cont.

I-TAX	Tax Code 3 = Calculate 3% and add to invoice amount (food items since 1-1-74). 5 = No tax charged. Calculate 5% and add to invoice amount. (food items) 6 = No tax charged. Calculate 6% and add to invoice amount. 7 = No state or local tax charged. Invoice will be included on monthly use tax reports. 8 = No local tax charged. Invoice will be included on use tax report for local tax. 9 = No state tax charged. Invoice will be included on use tax report for state tax.
I-DISCOUNT	Discount amount (either loaded or calculated from vendor record where applicable).
I-INV-AMT	Gross Amount of invoice.
I-NET-AMT	Net Amount of Invoice. (Gross Amount - Discount and Taxes).
I-BATCH-NO	Batch # for this invoice.
I-STATUS	Record Status: 0 = to be paid 1 = paid, no register or summary 2 = register, no summary 3 = summarized 4 = payroll void 5 = accounts payable void 6 = disbursement/receipt record 9 = deleted record
I-SSNØ	Social Security Number.
I-EMP-KEY	Actual key of employee's record in P/R Master File.
I-VOID-DATE	Date of void (accounts payable void).

FIGURE 61 cont.

I-REC-TYPE	Record type code:
	0 = invoice record
	*1 = journal entry
	*2 = receipt
	*3 = disbursement (Doc. #s 00001-04999 = checks)
	(Doc. #s 05001-09999 = bank charges)
	5 = previous fiscal year voided check
	6 = current month voided check
	7 = previous month voided check
	8 = destroyed (unused) check

I-GL-KEY	Actual key of general ledger record for the fund/ ledger combination in this record.
I-INV-NO	Invoice # (contains current date if no # provided).

*Applies to General Ledger associated records only.

B. DISBURSEMENT-RECEIPT RECORD

DR-FUND DR-FUND-KEY DR-LØC DR-LØC-KEY DR-LEDG DR-LEDG-KEY DR-VENDOR	Corresponds to like fields in invoice record.
DR-DEP-CK-NØ	Check number in disbursement records; deposit number in receipt record.
DR-DEP-CK-DT	Check (or deposit) date.
DR-DEBIT DR-CREDIT	Debit or credit amount of transaction.
DR-BATCH-NØ DR-STATUS DR-SSNØ DR-EMP-KEY DR-VØID-DATE DR-REC-TYPE DR-GL-KEY	Correspond to like fields in invoice record.
DR-PAYØR-PAYEE	Name or identification of payor (receipt) or payee (disbursement), or description of voided check.

FIGURE 61 cont.

C. JOURNAL ENTRY RECORD

J-FUND J-FUND-KEY J-LØC J-LØC-KEY J-LEDG J-LEDG-KEY	Correspond to like fields in invoice record.
J-DØC-NO	Document number.
J-NET-DATE	Journal entry date.
J-DEBIT J-CREDIT	Debit or credit amount of journal entry.
J-BATCH-NØ J-STATUS J-SSNØ J-EMP-KEY J-VØID-DATE J-REC-TYPE J-GL-KEY	Correspond to like fields in invoice record.

D. BATCH RECORD

BATCH-NØ	Batch Number.
BEG-ADD	Address of first record in batch.
NØ-ØF-INV	Number of invoices in the batch.
BATCH-STAT	Batch status Accounts Payable Batches: 0 = Loaded, no trial 1 = Trial complete 2 = Approved for payment 3 = Checks printed 4 = Summary run General Ledger Batches: 5 = Loaded 6 = Approved 7 = Summarized

FIGURE 62. ACCOUNTS PAYABLE HISTORY FILE.

PURPOSE:	To prepare various monthly or yearly reports which require previous period data.
CONTENTS:	This file contains a record for every invoice record processed through the Accounts Payable subsystem as well as the records for Accounts Payable voids and all journal entries processed through the General Ledger subsystem.
ORGANIZATION:	It is organized sequentially by check number. Void records precede the invoice records for that check number.

ACCOUNTS PAYABLE HISTORY FILE DATA ITEMS

Regular History Records:

H-REC-CODE	Type of records: 0 = Normal Invoice Record 1 = Void record 2 = Destroyed checks 5 = Comment record 6 = Journal Entry
H-CK-NO	Check number on invoice and void records, zero on journal entries.
H-CK-DATE	Check date or journal entry date.
H-FUND	Fund Code.
H-LOC	Location Code.
H-LEDG	Ledger Code
H-PO-NO	Purchase order number.
H-PO-DATE	Purchase order date.
H-VENDOR	Vendor number.
H-INV-DATE	Invoice date.
H-DISCØUNT	Invoice discount
H-INV-AMT	Amount of invoice.
H-NET-AMT	Net amount.

FIGURE 62 cont.

H-BATCH-NO	Batch number of record.
H-SSNO	Social Security Number (for school board employee).
H-VOID-DATE	Date of voided check.
H-REC-TYPE	0 = normal invoice record 1 = journal entry 5 = previous fiscal year void 6 = current month void 7 = previous month void 8 = destroyed checks
H-INV-NO	Invoice Number.
H-DESCH	(Used only in journal entry record) - a brief description of the journal entry.
H-COMMENT	(Used only in comment record) - a 60-character comment.

FIGURE 63. ACCOUNTS PAYABLE DEPOSIT VOUCHER.

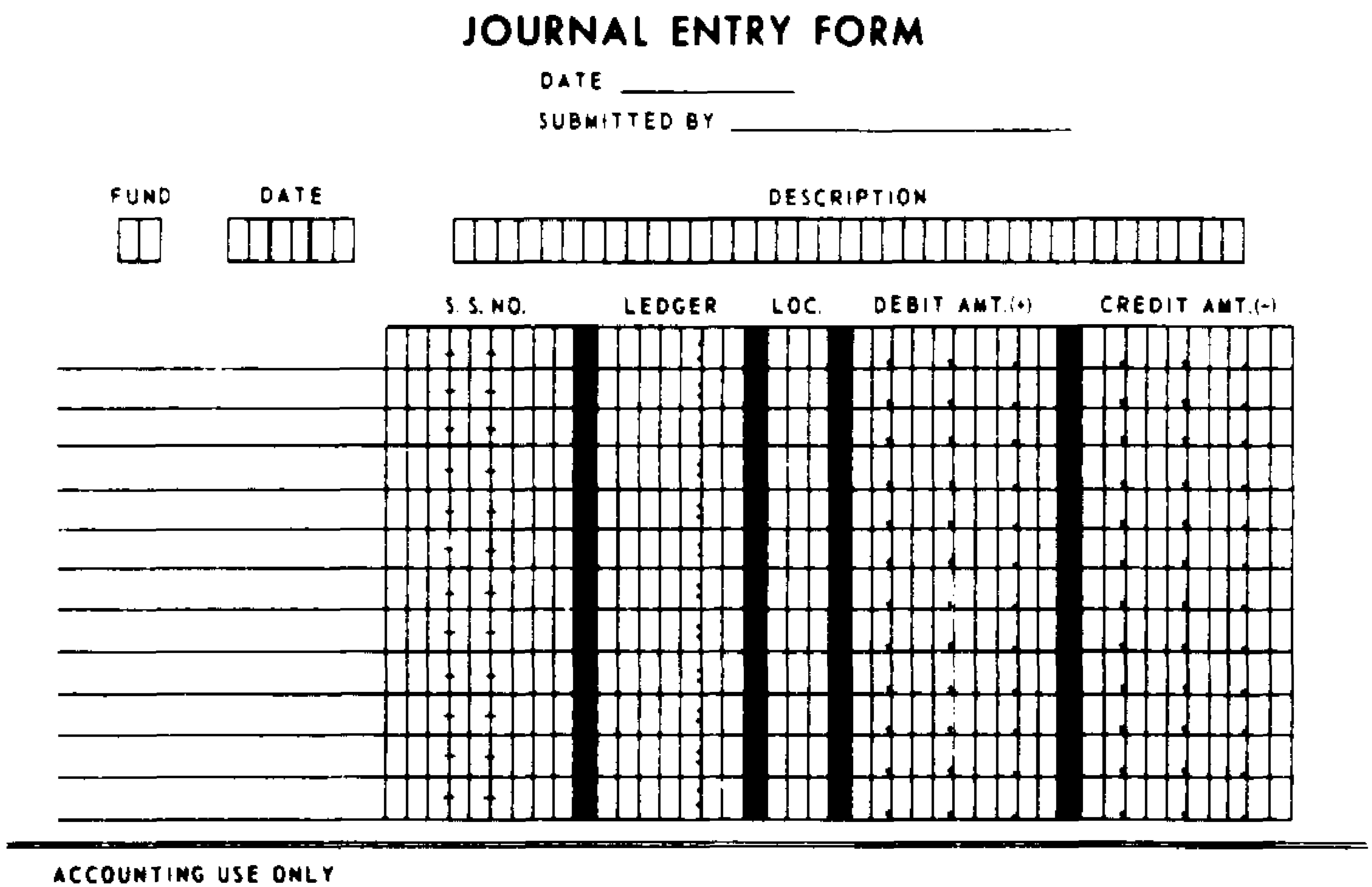
DEPOSIT VOUCHER

DEPOSIT DATE   FUND   SUBMITTED BY: ______________________

NOTE: Payor shall contain one of the following: Payor, social security no., or vendor number.

PAYOR	ACCT. NO.	DEBIT AMT.	CREDIT AMT.
TOTAL DEPOSIT	10 00		

FIGURE 64. JOURNAL ENTRY FORM.


JOURNAL ENTRY FORM

DATE ____________

SUBMITTED BY ________________________

FUND | DATE | DESCRIPTION

S. S. NO. | LEDGER | LOC. | DEBIT AMT.(+) | CREDIT AMT.(-)

ACCOUNTING USE ONLY

FIGURE 65. VOID CHECK FORM.

VOIDED PAYROLL OR ACCOUNTS PAYABLE CHECK
Date voided__________
Form filled out by______________

Accounts Payable Void:
____5. Previous fiscal year check
____6. Current month check
____7. Previous month check
____8. Unused check

Payroll Void:
____A. Previous fiscal year check
____B. Current month check
____C. Previous month check
____D. Unused check

Reason for voiding check: ______________________________________

Name________________________________Pay period ending__________

Voided check #:______________Date:__________Amount:______________

Replacement check #:__________Date:__________Amount:______________

Vendor #:__________Soc. Sec. #:____________Loc.:__________Pos:__________

NET EARNINGS / ACCOUNTS PAYABLE ACCOUNTS

Fund	Ledger	Debit	Credit

DEDUCTIONS & NET PAY ACCOUNTS

Account Title	Ledger	Debit	Credit

FIGURE 66. BATCH TRANSMITTAL FORM.

EAST BATON ROUGE PARISH SCHOOL BOARD

GENERAL LEDGER BATCH CONTROL

BATCH NUMBER

FUND

TOTAL DEBITS

=

TOTAL CREDITS

RETURN TRIAL TO: ELSIE SMITH

FOR D.P. USE ONLY:

DATE RECEIVED: ______________ TIME RECEIVED: ______________

KEYPUNCHED BY: ______________ VERIFIED BY: ______________

FIGURE 67. DAILY JOURNAL.

G E N E R A L   J O U R N A L

GENERAL   BATCH #:   00066   RUN DATE 4/18/75   PAGE: 1

DATE	DESCRIPTION	DOC NO	FUND	LEDGER	LOC	DEBIT	CREDIT	ACTUAL KEY
4/18/75	TRANSFER EDUC.& EQUALIZZTION-APRIL	00137	01	130100		47,480.55		10177
4/18/75	TRANSFER EDUC.& EQUALIZZTION-APRIL	00137	01	131100		3,018,752.06		10178
4/18/75	TRANSFER EDUC.& EQUALIZZTION-APRIL	00137	01	021100			3,066,232.61	10179
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	01	002102			1.70	10180
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	01	040105		1.70		
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	15	013112			1.70	
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	01	002103			1.70	10181
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	01	040105		1.70		
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	15	013112			1.70	
4/03/75	ACCTS PAYABLE VOIDED CHECK	00166	15	010100		3.40		10182
	BATCH TOTALS:					3,066,239.41	3,066,239.41	

FIGURE 68. VOIDS AND JOURNAL ENTRIES.

G E N E R A L   A C C O U N T I N G   S U M M A R Y

GENERAL — VOIDS AND JOURNAL ENTRIES — RUN DATE 4/11/75 PAGE 1

VOID--J.E.	DOC.NO	DATE	SSNO OR VENDOR	PAYOR-PAYEE DESCRIPTION	LEDGER	DEBIT	CREDIT
VOID	003838	1/09/75	03739	ACCTS PAYABLE VOIDED CHECK	040105	5.95	
VOID	003838	1/09/75	03739	ACCTS PAYABLE VOIDED CHECK	401105		5.95
J.E.	000132	4/09/75	00000	YAZOO STOCK #45555600 TO VALLY PK.	601105	183.96	
J.E.	000132	4/09/75	00000	YAZOO STOCK #45555600 TO VALLY PK.	602101		183.96
				FUND--VOID AND JOURNAL ENTRIES TOTAL		189.91	189.91

FIGURE 69. ACCOUNTS STATUS REPORT.

EBR PARISH SCHOOL BOARD
FUND: 01 GENERAL

ACCOUNT STATUS REPORT

DATE: 4/11/75
PAGE: 1

LEDGER	TITLE	BUDGET	ENCUMBERED	ACTUAL	BALANCE
0010'00	CASH			822,961.21	
0010'10	BANK TRANSFER				
0010'20	PETTY CASH			75.00	
0012'00	TRAVEL ADVANCE			2,800.00	
0012'01	ADVANCE - HOME ECONOMICS SUPPLIES			19,105.11	
0012'02	ADVANCE - INDUSTRIAL ARTS SHOP SUPPLIES			27,811.36	
0012'03	ADVANCE - AGRICULTURAL SHOP SUPPLIES			1,700.00	
0012'04	ADVANCE - GAS & OIL FOR E.S.E.A. TITLE I				
0012'05	ADVANCE - GAS & OIL CONTRACT - BUS DRIVERS			5,274.12	
0012'06	ADVANCE - GAS & OIL SCHOOL OWNED VEHICLES			88.07	
0012'07	ADV GAS & OIL FOR ESEA III BUS				
0012'08	ADVANCE - TRADE AND INDUSTRIAL EDUCATION			22,138.13	
0012'09	ADVANCES TO ASSESSOR			135,000.00	
0012'10	PURCHASE OF SAFETY GLASSES			23.47	
0012'12	ADVANCE VOCATION REHABILITATION			1,141.88	
0012'21	ESTIMATED RECEIVABLES FROM FED. GOVMT.-ROTC				
0012'23	ESTIMATED RECEIVABLES FOR LUNCHES BY DEPT				
0012'24	ESTIMATES SALES TAX RECEIVABLES			51,063.79-	
0012'25	ESTIMATED MOTOR VEHICLE TAX RECEIVABLE			18,554.35-	
0012'28	RECEIVABLE - DEFERRED PAY				
0012'29	ADVANCE - JOB ORIENTED MATERIAL				

FIGURE 70. TRIAL BALANCE.

RUN DATE 4/21/75 G E N E R A L L E D G E R T R I A L B A L A N C E PAGE 1

FUND GENERAL

LEDGER	LEDGER TITLE	DEBIT	CREDIT
011100	CASH	85,087,735.10	82,432,542.01
[illegible]	BANK TRANSFER	552,253.85	552,253.88
011120	PETTY CASH	75.00	
012100	TRAVEL ADVANCE	20,593.00	16,333.00
012101	ADVANCE - HOME ECONOMICS SUPPLIES	21,744.65	2,639.54
012102	ADVANCE - INDUSTRIAL ARTS SHOP SUPPLIES	32,476.70	4,660.78
012103	ADVANCE - AGRICULTURAL SHOP SUPPLIES	2,205.00	505.00
012104	ADVANCE - GAS & OIL FOR E.S.E.A. TITLE I	220.64	220.64
012105	ADVANCE - GAS & OIL CONTRACT - BUS DRIVERS	5,808.88	
012106	ADVANCE - GAS & OIL SCHOOL OWNED VEHICLES	88.07	
012107	ADV GAS & OIL FOR ESEA III BUS	14.10	14.10
012108	ADVANCE - TRADE AND INDUSTRIAL EDUCATION	34,001.88	11,663.75
012109	ADVANCES TO ASSESSOR	505,000.00	370,000.00
012110	PURCHASE OF SAFETY GLASSES	166.96	145.96
012117	ADVANCE VOCATION REHABILITATION	1,550.00	408.12
012121	ESTIMATED RECEIVABLES FROM FED. GOVMT.-ROTC	4,921.46	4,921.46
012123	ESTIMATED RECEIVABLES FOR LUNCHES ST DEPT		
012124	ESTIMATED SALES TAX RECEIVABLES	1,880,491.99	1,911,555.76
012125	ESTIMATED MOTOR VEHICLE TAX RECEIVABLE	105,000.00	123,554.35
012126	RECEIVABLE - DEFERRED PAY	366,000.00	366,000.00

FIGURE 71. GENERAL LEDGER FILE.

PURPOSE:	To prepare daily account status for Accounting Department.
CONTENTS:	This file contains one record for each valid fund/ ledger combination. (up to 10,000 accounts).
ORGANIZATION:	The file is random, accessed through XRAM indexes. New records are added to theend of the file. The next available record key is stored in the XRAM index record.

DATA ITEMS

GL-FUND/ GL-LEDG	Fund and ledger of the account. This is the basic identification of the record.
GL-BUDG-AMT	Current year budgeted amount for this account.
GL-APPROP	Current year appropriated.
GL-ENCUMB	Current year encumbered.
GL-DEBIT	Debits to this account in the current year.
GL-CREDIT	Credits to this account in the current year.
GL-BUDG-LST-YR	Last year budgeted
GL-ACTL-LST-YR	Actual amount expended last year.
GL-ACTL-2-YR	Actual amount expended 2 years ago.
GL-ACTL-3-YR	Actual amount expended 3 years ago.
GL-PCT-EXP	Percent of budget expended last year at the end of each calendar month.
GL-TRANS-LINK	Actual key of first transaction record for this account.
GL-LST-T-LINK	Actual key of last transaction record for this account.
GL-BUDG-LINK	Line item number of formal budget item where this account will be included.
GL-STAT-LINK	Statistic file link.
GL-NO-POSTS	Number of postings to this fund/ledger account.

FIGURE 72. GENERAL LEDGER TRANSACTION FILE.

PURPOSE:	List of transactions for given period which will be posted to General Ledger.
CONTENTS:	Contains a record for each posting made to any account in General Ledger file.
ORGANIZATION:	Organized randomly. Each transaction record contains the key to the next transaction record for its fund/ledger.

GENERAL LEDGER TRANSACTION FILE DATA ITEMS

GT-FUND	Fund Code.
GT-LEDG	Ledger Code.
GT-DATE	Date of Transaction.
GT-DR-CR	Debit or credit amount.
GT-AMOUNT	Transaction Amount.
GT-REC-TYPE	Type of transaction: 1. Journal entry 2. Receipt 3. Disbursement 5. Previous Fiscal year void check 6. Current month voided check 7. Previous month voided check 8. Destroyed check
GT-NEXT-REC	Actual key for the next transaction record.
GT-DØC-NØ	Document number.
GT-DESC	Abbreviated description of transaction.

GENERAL LEDGER HISTORY FILE

PURPOSE:	To provide Financial Statement at any desired interval.
CONTENTS:	This file contains all records (receipts, disbursements, journal entries and records) of year to date, which have been summarized and posted to the General Ledger file.

FIGURE 72 cont.

ORGANIZATION:	It is sequentially ordered by document number, with transaction type within fund.
GH-REC-CØDE	Type of transaction: 1. Journal entry 2. Receipt 3. Disbursement 4. Payroll void 5. Accounts payable void
GH-DØC-NØ	Document number.
GH-DØC-DATE	Document Date.
GH-FUND	Fund code.
GH-LØC	Location Code
GH-LDGR	Ledger Code.
GH-VENDØR	Vendor Number.
GH-DEBIT	Debit amount.
GH-CREDIT	Credit amount.
GH-BATCH-NØ	Batch number of transaction.
GH-SSNØ	Social Security number.
GH-VØID-DATE	Date of void transaction.
GH-REC-TYPE	Type of void transaction: 5. Previous year record 6. Current month void 7. Current year void 8. Destroyed check
GH-PAYOREE	Payor or Payee for receipts and disbursement.

FIGURE 73. LEDGER TITLE FILE.

PURPOSE:	Providing the fund title for the Payroll, Accounts Payable and General Ledger applications.
CONTENTS:	File contains a record for every unique ledger code. The title is always the same for the specific ledger code regardless of sources of the fund(s).
ORGANIZATION:	The file is random accessed through a Baurough's XRAM routine.

LEDGER TITLE FILE DATA ITEMS

FND-CØDE	Fund Code.
LØD-CODE	Ledger Code.
LDG-TITLE	Ledger Title.
FULL-TITLE	Full Fund Title.
ABBREV-TITL	Abbreviated Fund Title.
*LDG-STAT	Status of the title record (active or inac ive).
*LDG-FLAG	Location code.

*These fields are no longer in use.

ACCOUNTS PAYABLE CHECKS ISSUED FILE

PURPOSE:	It provides necessary data for bank reconciliation application.
CONTENTS:	File includes one record for each check issued (20 bytes).
ORGANIZATION:	Organized sequentially.

ACCOUNTS PAYABLE CHECKS ISSUED FILE DATA ITEMS

CI-CKNØ	Check number.
CI-CKAMT	Check amount.
CI-CKDATE	Date check was issued.

FIGURE 73 cont.

CI-VENDØR	Vendor number. If check is paid to School Board Employee, this field is all 9's.
CI-SSNØ	Social Security number of employee.
CI-CKSTAT	Check status: 0 = Normal issue (not voided) 5 = Previous fiscal year void 6 = Current month void 7 = Previous month void 8 = Destroyed check

FIGURE 74. BANK FILE, HISTORY FILE, MTD TRANSACTION FILE.

PURPOSE:	To prepare daily, weekly, and monthly information about the bank transactions.
CONTENTS:	Record of bank account of each school lunch program.
ORGANIZATION:	Organized randomly.
	<u>BANK FILE DATA ITEM</u>
S-BK-CØDE	Bank Number.
S-LØC	Location code.
S-BAL	Balance used during the run.
S-LØB-KEY	Location file actual key.
S-YTD-RECV	Year to date total.
S-MTD-RECV	Month to date total.
S-YTD-SFS7	Year to date SFS7 total.
	<u>HISTORY FILE DATA ITEM</u>
TH-DATE	Transaction Date.
TH-BANK	Bank Number
TH-LØC	Location Code.
TH-CØDE	Transaction Code.
TH-AMT	Amount of Transaction.
	<u>MONTH TO DATE TRANSACTION FILE DATA ITEM</u>
TR-CD-M	Transaction Code.
LØC-M	Location Code.
DATE-M	Transaction Date.
TR-AMT-M	Transaction Amount.

FIGURE 75. STUDENT INFORMATION SHEET (SID).

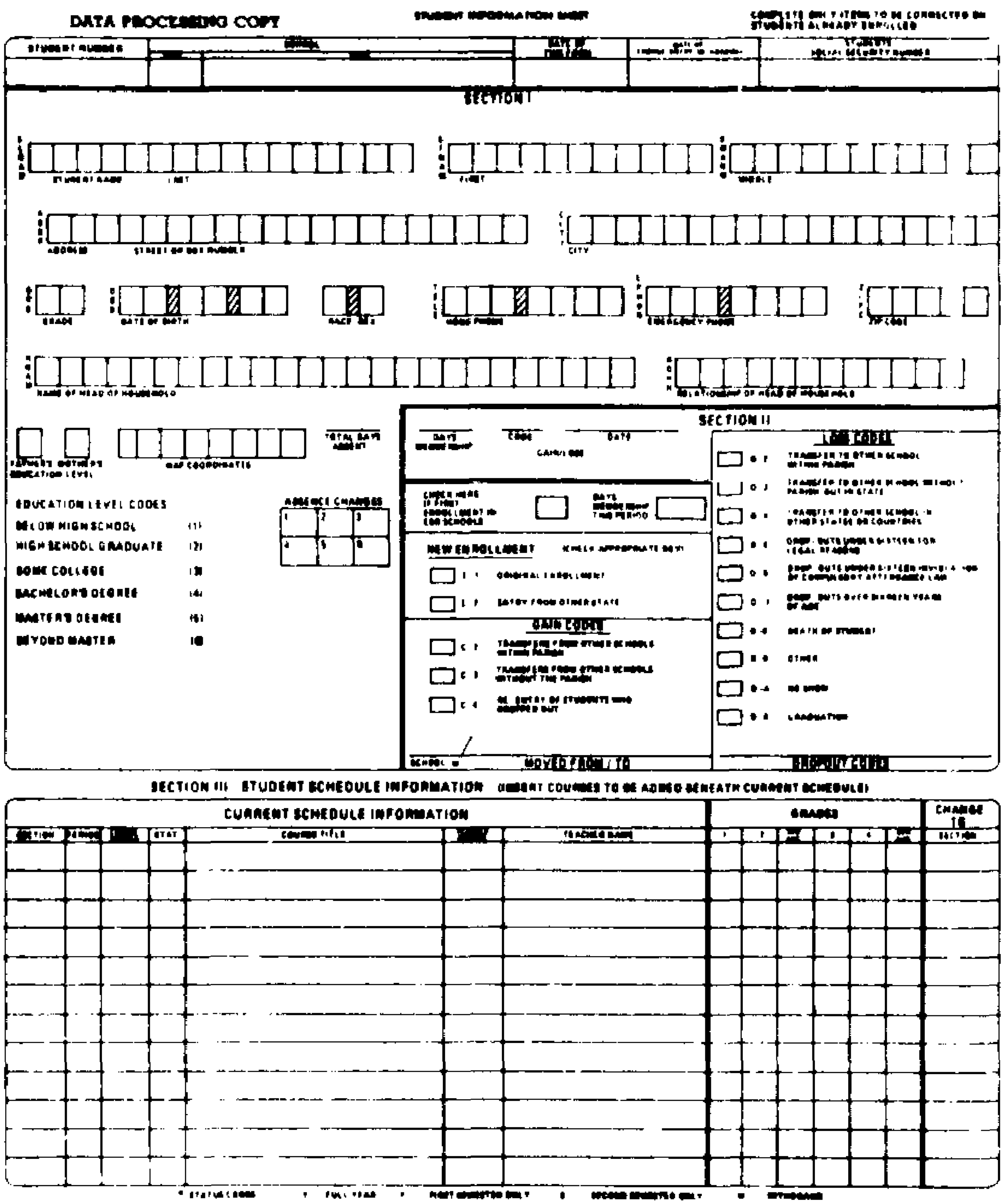


FIGURE 76. SCHEDULE REQUEST FORM.

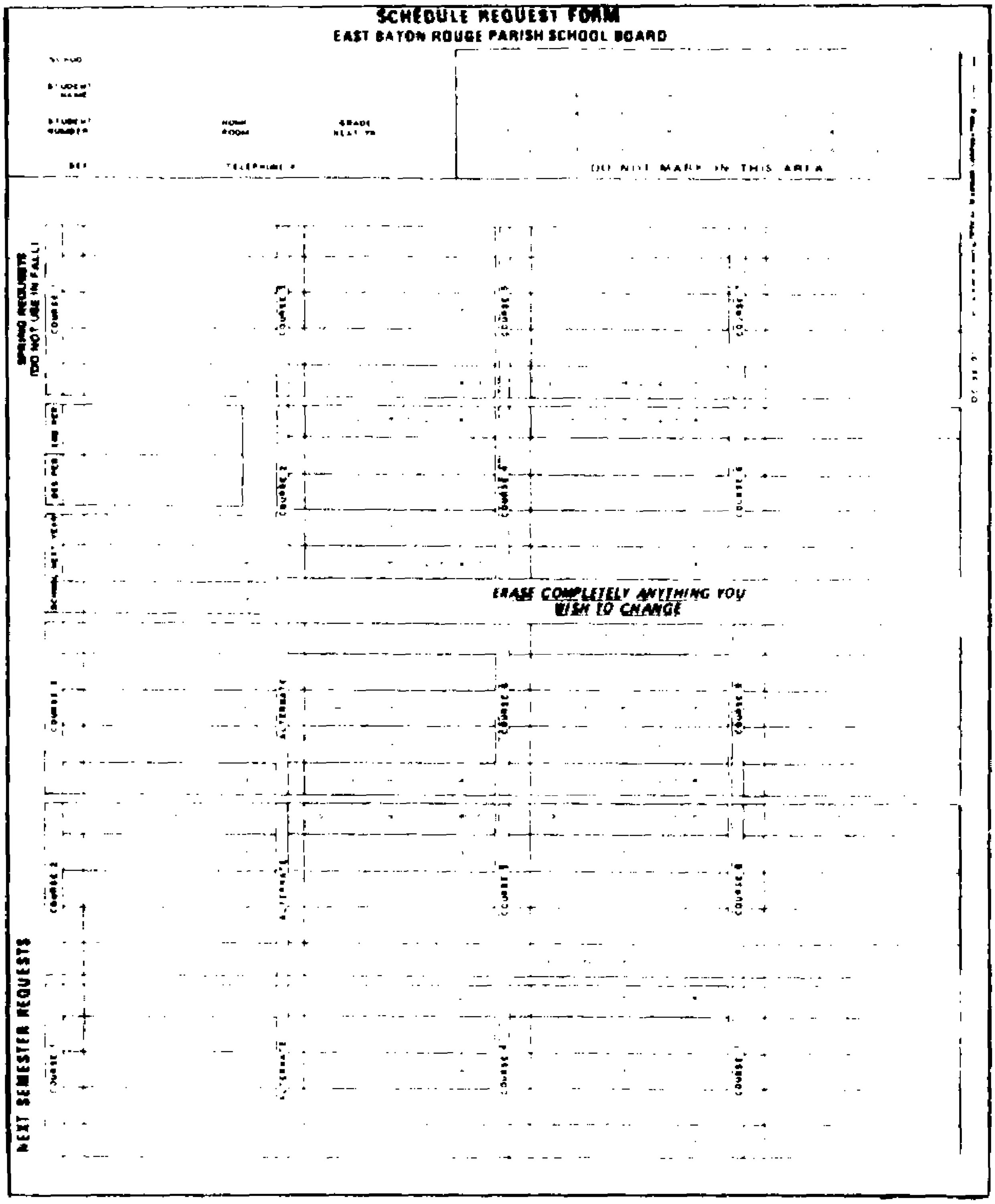


FIGURE 77. SCHEDULE VERIFICATION FORM.

[illegible] JUNIOR HIGH 470 SCHEDULE REQUEST CHANGE FORM

[illegible] 056636 BEG PERIOD 00 END PERIOD 00

[illegible] GRD NEXT YR 8 RACE W SEX B

[illegible] PHONE 293-3522 DOB 12/08/61

[illegible] ALTERNATE

NR TITLE NR TITLE

[illegible] ENGLISH [illegible]

[illegible] SOCIAL STUDIES 8

[illegible] MATH

[illegible] SCIENCE [illegible]

[illegible]

[illegible] INDUSTRIAL ARTS 8

[illegible]

GRADE 07 FROM SCH 470

FIGURE 78. SIMPLE COURSE TALLY.

EAST BATON ROUGE PARISH SCHOOL DISTRICT

DATE 04/11/75 SIMPLE COURSE TALLEY SCHOOL 225 ISTROUMA HIGH

0 COURSE NUMBER SEQUENCE

COURSE NUMBER	COURSE NAME	BOYS	GIRLS	TOTAL	NO GRD BOY	NO GRD GRL	GRADE 7 BOY	GRADE 7 GRL	GRADE 8 BOY	GRADE 8 GRL	GRADE 9 BOY	GRADE 9 GRL	GRADE10 BOY	GRADE10 GRL	GRADE11 BOY	GRADE11 GRL	GRADE12 BOY	GRADE12 GRL
73600	WOODWORKING II	25	2	27									6	2	13		6	
73700	METAL WORKING I	24		24									9		7		8	
74500	DE (PREP)	10	25	35								1	8	18	1	6	1	
74600	DE II	9	23	32										1	8	16	1	6
74650	DE II LAB	9	22	31										1	8	16	1	5
74680	BACHELOR SURVIVAL	34		34											7		27	
74700	DE III	4	5	9											1		3	5
74750	DE III (LAB)	3	5	8											1		2	5
75100	T&I AIR-COND/REFRI I	43		43									3		25		15	
75700	T&I ELECTRONICS I	30	5	35									1		14	2	15	3
75750	T&I ELECTRONICS II	12	1	13									1				11	1
76200	T&I HH CONSTRUCTIONI	26	1	27									2		15	1	9	
76300	T&I POWER MECH I	43	4	47									2		26	3	15	1
76350	T&IPOWER MECHAN II	20	1	21											4		16	1
76400	T&I WELDING I	43		43									2		41			
76490	T&I WELDING II	18		18											3		15	
81100	ART I	28	35	63							1		17	10	6	14	4	9
81200	ART II	39	41	80							1	1	22	9	12	17	4	14
81300	ART III	17	8	25											17	5		3
81400	ART IV	7	1	8											2	1	5	
82000	VOCAL ENSEMBLE	3	8	11											3	3		5
82600	ACAPELLA CHOIR	10	34	44										6	8	17	2	13
82700	MIXED CHORUS	5	28	33										4	2	13	3	11
83100	MUSIC THEORY	1	2	3											1	2		

FIGURE 79. CONFLICT MATRIX.

EAST BATON ROUGE PARISH SCHOOL DISTRICT

DATE 04/14/75

FORM STC505-1

SCHOOL 225 ISTROUMA HIGH

POTENTIAL CONFLICT MATRIX

CRS	DESCRIPTION	25300	33100	61200	63100	72600	00270	12010	21100	61100	70200	81100	92200	30200	56100	51100
25300	HUMANITIES	278	154	47	69	37	167		6	22	6	12		6	3	5
33100	SH MATH	154	373	39	63	40	225		9	13	9	19		8	3	4
61200	TYPING II	47	39	112	54	8	80		4		2	4		2	1	2
63100	BOOKKEEPING I	69	63	54	138	12	104		4	7	2	8		2	5	2
72600	GRAPHIC ARTS I	37	40	8	12	93	67			4		3		2		1
00270	NOT IN SCHOOL 71	167	225	80	104	67	657	103	62	73	32	49	49	64	26	25
12010	LANGUAGE USAGE S						103	467	267	265	59	80	227	140	42	56
21100	CIVICS	6	9	4	4		62	267	293	134	35	39	137	76	15	23
61100	TYPING I	22	15		7	4	73	265	134	321	46	43	191	64	32	34
70200	HOME ECONOMICS I	6	9	2	2		32	59	35	46	83	10	59	22	6	6
81100	ART I	12	19	4	8	3	49	80	39	43	10	129	39	23	4	10
92200	GIRLS PE II						49	227	137	191	59	39	230	56	31	27
30200	ALGEBRA I	6	8	2	2	2	64	140	76	64	22	23	56	169	12	20
56100	SPANISH I	3	3	1	5		26	42	15	32	6	4	31	12	56	1
51100	FRENCH I	5	4	2	2	1	25	56	43	34	4	10	27	20	1	76
73500	WOODWORKING I	7	12	2	1	3	57	133	76	33	3	39	14	48	3	13
91200	BOYS PE II						54	212	126	66		42		81	11	23
41600	THE CELL	4	1	2			12	152	86	90	7	10	70	24	12	17
41100	BIOLOGY	4	6				39	130	92	53	14	25	56	46	7	10

FIGURE 80. REVERSE VERIFICATION.

EAST BATON ROUGE PARISH SCHOOL DISTRICT

DATE 04/14/75 COURSE REQUEST LISTING SCHOOL 225

FORM STC510-1 COURSE NUMBER SEQUENCE ISTROUMA HIGH

COURSE NAME NOT IN SCHOOL LST 00210

STUDENT NUMBER	STUDENT NAME	GRD	SEX	SCHOOL	STUDENT NUMBER	STUDENT NAME	GRD	SEX	SCHOOL
025412	LUFORE, JIMMY JOSEPH	12	B	225	011830	LAIRD, CHARLES WAYNE	12	B	225
093297	MCQUIRTER, JOHNNY LEE	11	B	225	016584	WOODLIEF, PAMELA RENEE	12	G	225

BOYS 003 GIRLS 001 TOTAL 0004

FIGURE 81. MASTER SCHEDULE INPUT FORM.

EAST BATON ROUGE PARISH SCHOOL BOARD

MASTER SCHEDULE INPUT FORM

SCHOOL NAME ____________ SCHOOL NUMBER ____

Sect 4-6	Course 7-11	Course Title 12-31	Tchr No. 32-34	Teacher Name 35-53	Tchr SS# 54-63	Room Nr. 64-68	Sem Egr 69 71	Nr. Per 72	Seats Off. 73-75	Units 76-78	Grd. 79	Tran. 80

FIGURE 82. SEAT REQUEST FORM.

DATE 04/11/75
FORM S00295-1

EAST BATON ROUGE PARISH SCHOOL DISTRICT
MASTER SCHEDULE LIST
SECTION NUMBER SEQUENCE

SCHOOL NUMBER 315
SCHOOL NAME NORTHWESTERN MIDDLE SCH.

SECT NO	COURSE NO	COURSE NAME	UNITS EARNED	TEACHER NO	TEACHER NAME	ROOM NO	TEACHER SOC SEC NO	SEM CODE	GRADE FLAG	MANNER OFFERED MON	TUE	WED	THU	FRI	**** SEATS **** OFF.	ISS.	REM.
025	01720	ENGLISH		016	SULLIVAN J	B6	436-42-6748	3		06-1	06-1	06-1	06-1	06-1	34	27	7
026	01710	ENGLISH 7		017	CAUSEY J	B2	435-60-1134	3		01-1	01-1	01-1	01-1	01-1	25	25	
028	01710	ENGLISH 7		017	CAUSEY J	B2	435-60-1134	3		05-1	05-1	05-1	05-1	05-1	25	23	2
029	01710	ENGLISH 7		017	CAUSEY J	B2	435-60-1134	3		04-1	04-1	04-1	04-1	04-1	25	23	2
030	01820	ENGLISH 8		017	CAUSEY J	B2	435-60-1134	3		03-1	03-1	03-1	03-1	03-1	34	30	4
031	01810	ENGLISH 8		024	NELSON B	D4	229-78-1984	3		07-1	07-1	07-1	07-1	07-1	30	29	1
032	01810	ENGLISH 8		018	ROBERTSON L	B1	434-44-8283	3		01-1	01-1	01-1	01-1	01-1	30	32	2-
033	01810	ENGLISH 8		017	CAUSEY J	B2	435-60-1134	3		02-1	02-1	02-1	02-1	02-1	30	25	5
034	01800	ENGLISH 8		018	ROBERTSON L	B1	434-44-8283	3		03-1	03-1	03-1	03-1	03-1	30	24	6
035	01800	ENGLISH 8		021	ANDERSON E	D5	434-44-8283	3		04-1	04-1	04-1	04-1	04-1	30	28	2
036	01800	ENGLISH 8		018	ROBERTSON L	B1	434-44-8283	3		06-1	06-1	06-1	06-1	06-1	30	20	10
037	03820	SOC STU 8		018	ROBERTSON L	B1	434-44-8283	3		05-1	05-1	05-1	05-1	05-1	30	34	4-
038	03810	SOC STU 8		019	MORTON D	D6	438-46-2430	3		01-1	01-1	01-1	01-1	01-1	30	29	1
039	03810	SOC STU 8		019	MORTON D	D6	438-46-2430	3		02-1	02-1	02-1	02-1	02-1	30	35	5-
040	03810	SOC STU 8		019	MORTON D	D6	438-46-2430	3		03-1	03-1	03-1	03-1	03-1	30	23	7
041	03800	SOC STU 8		019	MORTON D	D6	438-46-2430	3		04-1	04-1	04-1	04-1	04-1	30	20	10
042	03800	SOC STU 8		019	MORTON D	D6	438-46-2430	3		06-1	06-1	06-1	06-1	06-1	30	21	9
043	03800	SOC STU 8		022	TURNER E	D2	438-46-2430	3		07-1	07-1	07-1	07-1	07-1	30	30	
044	01750	READING		020	SPENCER M	D1	433-02-0740	3		01-1	01-1	01-1	01-1	01-1	20	18	2

FIGURE 83. STUDENT'S SCHEDULE FORM.

EAST BATON ROUGE PARISH PUBLIC SCHOOLS

STUDENT'S SCHEDULE

SCHOOL

REPORTING DATE

STUDENT NUMBER	STUDENT NAME	GRADE	HOME ROOM

SECTION	PERIOD	ROOM	TEACHER NUMBER	COURSE NUMBER	COURSE TITLE

NOTE:

IF ANY CHANGE IS DESIRED IN YOUR SCHEDULE, PLEASE CONTACT YOUR GUIDANCE DEPARTMENT IMMEDIATELY

FIGURE 84. C-2 REPORT (STUDENT TRANSFERRED).

STC353-1 EAST BATON ROUGE PARISH SCHOOL BOARD DATE 4/28/75

LIST OF PUPILS ENROLLED IN GLEN OAKS HIGH ALPHA WITHIN SCHOOL PAGE 01

ST # RACE-SEX	NAME OF CHILD	GRADE	HMRM	BIRTH YR MO DA	HEAD OF HOUSEHOLD RELATION HEAD HSLD	EDU MOTHER EDU FATHER	ADDRESS CITY	ZIP	PHONE
026067 W G	AARON, PATSY A	10	11	59-08-01	ALBERT L AARON FATHER		7058 GLEN OAKS DR BATON ROUGE	70812	357-7012
039489 W B	ACHORD, WILLIAM DUREL	10	27	59-12-17	JUDY ACHORD MOTHER	HIGH SCH. HIGH SCH.	6008 OAKGLEN BATON ROUGE, LA.	70812	293-3539
018597 W G	ADAMS, DONNA GAIL	10	29	59-01-18	EDITH A ADAMS MOTHER	HIGH SCH. HIGH SCH.	6389 ARBOR VITAE BATON ROUGE	70811	356-9691
026925 W B	ADAMS, JOHN LEONARD	10	43	59-06-06	VAL EUGENE ADAMS FATHER		6507 BROWNFIELDS DR BATON ROUGE	70811	775-2318
048362 W G	ADAMS, TANYA DARLENE	10	12	59-04-24	EVELYN KINCHEN MOTHER	HIGH SCH. HIGH SCH.	7036 HANKS DR BATON ROUGE, LA.	70811	355-9370
015708 W B	ADAMS JR., BENNY	11	25	57-08-08	BENNY J ADAMS FATHER		6025 VINEYARD DR BATON ROUGE	70812	357-0336
047108 W G	AGUILLARD, CONSTANCE ANN	12	33	57-09-11	LEONARD FENO AGUILLA FATHER		3133 OAKCREST BATON ROUGE	70814	921-8874
028124 W B	AGUILLARD, LARRY KENT	10	18	59-01-24	RAYMOND DOLCISE AGUI FATHER		7250 PERIMETER BATON ROUGE	70812	
026819 W G	AGUILLARD, PATRICIA ANN	11	20	58-03-17	RAYMOND AGUILLARD FATHER		7250 PERIMETER DR BATON ROUGE	70812	355-4004
020202 W B	ALBARADO, GARY J	11	1	58-04-21	CLEVELAND J ALBARADO FATHER		7301 PRESCOTT RD BATON ROUGE	70812	355-8685
025962 W G	ALEXANDER, ALESIA GAY	10	9	59-10-18	W P ALEXANDER FATHER		11815 CANCE AVE BATON ROUGE	70811	775-2077
021528 W B	ALFORD, RONALD J	12	33	57-06-24	RONALD LEWIS ALFORD FATHER		4773 DICKENS BATON ROUGE	70812	357-9619
025058 W G	ALLEMOND, SHEILA MARIE	10	9	59-07-24	ALLEN JOSEPH ALLEMON FATHER		6020 CEDARGROVE BATON ROUGE	70812	357-3488

FIGURE 85. ATTENDANCE REPORTING FORM.

FORM 85002

SCHOOL

PAGE

ATTENDANCE PERIOD

PERIOD BEGIN

END

EAST BATON ROUGE PARISH SCHOOL BOARD

DO NOT MARK IN THIS AREA

ATTENDANCE REPORTING FORM

1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14

USE NUMBER 2 PENCIL ONLY ERASE COMPLETELY ANYTHING YOU WISH TO CHANGE

FIGURE 86. PRINCIPALS' MONTHLY REPORT.

E. BATON ROUGE — PRINCIPALS MONTHLY REPORT-WHITE — [illegible] ELEMENTARY

3/03/75 TO 4/18/75 — PAGE 1

	FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH	SPECL.	KINDER	1-8	9-12	K-12	GND-TOT
A-DAYS TAUGHT	150	150	150	150	150	150	150	150	150	150	150	150
B-REGISTRATION												
E-1 BOYS	44	44	29	58	53	64	3	30	292		322	324
E-1 GIRLS	29	35	31	48	51	67	2	30	261		291	293
E-1 TOTALS	73	79	60	106	104	131	5	60	553		613	616
E-2 BOYS	1	4	1	3	2	2		2	11		15	13
E-2 GIRLS		1			2	1		1	6		5	5
E-2 TOTALS	1	5	1	3	4	3		3	17		20	20
T-R BOYS	45	48	30	61	55	66	3	38	305		337	340
T-R GIRLS	29	36	31	48	53	66	2	31	265		296	298
T-R TOTALS	74	84	61	109	108	130	5	63	570		633	636
C-GAINS												
C-1	2								8		2	4
C-2	6	3	2	2	4	4	1	1	21		22	23
C-3	2	1	1	2	1			1	8		7	7
C-4												
TOTAL GAINS	9	4	3	4	5	4	1	2	29		31	34
D-LOSSES												
D-1		1				1			2		2	4
D-2	2	3	2	3		3		1	13		14	14
D-3	3	3	1	1	3	3		1	14		15	15
D-4	3	2	1		1	2		1	9		10	10
D-5												
D-6												
D-7												
D-8												
D-9	2	3	2		2	2		3	12		15	15
D-0												
TOTAL LOSSES	10	12	6	4	6	11		6	50		56	56
E-CURRENT MEMB.	73	76	58	109	107	127	6	59	549		608	614
F-AGG. DAYS MEMB.	11,231	11,410	8,924	16,298	16,056	19,402	748	9,213	83,582		92,795	93,575
G-AGG. DAYS ATT.	10,655	11,049	8,545	15,549	15,464	18,707	742	8,503	80,030		88,533	89,255
H-AGG. DAYS ABS.	576	361	379	749	592	695	58	710	3,552		4,262	4,320
I-AVG. DAILY MEMB.	74.9	77.4	59.5	108.7	107.0	129.3	5.2	61.4	557.2		618.6	623.8
J-AVG. DAILY ATT.	71.0	73.7	57.0	103.7	104.1	124.7	4.8	56.7	533.5		590.2	595.0
K-AVG. DAILY ABS.	3.8	3.7	2.5	5.0	3.9	4.6	.4	4.7	23.7		28.4	28.8
L-% ATTENDANCE	94.8	95.2	95.8	95.4	96.4	96.4	92.3	92.3	95.7		95.4	95.4
M-% ABSENCE	5.2	4.8	4.2	4.6	3.6	3.6	7.7	7.7	4.3		4.6	4.6

FIGURE 87. GAIN AND LOSS REPORT.

STC370-1 EAST BATON ROUGE PARISH SCHOOL BOARD DATE 4/23/75

R E P O R T O F N E W R E G I S T R A N T S

SCHOOL - BATON ROUGE HIGH PERIOD BEGINNING 3/05/75 PERIOD ENDING 4/14/75 PAGE 1

ST. # / RACE	NAME OF CHILD / ATT	GRADE	CODE	BIRTH YR MO DA	NATURAL FATHER / MOTHERS MAIDEN	HEAD OF HOUSEHOLD	ADDRESS	[illegible] FROM--TO
040535 / [illegible]	BLANTON, DEMETRIUS LEVI / 74-08-25	9	E1	60-08-31		JOSEPH C MELANSON	404 DELPHINE, BATON ROUGE, LA.	
115914 / [illegible]	STANSBERRY, ANTHONY / 75-03-17	9	E1	59-01-04		LAURA CHAPMAN	313 1/2 S 18TH ST, BATON ROUGE, LA.	
116409 / [illegible]	CREED, JO ELLEN / 75-04-22	10	E1	59-02-23		LINDA THERIOT	445 LOVERS LANE, BATON ROUGE, LA.	
114155 / [illegible]	DOUDY, MITCHELL CHARLES / 75-04-07	11	E2	57-07-21		JERRY PHILIPPART	711 HEBERT ST, BATON ROUGE, LA.	
115915 / [illegible]	SMITH, SUZETTE MARIE / 75-03-13	11	E1	58-08-03		HENRY SMITH	4735 GOVT #308, BATON ROUGE, LA.	

FIGURE 88. EXCESSIVE ABSENCE REPORT.

CAPITAL HIGH — ATTENDANCE REGISTER FOR 5TH SIX-WEEKS 3/05/75 - 4/18/75 — PAGE 1 DATE 4/28/75

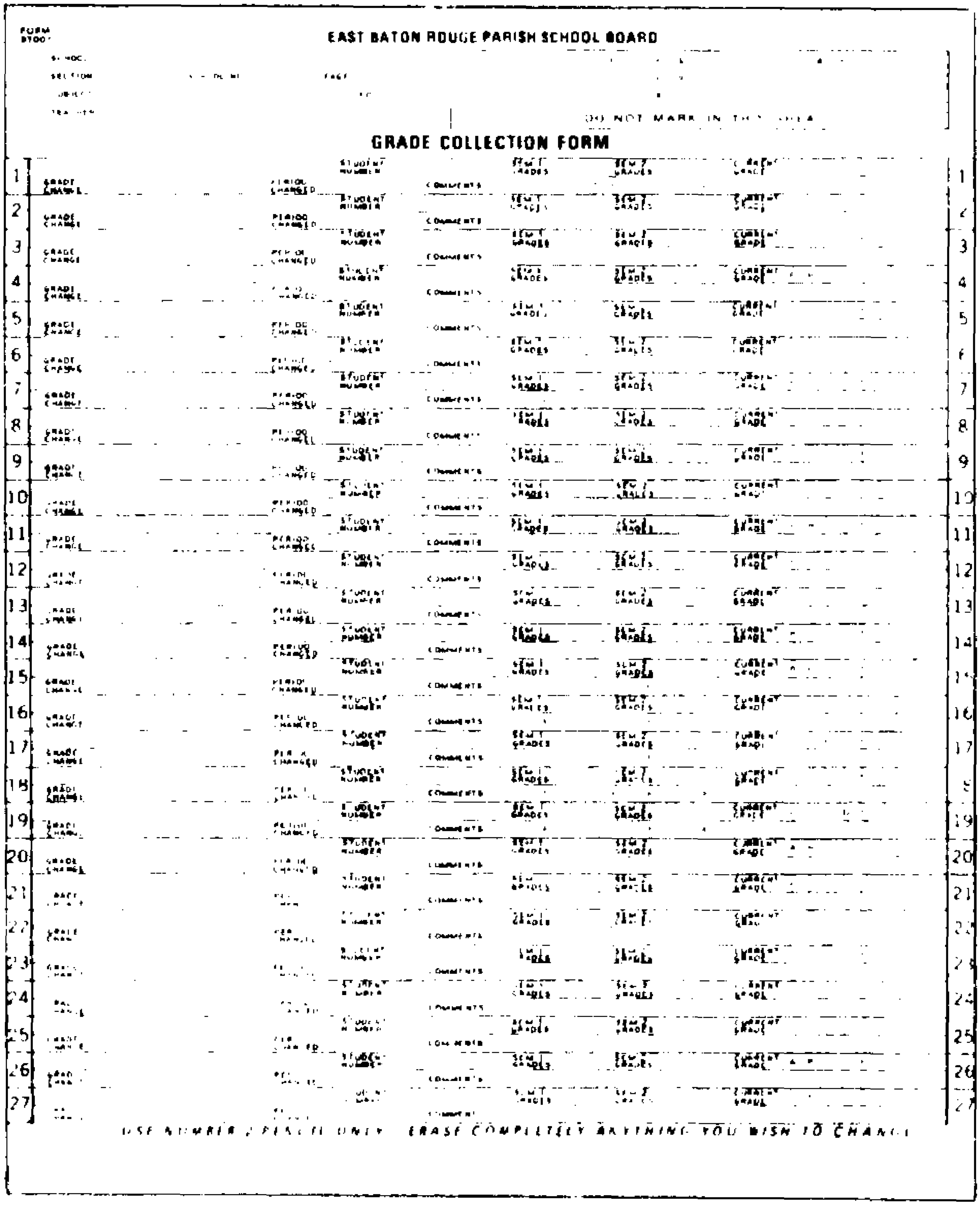
ST. #	NAME	GRADE	MARK	MARCH 5 W	6 TH	7 F	10 M	11 TU	12 W	13 TH	14 F	17 M	18 TU	19 W	20 TH	21 F	24 M	25 TU	26 W	APRIL 1 TU	2 W	3 TH	4 F	7 M	8 TU	9 W	10 TH	11 F	14 M	15 TU	16 W	17 TH	18 F
047295	ALLEN, DON E.	11	3																														
044608	BROCK, MARY F.	12	3																														
044677	BUTLER, JOE N.	09	3																														
101254	CALDO, JAMES A.	12	3																														
044089	GREENUP, ROBERT L.	12	3																														
030802	JACKSON, EULA M.	12	3																														
016512	PATTERSON, TERRY T.	12	3																														
044343	SANDERS, JOYCE M.	12	3																														
015903	WHITE, ROBERT	11	3																														
030214	BANKS, MICHAEL	09	100	25	26		27							28	29	30	31	32	33	34		35			36	37				38	39	40	41
040532	BETHLEY, JOSEPH	10	100	29															30	31			32								33	34	35
030615	BOWMAN, HENRY	09	100											36									37								38	39	40
110534	BYRD, CHARLES J.	09	100																			26	27	28	29					30	31	32	
030541	CHASE, DARRYL E.	09	100	15																16		17	18	19									
114437	CHASE III, ROBERT	09	100	11												12	13	14	15			16	17	18	19					20	21		22
111615	COLLINS, KELVIN D.	10	100	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	40	41							42		
021890	DOUGLAS, DWAYNE E.	10	100																												3		4
111207	DYSON, MOSIA	10	100										9		10		11			12											13	14	
044735	FRANCIS, GERALD W.	11	100																						10								
030508	GAINES, ELLIS	09	100	52	53		54							55	56	57	58	59				60	61	62									63
047968	GRIFFIN, SHEDRICK	10	100										8											9									10
030333	JONES, GERALD J.	10	100																														
044847	LATHERS, RAFUL L.	10	100	49											50	51	52	53	54	55		56	57	58	59	60				61	62	63	64
044464	MOORE, CHARLES	11	100	4	5								6							7		8											
047998	NICHOLAS, BERNICE	09	100																														
030499	OLIVER, CHARLES	09	100	10																													
020244	PARKER, JUAN L.	10	100	43	44		45		46					47	48	49	50	51	52	53		54	55	56		57				58	59	60	61
045762	PEALER, ANTHONY	10	100	11			12								13	14			15	16		17	18		19						20	21	22
044513	ROBERTSON, DONALD	09	100	22			23						24			25	26	27	28	29		30	31	32						33	34		35
045945	SINGLETON, DON M.	10	100	21	22		23	24					25	26	27	28	29	30	31	32		33	34	35	36								
030219	SPOONER, LONNIE	10	100		8																												
044505	VICTORINO, RALPH	11	100														5					6											
094662	WHITE, GERALD	09	100				17	18	19				20	21	22			23	24											25			
030445	WILLIAMS, CLARENCE	10	100	9				10							11		12		13	14		15	16								17		
030880	BROWN, SANDRA	09	101	25					26		27	28	29					30															
043884	BUTLER, GARY L.	12	101																					14	15								
094609	CANNON, PATRICIA A.	11	101																			17		18	19								20
032935	COLEMAN, GERTRUDE	09	101																			7					8						

FIGURE 89. ATTENDANCE PATTERN STUDY.

CAPITOL HIGH — PATTERN OF ABSENCES FOR 5TH SIX-WEEKS 3/05/75 - 4/18/75 — PAGE 1 DATE 4/28/75

				CURRENT PERIOD					YEAR TO DATE					
ST. #	NAME	GRADE	MMMM	M	TU	W	TH	F	M	TU	W	TH	F	TOTAL ABSENCES
047205	ALLEN, DON E.	11	3											
044608	BROCK, MARY E.	12	3						2	2	1	4	3	12
044677	BUTLER, JOE N.	09	3											
101254	CADDO, JAMES A.	12	3							1			1	2
044049	GREENUP, ROBERT L.	12	3									2	2	4
038802	JACKSON, EULA M.	12	3						3	2	2	4	1	12
016512	PATTERSON, TERRY Y.	12	3											
044343	SANDERS, JOYCE M.	12	3						3	5	7	10	7	32
015903	WHITE, ROBERT	11	3						7	5	5	6	5	28
030234	BANKS, MICHAEL	09	100	2	4	5	4	2	6	5	8	12	10	41
048532	BETHLEY, JOSEPH	10	100		1	3	1	2	10	4	7	6	8	35
030615	BOWMAN, HENRY	09	100			2	1	2	7	8	9	8	8	40
110596	BYRD, CHARLES J.	09	100	1	2	1	2	1	7	4	5	9	7	32
030541	CHASE, DARRYL E.	09	100	1	1	1	1	1	5	2	4	3	5	19
114437	CHASE III, ROBERT	09	100	2	3	3	1	3	4	3	6	3	6	22
111615	COLLINS, KELVIN D.	10	100	1		1		1	10	7	7	6	10	8***
021858	DOUGLAS, DWAYNE E.	10	100			1		1			2	1	1	4
111287	DYSON, HOSIA	10	100	1	2	1	2		6	3	1	4		14
044735	FRANCIS, GERALD W.	11	100		1				2	4		2	2	10
030588	GAINES, ELLIS	09	100	3	1	2	3	3	16	9	12	13	13	63
047964	GRIFFIN, SHEDRICK	10	100	1	1			1	3	1	1	3	2	10
030333	JONES, GERALD J.	10	100						8	6	5	9	4	32
044867	LATHERS, RAFUL L.	10	100	2	4	6	3	3	13	12	11	14	14	64
044464	MOORE, CHARLES	11	100		2	1	2		1	3	1	2	1	8
047966	NICHOLAS, BERNICE	09	100											
030609	OLIVER, CHARLES	09	100			1			3		2	3	2	10
020264	PARKER, JUAN L.	10	100	3	3	6	4	3	13	8	13	14	13	61
045762	PEALER, ANTHONY	10	100	1	2	3	3	3	1	3	6	6	6	22
044515	ROBERTSON, DONALD	09	100	3	4	3	1	3	11	6	5	4	7	35
045965	SINGLETON, DON M.	10	100	3	5	3	3	2	7	10	4	8	7	36
030219	SPOONER, LONNIE	10	100				1		1	2	1	2	2	8
044585	VICTORIN, RALPH	11	100	1			1		2	1		3		6
094662	WHITE, GERALD	09	100	1	4	3	1		11	7	5	2		25
030665	WILLIAMS, CLARENCE	10	100	1	2	3	2	1	2	2	5	5	3	17
030650	BROWN, SANDRA	09	101	1	2	2		1	4	8	5	5	8	30
043484	BUTLER, GARY L.	12	101	1	1				7	2	1	3	2	15
094609	CANNON, PATRICIA A.	11	101	1	1		1	1	6	4	2	2	6	20
032935	COLEMAN, GERTRUDE	09	101				2		2	1	1	3	1	8

FIGURE 90. GRADE COLLECTION FORM.



FORM 9700

EAST BATON ROUGE PARISH SCHOOL BOARD

SCHOOL

SECTION

SUBJECT

TEACHER

DO NOT MARK IN THIS AREA

GRADE COLLECTION FORM

	GRADE CHANGE	PERIOD CHANGED	STUDENT NUMBER	COMMENTS	SEM 1 GRADES	SEM 2 GRADES	CURRENT GRADE	
1								1
2								2
3								3
4								4
5								5
6								6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24
25								25
26								26
27								27

USE NUMBER 2 PENCIL ONLY   ERASE COMPLETELY ANYTHING YOU WISH TO CHANGE

FIGURE 91. DECLINING GRADE REPORT.

SOUTHEAST JUNIOR HIGH　　DECLINING GRADE REPORT　　4/28/75　　PAGE 1

ST. #	STUDENT NAME	GRD	HMRM	RACE	SEX	SEC	SUBJECT	TEACHER	PD	GRD1	GRD2	SEM1	GRD3	GRD4	SEM2	COM	STAT	ABS
112709	[illegible], LYNN MARIE		030	W	G	029	GIRLS H & PE	MRS SMILEY	5	B	F	F	F			3	Y	100
082[illegible]7	[illegible], KRISTINA MARIE		039	W	G	037	SCIENCE 7	MR DAVISON	3	C	F	F					W	27
						171	7TH GR ELECTIVE	MRS WILLIAMS	6	C	F	F	C				Y	
066121	AMACKER, ROBERT LYNN	7	006	W	B	020	MATHEMATICS 7	MRS CAMPS	1	A	C	B	C				Y	4
107530	ANDREWS, KIMBERLY AN	7	005	W	G	055	7TH GR ELECTIVE	MISS HICKS	6	A	C	B	A				Y	20
072603	ARCENEAUX, CHRIS MAT	7	022	W	B	106	MATHEMATICS 7	MISS REES	1	C	D	C	B				Y	15
						040	SCIENCE 7	MR DAVISON	6	C	D	D	C			6 7	Y	
054876	ARCENEAUX, WILLIAM B	7	003	W	B	036	SCIENCE 7	MR DAVISON	2	C	D	D	B			6 7	Y	2
						080	WORLD OF MANUFACT	MR MIRE	5		C		C				Y	
066117	ARMSTRONG, LISA DENI	7	021	W	G	117	SOCIAL STUDIES 7	MRS RALSTON	2	A	C	B	A				Y	1
080376	ASHLEY, RANDALL KEIT	7	031	W	B	151	SOCIAL STUDIES 7	MR VERDIN	1	C	D	C	B			2	Y	6
						054	7TH GR ELECTIVE	MISS HICKS	5	B	D	C	C				Y	
						040	SCIENCE 7	MR DAVISON	6	C	F	F	D			6 7	Y	
107545	AUCOIN, ANDREW ALPHO	7	017	W	B	061	SCIENCE 7	MRS MOORE	1	B	D	C	C			7	Y	12
107527	AVERA, RONALD HALL	7	015	W	B	055	7TH GR ELECTIVE	MISS HICKS	6	A	C	B	A				Y	4
061349	BABINEAUX, DINA RICH	7	005	W	G	021	GIRLS H & PE	MRS BURNS	1	D	F	F	C				Y	21
052306	BAKER, ERIC WILLIAM	7	003	W	B	060	MATHEMATICS 7	MRS HOPPER	6	B	D	C	D			6 5	Y	4
052600	BAKER, JOHN BRETT	7	030	W	B	059	MATHEMATICS 7	MRS HOPPER	5	C	F	F	F			6 7	Y	19
063302	BALENTINE, DAVID RAY	7	012	W	B	056	MATHEMATICS 7	MRS HOPPER	1	C	D	D	D			6 8	Y	6
						074	BOYS H & PE	MR M LEE	4	C	D	D	D			5 8	Y	
						154	SOCIAL STUDIES 7	MR VERDIN	5	C	D	D	B			1 2	Y	
						055	7TH GR ELECTIVE	MISS HICKS	6	B	D	C	C				Y	
061298	BANE, LESA MINETTE	7	005	W	G	021	GIRLS H & PE	MRS BURNS	1	B	D	C	C				Y	16
						119	SOCIAL STUDIES 7	MRS RALSTON	5	B	D	C	C				Y	
090063	BARNETT, DAWN ELIZAB	7	003	W	G	039	SCIENCE 7	MR DAVISON	5	C	F	F	D			6 7	Y	16

FIGURE 92. HONOR LIST.

SOUTHEAST JUNIOR HIGH

4/28/75 H O N O R L I S T I N G PAGE 1

THIRD QUARTER

STUDENT #	STUDENT NAME	GRADE	
077180	ADAMS, PATRICIA RENEE	07	
065986	AIME, RONELLE MARIE	07	
065117	ARMSTRONG, LISA DENISE	07	
107527	AVERA, RONALD HALL	07	
096014	BABB, SCOTT ALAN	07	
107107	BARRIOS, THERESA LURIE	07	*****
077754	BAUGH, JANET KATHARINE	07	
066120	BETZ, JEFFREY LEE	07	
114184	BLACKWELL, RANDAL NEAL	07	
110817	BOUDINOT, DOREEN ALICIA	07	
082720	BOZEMAN, RENEE	07	*****
114653	BRASHER, MARY ELIZABETH	07	*****
082682	BREAU, KAREN DENISE	07	*****
082718	BYERS, TAMRA LYNNETTE	07	
054869	CAPUTA, RANDAL JERID	07	
064809	CASTELL, CHERYL LYNN	07	
067441	CAUBIN, MICHAEL WAYNE	07	
082715	CHAISSON, ROBIN SUZANNE	07	
100988	CORNELIUS, KENT R	07	
082735	CRONAN JR, JOHN MICHAEL	07	
113049	CRUM, MICHAEL ROY	07	
053409	DAVIDSON, JERRY MARTIN	07	
108408	ELLIS, SCOTT KENNETH	07	
108606	FERRELL, LISA ANN	07	
054837	FRANCIS, SHARON KAY	07	

FIGURE 93. GRADE ANALYSIS REPORT.

STC385 SOUTHEAST JUNIOR HIGH

EAST BATON ROUGE PARISH SCHOOL BOARD
TEACHER GRADE ANALYSIS

DATE 4/28/75
PAGE 1

#	TEACHER NAME	QTR	GIRLS A	B	C	D	F	OTH.*	BOYS A	B	C	D	F	OTH.*	TOTAL GIRLS AND BOYS A	B	C	D	F	OTH.*	TOTAL GRADES
00001	ROMERO	1	22	23	23	7	2		14	15	21	19	1	*	36	38	44	26	3	*	147
	% BY TOTAL GRADES														24.5	25.9	29.9	17.7	2.0		
00001	ROMERO	2	27	18	16	13	2	1	16	11	18	21	4	*	43	29	34	34	6	1 *	147
	% BY TOTAL GRADES														29.3	19.7	23.1	23.1	4.1	.7	
00001	ROMERO	S1	26	18	18	12	2		16	10	19	21	4	*	42	28	37	33	6	*	146
	% BY TOTAL GRADES														28.8	19.2	25.3	22.6	4.1		
00001	ROMERO	3	30	21	16	7	2	3	17	17	22	13	2	*	47	38	36	20	4	3 *	148
	% BY TOTAL GRADES														31.8	25.7	24.3	13.5	2.7	2.0	
00002	MR BATTALORA	1	14	16	15	5			17	36	28	18	3	1 *	31	52	43	23	3	1 *	153
	% BY TOTAL GRADES														20.3	34.0	28.0	15.0	2.0	.7	
00002	MR BATTALORA	2	11	22	15	1			18	39	33	8	1	*	29	61	48	9	1	*	148
	% BY TOTAL GRADES														19.6	41.2	32.4	6.1	.7		
00002	MR BATTALORA	S1	10	22	16	1			14	42	33	9	1	*	24	64	49	10	1	*	148
	% BY TOTAL GRADES														16.2	43.2	33.1	6.8	.7		
00002	MR BATTALORA	3	8	20	12	9			11	33	31	16	8	*	19	53	43	25	8	*	148
	% BY TOTAL GRADES														12.8	35.8	29.1	16.9	5.4		

FIGURE 94. GRADE REPORT CARD.

EAST BATON ROUGE PARISH PUBLIC SCHOOLS

PUPIL'S REPORT

SCHOOL YEAR

STUDENT NUMBER	STUDENT NAME	GRADE	HOME ROOM

SECTION	COURSE TITLE		II	SEM	[illegible]	[illegible]	SEM	COMMENTS	UNITS

EXPLANATION OF GRADES

- A Outstanding achievement
- B Good achievement
- C Satisfactory achievement
- D Minimum achievement
- I Incomplete
- F Failure
- S Satisfactory
- U Unsatisfactory
- W Withdrew

EXPLANATION OF COMMENT CODES

1. Student is improving in this course
2. Instruction is below grade level
3. Absences are affecting class work
4. Tardiness is affecting class work
5. Books or materials are not brought to class
6. Assignments are not completed regularly
7. Study habits need improving
8. Behavior presents class problems
9. Please contact teacher

DAYS ABSENT			
1ST	2ND	3RD	
4TH	5TH	6TH	TOTAL

TO PARENTS GUARDIANS:

Student success in school depends to a large extent on a cooperative relationship between home and school. Parents and guardians are urged to contact the school whenever there is need for information about student progress or about the school.

FIGURE 95. STUDENT LOOK UP (CRT LAYOUT)

```
                                    STUDENT LOOK UP
99999                                   DØB Z9/99/99     SEC STAT COM 1 2 3 4 1 2

                      ZIP 9999  PHØNE:
SCH       GRD      HMRM      STAT     BEG-P     END-P
S/REQ
MOV/FT                                   ABS  SUSPENSIØNS
RACE     SEX       YTD-M      MTD-M          CØDE
G/L-CØDE     G/L-DATE  Z9/99/99                # DAYS DT
SØC. SEC. NO.
RQ         SCHØ         MAP 999999 99
TRANS        TS
SCH-NXT      GRD-NXT
```

FIGURE 96. STUDENT SUBSYSTEM PROGRAMS.

Student Maintenance Monitor
Location File Maintenance
Student File Adds and Changes
Master Schedule Maintenance
Tag Sort - Alpha/Homeroom/School
Tag Sort - Alpha/Grade/School
Tag Sort - Alpha/School
Location-Tag Linkage Program
Student Locator Cards for Students with Changes
SID Sheet Print - for students with changes
Student File Adds and Changes

Tag Sort - Alpha/Homeroom/School/School - next
Tag Sort - Alpha/Grade/School/School - next
Tag Sort - Alpha/School/School - next
Schedule Request Cards - for students with changes

Print Attendance Scanner Sheets at beginning of Six-Weeks
Tag Sort - Student number/School - before Attendance Update.
Attendance Update and Update of Attendance Register Tape.
Print Six-Weeks Reports
Tape Sort of Attendance Register Tape.
Print Attendance Register and Pattern Study for all schools
Print Dropout Sheets for all D5, D6, and D7 on file.
Parish Summary of Attendance Report
Absence Report
Average Daily attendance

Print Grade Scanner Sheets
Tag Sort - Student number/School
Update Student Grades
Print Report Cards
Grade Analysis Lists
Failure Lists
Honor Roll Lists
Declining Grade Report
Cumulative Labels.
Potential-Failure List

Print Schedule Collection Forms
Clear Request Links
Update Request File From Schedule Collection File
Print Schedule Request Cards and Schedule Verification Report
Simple Course Talley
Conflict Matrix
Reverse Verification Report
Update Request File
Students Without Course Requests
Semester Conversion

FIGURE 96 cont.

Expands Master Schedule File for a Scheduling
Build Master Schedule File
Seats Offered Versus Seats Requested
Conflict Matrix - Singleton and Doubletons
Full Day Edit
Master Schedule List
With Switch to Build File to be used in Master Schedule Analysis
Master Schedule Analysis

Create Simi Scheduling Files from E.B.R.P.S.B. Files
Summarize Simi Scheduling and Pattern File
Student Scheduling Program
Update Student Files With Scheduling Data

Tag Sort Student Number Sequence
Calculate Grade Point Average, Rank, etc.
History Update
Update next year fields into this year fields

De-block blocked courses
Assign Homerooms
Print SID sheet (all students in all schools)
Print Schedule list and students without a full day schedule.
Print Locator Cards
Print Roll Books
C-2 Listings

Initialize Student Files (take off status 9, re-link files, etc.
Print Student ID
List Interim Summer Losses

Update Master Schedule loads
Mass Section Schedule Change
Mass Request Change
Create new Master Schedule and Student Schedule File

Print Scanner Sheets
Score SRA (8th Grade and 5th, 6th grades)
Check Grade Equivalent Below 7.2 SRA
Test Bar Graft
Tag Sort
Test Update (Multiple Tests)
Test Update High School Reading and Spelling
List of Test Results (Multiple Tests)
Build Assist Files
List DAT Test Results

FIGURE 96 cont.

Build or Update Test Tape
Build Student Test File From Test Tape
Merge Blending Test
Print multiple test results

Fix it to clear out links.
Prints code tape for student maintenance
Print all data from Student Files
Student List
List Student in 12 different ways
Alpha list of all students
Sort for Alpha List
Student List
Suspensions Report
List of 12th Graders with Failing Grades
Missing Grade Register
List of Prospective Graduates
Print Report Sequence
Analysis of Grades
Update or Initial Build of Subject File.
Build Alpha indexes
Build Student Dropout Tape File
Reports on Student Dropouts
Honor Listing
Check Enrollments
Print Teacher Attitude inventory
Survey Analysis
List Test Dates
List School Test Totals
Print School Labels
Print Number of White, Black and Integrated Sections by School
Print labels for girls on athletic survey
Girls athletic survey
Address labels
Listing for schedule next year alpha or grade
Check-off List
Student list address/schedule
Student ID print
Data Collection elementary students
Alpha List
Student Edit

FIGURE 97. STUDENT SUBSYSTEM FILE LAYOUT.

Location File

File contains one record for each location plus an index (first records) which gives actual key of the location record. Records contain the basic school data (name, address, etc.), pointers to the Master Schedule File, pointers to the Tag Files reflecting the first student in each school. Records also contain control information concerning the processing of each particular school (sequence of reports, etc.).

LOCATION FILE DATA ITEM

DATA NAMES	DESCRIPTION
S-PARISH-NO	Parish Number
S-SCH-NO	School Number
S-LOW-GRD	School's Lowest Grade
S-HI-GRD	School's Highest Grade
S-SCHED-BASE	Schedule Base
S-SCHED-LIM	Schedule Limit
S-TAGA-BLK	School Tag Block
S-TAGA-OC	School Tag Occurrence
S-TAGG-BLK	School Tag Block
S-TAGG-OC	School Tag Occurrence
S-TAGH-BLK	School Tag Block
S-TAGH-OC	School Tag Occurrence
S-REC-CNT	Number Students in School
S-PHONE	School Phone Number
S-ZIP	School Zip Code
SEQUENCE-FLAGS	Report Seq. Flags
RPT-CRD	Report Card Seq. Flag

FIGURE 97.cont.

LOCATION FILE DATA ITEM

DATA NAMES	DESCRIPTION
FAIL-LST	Failure List Seq. Flag
HNR-ROL	Honor Roll Seq. Flag
STD-SCH	Student Schedules Seq. Flag
ATT-CRD	Attendance Scan. Sheets Seq. Flag
FILE-CRD	File Card Seq. Flag
CUM-LABL	Cumm Record Labels Seq. Flag
SID-SHET	Sid Sheet Seq. Flag
LOC-CRD	Locator Cards Seq. Flag
TEST-8	8th grade test Seq. Flag
REQ-FORMS	Schedule Request Forms Seq. Flag
REQ-VER	Request Veri. Cards Seq. Flag
HMRM-PD	School Homeroom Period
S-BK-NUM	Bank Number (Fund Accts)
S-ENRL-THSYR	Enrollment this year
S-ENRL-LSTYR	Enrollment last year
S-SL-PCT	School Lunch Percentage
S-ALLOTMT	Total Teacher allotment
S-REG	Allotment-regular teachers
S-ESEA	Allotment-E.S.E.A. (fund) teachers
S-SPED	Allotment-Special Ed. Teachers
S-ESAP	Allotment-E.S.A.P. (fund) teachers

FIGURE 97 cont.

LOCATION FILE DATA ITEM

DATA NAMES	DESCRIPTION
S-TCORP	Allotment-Teacher corps teachers
S-SCHED-BASE-N	New M/S Base
S-SCHED-LIM-N	New M/S Limit
S-NAME	School Name
S-ADDRESS	School Address
S-CITY	City of school
INDEX-FLAG	Index Record Flag
POINTER	School Pointer
IND-SCH	Index School Number
IND-KEY	Actual key of school location Record
CMP-ITEM-S	CMP Fields
ALPHA-ITEMS-S	Alpha fields

FIGURE 98. STUDENT MASTER FILE.

Contains one record for each student in the parish, both public and private schools. This file is organized randomly. The records on this file contain the student's basic data (name, address, etc.), his attendance information, the school he is assigned (this year & next year), pointers to the student's schedule record, request record, transfer records, test records, and auxillary record.

STUDENT MASTER FILE

DATA NAMES	DESCRIPTION
PARISH-NO	Parish Number
SCHL	School Number
SNUM	Student Number
FNUM	Family Number
S-SSNO	Student Social Security Number
GRADE	Student's Present Grade
HMRM	Homeroom Number
DOB	Student's Date of Birth
HANDI-CAP	Handicap Code
PHON	Home Telephone No.
ZIPC	Zip Code
YTD-MEMB	Year To Date Membership
MTD-MEMB	Six Weeks Membership
STAT	Status of Student
G-L-CODE	Gain-Loss Code
G-L-DATE	Gain-Loss Date
SCHED-LINK	Sched Link
TRANS-LINK	Transfer File Link

FIGURE 98 cont.

DATA NAME	DESCRIPTION
REQ-LINK	Request File Link
TEST-LINK	Test File Link
AUX-LINK	Auxiliary File Link
E-PHON	Emergency Phone No.
ED-FATHER	Education of Father
ED-MOTHER	Education of Mother
ATTENDANCE	Group Item for Attendance
ABSENCES	Each Six Weeks Number of Absences
SID-FLAG	Sid Sheet Flag
SCH-NEXT	Next Year's School
SCH-LAST	Last Year's School
GRADE-LAST	Last Year's Grade
HMRM-LAST	Last Year's Homeroom
SLNAM	Student's Last Name
SFNAM	Student's First Name
SMNAM	Student's Middle Name
FNAM	Natural Father's Name
MNAM	Mother's Name
HNAM	Head of Household Name
STRE	Street Address
CITY	City
PLAC-OF-BIRTH	Place of Birth (City)
BIR-CER-NUM	Birth Certificate No.

FIGURE 98 cont.

DATA NAME	DESCRIPTION
HOH-REL	Head of Household Relation (i.e. Father)
RACE	Race of Student
SEX	Sex of Student
MAP	Not Used
MOVED-FRM-TO	Moved From To
FLAG-SCHED	Schedule Flag
ST-CMP-ITEMS	Cmp Fields
ST-ALPHA-ITEMS	Alpha Fields

FIGURE 99. MISCELLANEOUS FILE IN THE STUDENT SUBSYSTEM.

1. Student Schedule File

This file contains one record for each student enrolled in a school for which grade reporting is accomplished. File is organized randomly and has a pointer to the student's master record. Normal access is achieved through use of the pointer from the Master File. The record contains the student's schedule and grades.

2. Student Request File

Contains one record for each student who is to be scheduled for the next school year. File is random in nature, with pointers to the student's master record. Normal access will be possible through the use of the pointers in the student master record. Record contains the courses requested by the student, anticipated grade in the next year, early release, Late Arrival Data, etc.

3. Master Schedule File

Contains one record for each course section in any given school's master schedule. File is created during scheduling runs and allows for 20% growth factor for each school. The file is randomly accessible and each record contains data which describe each particular section (course, teacher, room, way taught, load, etc.).

4. Student Transfer Files

Contains records for each withdrawal or transfer from or to another school. Master File points to the first transfer record for a student, which in turn points to the next, etc. Each transfer record in turn points back to the master record. Records are created upon receipt of a drop notice from the old school, or the add notice from the new school.

5. Tag File(s)

These files are created by generated sort programs and contain only the actual keys of the Student Master File, sorted into the desired sequence. Three primary sequences are maintained, alpha in school, alpha in grade, & alpha in homeroom.

FIGURE 99 cont.

6. Subject File

File contains one record for each course listed in the master course catalogue (title & number). Course number is the actual key which is accessible randomly and used only for schedule output reports.

7. Student History File

This is a file that is updated at the end of each school year and will be used for historical, statistical purposes. The file is organized sequentially and stored on the tape.

8. Student Test File

This file contains one record for each standardized test taken by each student and were graded previously by Data Processing Department. It is linked to the Student Master File.

9. Auxillary Student File

This file is for any additional information needed on any of the students. The type of auxillary data is determined by a code on the file. It is linked to the student master file.

10. Map District File

File contains one record for each map code in the system and is organized randomly. Accessing of each record is accomplished through the use of the first six digits of the map code. Each record contains a link to an overflow map code record. Records also contain general information on the map code. The first entry of the first record in Map District File contains the next available record on the Map District File.

11. School District File

The file organization is in random. Records are accessed by using their actual address. Normal access will be from use of links in the student location record. The records on this file contain a school number and map codes which are assigned to that school number.

FIGURE 100. SURVEY QUESTIONNAIRE

SURVEY OF INFORMATION REQUIREMENTS IN
EAST BATON ROUGE PARISH SCHOOL BOARD

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. What is your present position in this organization?

2. What is (are) the major objective(s) or goal(s) of your department?

3. Do you recerive adequate information with regard to the above objective(s)?

____ Yes

____ No

4. If your answer to question 3 was yes, in what form is this information provided?

____ Formally
____ Informally
____ Written
____ Oral

5. If the available information for your planning purpose(s) is not adequate, list the additional information which you feel must be produced by the Data Processing Department.

6. What type or form of information would you rather have for your planning?

____ Statistical forecast
____ Government surveys
____ Historical information
____ Casual ideas (ad hoc)
____ Other (Specify)________________________________

7. Do you have adequate information for controlling the activities of your department?

____ Yes

____ No

8. If your answer to question 7 was no, what additional information should be provided by the Data Processing Department?

FIGURE 101. MASTER FILE LAYOUT OF PROPERTY.

	Position #
Location code	1-4
Item number	5-10
Description of asset	11-30
Date acquired	31-36
Vendor	37-50
Value code	51
1. Cost	
2. Appraised	
Cost	52-61
Appraisal reference	62-71
Estimated useful life	72-73
Scrap value	74-80
Depreciation for last year	81-88
Accumulated depreciation	89-98
Book value	99-108
Location name	109-134

FIGURE 102. MASTER FILE CHANGE REPORT.

FILE CHANGE REPORT

Z9/99/99

ITEM NO.	TRANS CODE	DESCRIPTION	LOCATION CODE	EST. LIFE	SCRAP VALUE $	COST $	OLD E.L.	OLD SCR.V.	OLD LOC.	DATE ACQUIRED
9999-999999	1	XXXXXXXXXXXXXXXXXXXX	9999	99	ZZZZ9.99	ZZZZZZZ9.99				
		ACCUMULATED DEPR............................				ZZZZZZZ9.99				
		BOOK VALUE..................................				ZZZZZZZ9.99				
9999-999999	2			99			99			
9999-999999	3				ZZZZ9.99			ZZZZ9.99		
9999-999999	4		9999						9999	
9999-999999	5	XXXXXXXXXXXXXXXXXXXX	9999	99	ZZZZ9.99	ZZZZZZZ9.99				Z9/99/99

FIGURE 103. MASTER FILE LAYOUT OF INVENTORY RECORD.

	Position #
Item number	1-6
Description of item	7-26
Location of item in the warehouse:	
Floor	27
Shelf	28
Quantity on hand	29-35
Quantity on order (this time)	36-42
Minimum quantity required	43-49
Economic order quantity (EOQ)	50-56
Reorder point	57-63
Average cost/unit	64-68
Total cost	69-78
Quantity ordered (most recent)	79-86
Unit price (most recent)	87-91
Vendor (most recent)	91-120
Vendor (next most recent)	121-140

VITA

Mohsen Sharifi Fardi, the son of Ahmad and Fatemeh Sharifi Fardi was born on July 29, 1945, in Tehran, Iran. He graduated from Firooz-Bahram High School in Tehran in 1963. In September 1964, he was accepted to Tehran Business College where he received his Bachelor of Commerce in September 1967.

He has worked for National Cash Register of Iran as the Head Accountant and for Plan Organization of Iran as an auditor. In the Fall of 1970, he entered the graduate Accounting program of Louisiana State University where he received his M.S. in Accounting and his M.B.A. In the Fall of 1974, he passed the Certified Management Accountant exam. He is currently a candidate for a Ph.D. in the Department of Accounting of Louisiana State University.

EXAMINATION AND THESIS REPORT

Candidate: Mohsen Sharifi Fardi

Major Field: Accounting

Title of Thesis: A Pragmatic Approach to Development and Application of Total Information System

Approved:

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:

August 7, 1975