DOCUMENT RESUME

ED 136 829 IR 004 631

AUTHOR	Gifford, Bernard R.
TITLE	Restructuring the Collection, Processing and Dissemination of Educational Data. An Action Plan for Change. Internal Note No. 6.
INSTITUTION	New York City Board of Education, Brooklyn, N.Y.
PUB DATE	3 Dec 74
NOTE	89p.; Best Copy Available
EDRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS	Board of Education Role; Boards of Education; Change Strategies; *Data Bases; Data Collection; Data Processing; Decision Making; *Educational Administration; Information Dissemination; *Information Needs; *Information Utilization; *Management Information Systems; Organizational Change
IDENTIFIERS	New York City Board of Education

ABSTRACT

The purpose of this study was to develop a plan for alleviating problems in the collection, processing, and dissemination of educational data as they affect the New York City Board of Education information requirements. The Data Base Management concept was used to analyze three topics: administration, structure, and standards. The study found that the fragmentation of organizational responsibility limits the Board's ability to successfully meet its educational data requirements. It was also found that decision-makers within the Board did not use their educational data to full potential. Finally, fragmented administrative control and the inadequate computerization of the Board's data base created problems for the maintenance of data base integrity and security. The suggested changes to the educational data process include creating a new Bureau of Educational Statistics, developing a new computer system, and adopting a proposed reorganization plan over an eighteen month period. (Author/DAG)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED136829

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

IR

RESTRUCTURING THE COLLECTION, PROCESSING, AND DISSEMINATION OF EDUCATIONAL DATA

AN ACTION PLAN FOR CHANGE

DECEMBER 3, 1974

BEST COPY AVAILABLE

INTERNAL NOTE NO. 6

BOARD OF EDUCATION
CITY OF NEW YORK

JAMES R. REGAN, PRESIDENT
ISAIAH E. ROBINSON, VICE PRESIDENT
STEPHEN R. AIELLO
AMELIA ASHE
JOSEPH G. BARKAN
ROBERT CHRISTEN
JOSEPH MONSERRAT

IRVING ANKER, CHANCELLOR

PREPARED BY
OFFICE OF THE DEPUTY CHANCELLOR
EDUCATIONAL POLICY DEVELOPMENT UNIT

BERNARD R. GIFFORD, DEPUTY CHANCELLOR

IR004631

ERIC

FL

SUMMARY

The flow of educational information is the administrative lifeblood of the New York City Board of Education. Fiscal, legal and policy requirements of the public school system demand the collection of a variety of school-based data on pupils, staff, physical facilities, expenditures and programs. Despite the obvious need for a comprehensive and responsive educational data capability, however, the Board of Education lacks an adequate mechanism for meeting educational data requirements.

FINDINGS

The purpose of this study was to develop an action plan for alleviating problems in the collection, processing, and dissemination of educational data so that the Board's information requirements are met in an accurate, comprehensive and timely fashion. To support this, the study utilized the Data Base Management concept to analyze three topics:

- Data Base Administration
- Data Base Structure
- Data Base Standards

Data Base Administration

The objective of this component of the study was to determine how the Board of Education currently establishes organizational responsibilities, procedures and standards to handle the administrative aspects of educational data collection, processing and dissemination. The study found that the existing fragmentation of organizational responsibility into a number of separate data process units greatly limits the Board's ability to successfully meet its educational data requirements. This limitation not only affects the ability to meet specific, one-time data needs, but also affects the mandatory and routine reporting needs of the school system.

Specifically, there are three major problems that seriously hamper the administration of the data process.

- Existing data units lack direct contact with management. This particular problem is due primarily to the present organizational fragmentaion. Historically, the educational data units were created as the need for particular activities -- facilities planning, zoning, school safety -- developed. Most data units, therefore, see their mandate in terms of the particular data requirements of their function (or of their immediate organizational superior). Unit contact with management -- the Board of Education, Chancellor, Deputy Chancellor, and Executive Directors -- is infrequent.

  This lack of contact with managment has two important consequences. First, the passage of time has rendered some data "requirements" obsolete. Data which were necessary for the operation of the school system in the 1950's are no longer critical or even used in the 1970's. As a result scarce resources of time and staff are employed on activities having little or no value. Secondly, as a result of issues arising out of a dynamic social environment, the Board has been repeatedly faced with the need for timely and accurate data on a variety of factors not routinely collected. Such situations call for clear lines of authority and responsibility to provide the necessary information.

- Data unit operations are too labor-intensive. The collection of educational data from the field requires careful manual inspection of the returned forms for correct coding, legibility and missing data. Unfortunately, much of this collected data is currently being manually processed as well. Outside of their routine reporting responsibilities, none of the Board's data units have the capability to process and analyze data other than manually. Any request for even the most rudimentary data analysis (such as a frequency distribution of schools by ethnic composition) will require a manual effort which may take days or weeks to complete. Frequently, the Board is required to provide data with such urgency that the luxury of one week's time to do a manual analysis simply does not exist. In such instances, the Board may be forced to use whatever data is on hand to meet the request.

- Redundant Data Operations are Common. In addition to performing many of their operations manually, the data units also duplicate each other's manual operations. Because of the existing organizational fragmentation, data units are either assigned (or take upon themselves) data processing and analysis functions already handled by other data units. Such redundant efforts are a waste of staff time which could be better used on other activities. Perhaps more critical is that redundant efforts result in a proliferation of differing statistics all proporting to be the same.

Data Base Structure

The objective of this component of the study was to determine how the Board of Education develops and structures its educational data base. The study found that decision-makers within the Board are hard put to manage -- and use -- their educational data to full potential. Basically, there are two major problems that seriously limit the usefulness of the educational data base.

- Existing data systems are outmoded. The management of data at the Board has generally developed in a fragemented fashion and at rather low organizational levels. The traditional approach to educational data processing used by the school system involves collecting and coding data for specific computer programs and thereby linking them more or less permanently and exclusively to these programs. This type of data structure -- separate data files feeding into specialized reporting systems -- severely limits the ability to combine and analyze data elements from separate data files. In order to analyze data contained on two separate files, it would be necessary to first perform record-by-record match sorts for the two files and then produce a new data file containing all of the necessary data. The time and effort required to do this often discourages requests for such analyses or leads to a manual computation of the data from printouts.

- Data inventory and dissemination procedures are poor. Immediate requests for information can generally be satisfied only if the data, in terms of format and content, are contained in regular unit reports, printouts, or publications. All of the data units are tied into their routine reporting systems; any non-routine requests must await time-consuming manual computations before being satisfied. Requests for historical data more than two or three years in age often face delays because of chaotic or inaccesible filing systems. Unit staff are not always familiar with the types of data available in their offices. Data documentation manuals and information libraries are non-existent at the Board and data requests are often dependent upon the availability of a single individual who knows which pile of paper can satisfy the request.

Data Base Standards

The objective of this component of the study was to determine how and to what extent the Board of Education uses rules, practices, guidelines, and procedures in the planning, development, and maintenance of its

educational data base. The study found that fragmented administrative control and inadequate computerization of the Board's data base has created serious problems for the proper maintenance of data base integrity and security. In a number of situations, standards and conventions governing data integrity and security simply do not exist. Where such standards do exist, they are often enforced either informally or not at all. Three aspects of the data standards function were found to need immediate improvement.

- Data quality control varies greatly. Quality control of educational data involves the degree to which the sources of data are held responsible, the clarity of data element definitions, and the extent of edit checks built into the processing system. While all of the Board's data units attempt to do a conscientious job of verifying data accuracy, they are hampered by personnel and time constraints, and an inability to conduct field audits. Only the October 31 register and the period attendance reports are subject to an on-site audit; audits of all other data are limited to telephone calls to the schools by unit staff to check on missing or obviously erroneous data.

- Data security standards are inadequate. Data security standards ensure that a particular data file will be maintained and available for use during a designated period of time. Although the Board's Bureau of Management Information and Data Processing (BMIDP) has a standard user procedure for retaining data tapes, data units have little sense of the relative importance of their various files to management. Most tape files are retained for only a year or two. As a result, valuable pupil tapes are lost for further computer analysis and the necessary data must be recreated from printouts whose own existence is often none too secure.

- Data collection forms are poorly designed. Each year, the schools and districts are the unfortunate recipients of dozens of educational data forms. Some of these forms are professionally printed in easy-to-work-with formats while others are mimeographed from poorly-typed copy. Some forms are coded for keypunching while most are not. The layout of header information on most forms is not consistent even for forms from the same data unit. Some forms have excellent instructions for completion while others leave much up to the imagination of the person completing the form. Inevitably, many forms ask for the same information. Inevitably, many forms asking for the same information are returned containing different figures.

ACTION PLAN FOR CHANGE

The study identified a number of serious problems in the Board's educational data process. Strengthening this data process, thereby enabling it to more effectively serve the information needs of the city school system, will require a number of major changes in the administration and structure of the educational data base. Such changes, to be effective, must impact not only on the procedures and systems used by the present data process units, but also on the units themselves -- their internal structure and traditional relationships within the system.

Accordingly, the action plan consists of the following changes:

- Create a new Bureau of Educational Statistics. One major point regarding the Board's educational data process has clearly emerged from this study: almost all of the existing data process problems result from the lack of central responsibility for the operation of the process. Top priority must therefore be given to the elimination of the existing data unit organizations and the restructuring of their staff and functions into a new Bureau of Educational Statistics (BES). BES should report directly to the Deputy Chancellor, establishing the necessary communications link with management that was missing from the old organizational structure. BES should have the sole responsibility for the collection, processing (excluding, of course, actual machine processing), and dissemination of all educational data not involving pupil testing. Whenever possible, BES should serve as a data user clearinghouse, consolidating similar data requests by client offices to prevent the collection of duplicate data and to maximize data utility.

  A new administrative position of Director of Educational Statistics should be created to supervise the new BES, replacing two existing pedagogic director positions in the Bureau of Educational Program Research and Statistics and the Programming Section - Office of Educational Facilities Planning. Because the BES reorganization places very heavy emphasis on the development and operation of management information systems, it is recommended that the BES director position be established as a Principal Quantitative Analyst line at the M-IV salary level in the Managerial Pay Plan. This action will ensure that future incumbents in the BES director position will possess the necessary technical background for the position.

- Develop new computer systems. Most of the shortcomings identified by the study centered around manual data processing or limited and inflexible computer programs and files. To alleviate these problems, six new computer systems should be developed during the BES reorganization:

  1. An Annual School Census System to replace the many existing overlapping manual and computer systems now used to collect pupil and school facility data for the annual October 31 school census. This system will form the basis of a comprehensive grade-within-school data base.

  2. A Geographic Data Base System to provide for the collection and processing of demographic data down to the block level of detail. This system will generate detailed and up-to-date inventories of demographic data to support such Board activities as school zoning, enrollment forecasting, redistricting, pupil busing and integration studies.

  3. An Incident Reporting System to provide for the entry and processing of school incident data, and replacing the existing manual procedure. The computerized incident file created by this system would be accessed via remote terminal to generate a variety of incident reports and statistical analyses.

  4. A Pupil Mobility Reporting System to generate detailed reports of pupil admissions and discharges down to the school level, replacing the present systems which provide only borough and district data summaries.

  5. A Professional Staff Reporting System to provide flexible access to position and salary data contained on the regular and per-diem professional staff payrolls. The system will generate information necessary for analyzing personnel survival trends and for determining long-range costs of collective bargaining salary offers.

  6. A Preliminary Reports System to produce on-demand reports and analyses of "raw" or preliminary data, replacing many of the time-consuming manual procedures now used to produce preliminary or special data reports.

- Adopt a two-phase reorganization plan. The above recommendations (and others to be found in Chapter 4 of this report) for the restructuring of the educational data process should be implemented over an eighteen month period consisting of two phases.

  Phase I - This phase will extend from January 1, 1975 through June 30, 1975. At the outset of this phase, the Bureau of Educational Program Research and Statistics (BEPRAS) and selected staff from the Office of Educational Facilities Planning's Programming Section and the Office of School Safety's Analysis and Statistics Unit will be incorporated

into the new Bureau of Educational Statistics (BES). Work will begin on the development of the six new computer systems recommended above, and on microfilming educational data files. It is expected that three (Incident Reporting System, Professional Staff Reporting System, and Preliminary Reports System) of the six new systems will be operational by the end of Phase I.

Phase 2 - This phase will extend from July 1, 1975 through June 30, 1976. At the outset of this phase, Educational Facilities Planning's Programming Section and School Safety's Analysis and Statistics Unit, together with units of the Bureau of Attendance's Pupil Accounting Division will be merged into BES. In addition, Phase 2 will see the incorporation into BES of other data units not included in this initial study. As of this writing, likely candidates for merger include the Bureau of School Financial Aid's Survey Unit and certain functions of the Central Zoning Unit.

* * * * * * * *

The detailed findings of the educational data process study are discussed in the four chapters of this report. Chapter I provides an introduction to the Data Base Management concept. Chapter 2 analyzes the functions, procedures, and responsibilities of each of the Board's educational data units, and examines how the present fragmentation of organizational authority affects the data process. Chapter 3 examines the major shortcomings of the Board's educational data base -- its structure and standards -- and the problems this creates for the Board's top decision-makers. Chapter 4 provides specific recommendations for an immediate restructuring of the educational data process to alleviate the problems identified in the study.

Bernard R. Gifford

Study Team

Leon Brazel
Catherine Lyon
Richard Vigilante

CONTENTS

SUMMARY ii

LIST OF EXHIBITS x

1. THE EDUCATIONAL DATA BASE I-1

2. ADMINISTERING THE EDUCATIONAL DATA BASE II-1
   Organizational Responsibility Is Fragmented II-1
   Major Problems Hinder The Data Process II-19

3. DEVELOPING THE EDUCATIONAL DATA BASE III-1
   Existing Data Systems Are Outmoded III-1
   Many Data Files Are Not Computerized III-7
   Data Dissemination Procedures Are Poor III-8
   Data Base Standards Need Improvement III-11

4. ACTION PLAN FOR CHANGE IV-1
   Create A New Bureau Of Educational Statistics IV-1
   Strengthen The Staff Organization IV-4
   Develop New Computer Systems IV-7
   Establish A Data Center IV-11
   Expand Field Data Audits IV-12
   Adopt A Two-Phase Reorganization Plan IV-12

APPENDIX A - WORK DISTRIBUTION ANALYSES A-1

LIST OF EXHIBITS

1.1 THE EDUCATIONAL DATA PYRAMID I-2

1.2 MANAGING THE EDUCATIONAL DATA PROCESS I-6

2.1 THE EXISTING STRUCTURE OF THE EDUCATIONAL DATA PROCESS II-4

2.2 BEPRAS ORGANIZATION CHART II-7

2.3 BEPRAS' REPORTS LISTING II-9

2.4 PROGRAMMING SECTION ORGANIZATION CHART II-13

2.5 ANALYSIS AND STATISTICS UNIT ORGANIZATION CHART II-16

2.6 PUPIL ACCOUNTING DIVISION ORGANIZATION CHART II-19

2.7 SCHOOL BUILDING CAPACITY WORKSHEET II-24

3.1 THE EXISTING APPROACH TO DATA PROCESSING III-3

3.2 THE DATA BASE APPROACH TO DATA PROCESSING III-6

4.1 THE PROPOSED STRUCTURE OF THE EDUCATIONAL DATA PROCESS IV-3

4.2 PROPOSED BES ORGANIZATION CHART IV-5

4.3 PROPOSED DATA STORAGE/RETRIEVAL PROCESS IV-10

4.4 FLOWCHART OF SYSTEMS DEVELOPMENT AND REORGANIZATION PROCESS IV-14

1 - THE EDUCATIONAL DATA PROCESS

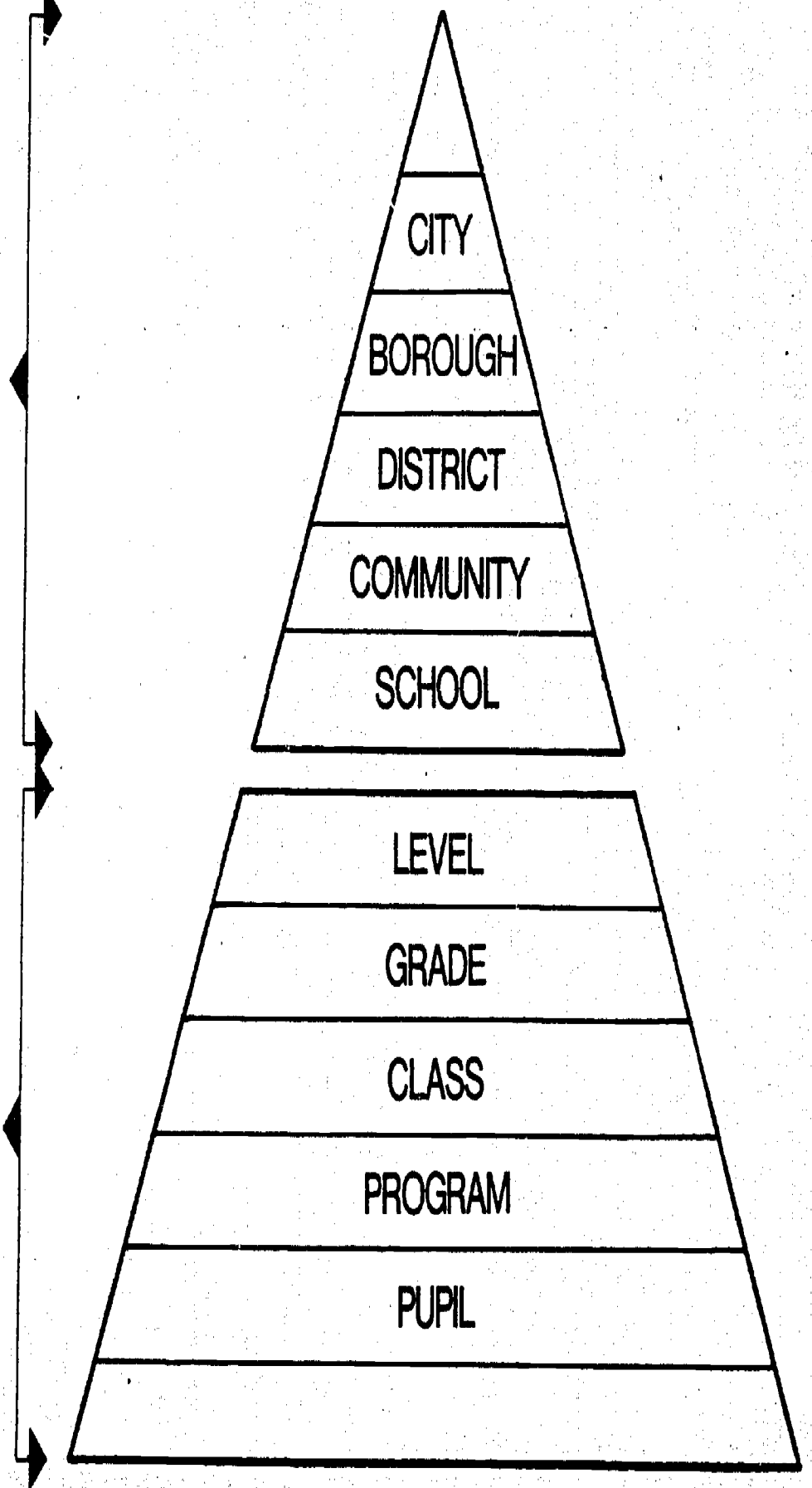
> Government is very keen on amassing statistics. They collect them, add them, raise them to the Nth power, take the cube root and prepare wonderful diagrams. But you must never forget that every one of these figures comes in the first instance from the village watchman, who just puts down what he pleases.
>
> — Sir Josiah Stamp

True to Sir Josiah's maxim, the New York City Board of Education is very keen on amassing statistics. Fiscal, legal and administrative requirements of the City School System demand the collection, processing, and dissemination of a variety of school-based data on pupils, staff, physical facilities, expenditures and programs. The appropriateness, accuracy and timeliness of the numerous reports generated from these data are critical to the effective management of the school system. As shown in Exhibit 1.1, educational data exist at various levels of geographic and organizational resolution. Most of the educational data regularly collected by the Board of Education are at the school level of detail. Generally, these data are used to provide information for identifying and evaluating policy and decision alternatives in support of the following system requirements:

- To obtain City, State, and Federal funding
- To determine the allocation of resources to districts and schools
- To achieve effective school integration
- To develop or change school zoning patterns
- To plan and evaluate educational programs

EXHIBIT 1.1

THE EDUCATIONAL DATA PYRAMID



- To determine short- and long-range needs for physical facilities
- To provide data for collective bargaining purposes

Despite the obvious need for a comprehensive and responsive educational data capability, the New York City Board of Education lacks an adequate mechanism for meeting educational data requirements. Problems exist in all three parts of the educational data process - collection, processing, and dissemination.

1. Data Collection - This activity involves the preparation and distribution of data forms to schools and districts, and the subsequent collection and verification of the returned forms.
2. Data Processing - This activity involves the coordination and supervision of all functions necessary for the successful processing of the collected data by computer or manual effort; including data keypunch and verification, systems development from the basic system design through programming, error listing and final report generation.
3. Data Dissemination - This activity involves methods and procedures for the adequate storage, retrieval and dissemination of educational data; including the reporting of data in three ways: recurrent, as in the production of monthly reports of certain variables (such as pupil attendance), exception, notifying management of unusual behavior (such as an increase in school incidents), or on-demand, in which specific information is provided in response to a request from management.

The purpose of this study was to develop an action plan for alleviating problems in the educational data process so that the information requirements of the New York City Board of Education are met in an accurate, comprehensive and timely fashion. To support this, the study utilized the Data Base Management concept to analyze three topics:

- Data Base Administration
- Data Base Structure
- Data Base Standards

Data Base Administration

The objective of this component was to determine how the Board of Education currently establishes organizational responsibilities, procedures and standards to handle the administrative aspects of educational data collection, processing, and dissemination. The basis for such an assessment was provided by a review of the following factors:

- Is there a function and/or strategy that addresses educational data base management throughout the Board?
- Who has technical responsibility for the data base? Who has non-technical responsibility (user interface)?

Data Base Structure

The objective of this component was to determine how the organization is structuring its data base. A review of the following factors provided a basis for assessment:

- Is there a strategy to determine what common data bases should be developed and a priority schedule for development?
- Is the existing data base designed to support research on policy issues?
- Can data be viewed logically so that it appears organized in different ways to various users?
- How are information needs determined and to what degree is the user involved?
- Are future data needs forecast to assure that data base capacity and performance can be maintained?

Data Base Standards

The objective of this component will be to determine how and to what extent the Board of Education uses rules, practices, guidelines, and procedures in the planning, development and maintenance of its educational data base. A review of the following factors provided a basis for assessment:

- What standards and conventions govern data integrity and security?
- What are the coding and classification standards?
- What are the procedures for data change nomination, concurrence, arbitration, implementation, and documentation?

Exhibit I.2 shows the relationship between Data Base Management and the educational data process. Notice that each element of Data Base Management -- administration, structure, and standards -- impacts upon the three aspects of the educational data process -- collection, processing, and dissemination. Enforcement of Data Base Management principles is necessary for the successful operation of the educational data process.

* * * * * * * *

The findings of the educational data process study are discussed in the three remaining chapters of this report. Chapter 2 analyzes the functions, procedures and responsibilities of each of the Board's educational data units, and examines how the present fragmentation of organizational authority affects the data process. Chapter 3 examines the major shortcomings of the Board's educational data base -- its structure and standards -- and the problems this creates for the Board's top decision-makers. Chapter 4 provides specific recommendations for an immediate restructuring of the educational data process to alleviate the problems identified in the study.

2 - ADMINISTERING THE EDUCATIONAL DATA BASE

The recent reorganization of the Board of Education's central headquarters recognized that clear lines of authority must exist if key management functions were to be performed properly. While the reorganization resulted in major administrative changes at the division level, the functions and responsibilities of most subordinate offices and bureaus were left unchanged. As most of the Board's educational data process activities take place at the bureau level, any restructuring of that process must first analyze current organizational responsibilities, procedures, and standards used to handle the administrative aspects of data.

Accordingly, the purpose of this chapter is to:

- Analyze the functions, procedures and responsibilities of each of the existing educational data units.
- Examine how the present fragmentation of organizational authority and the supporting systems limit the Board's ability to successfully meet its educational data requirements.

ORGANIZATIONAL RESPONSIBILITY FOR THE DATA BASE IS FRAGMENTED

Both the traditional role and recent expansion of the Board of Education's management responsibilities account in large part for the current fragmentation of the educational data process. As late as 1949, all statistical and research activities, including budget preparation, were incorporated in a single Bureau of Reference, Research and Statistics under a single director. Because the

then existing and unwieldly span of control in the Bureau was hindering important administrative and educational decision making processes, the statistical and research activity underwent a series of reorganizations which divided the data process (collecting, processing and disseminating) along functional lines. Over a brief five-year period separate bureaus responsible for administrative research, curriculum development, budget analysis, facilities planning, educational research and pupil attendance statistics were created. Later years saw the creation of new data bureaus for school zoning, personnel planning, public information, Federal programs, and program analysis.

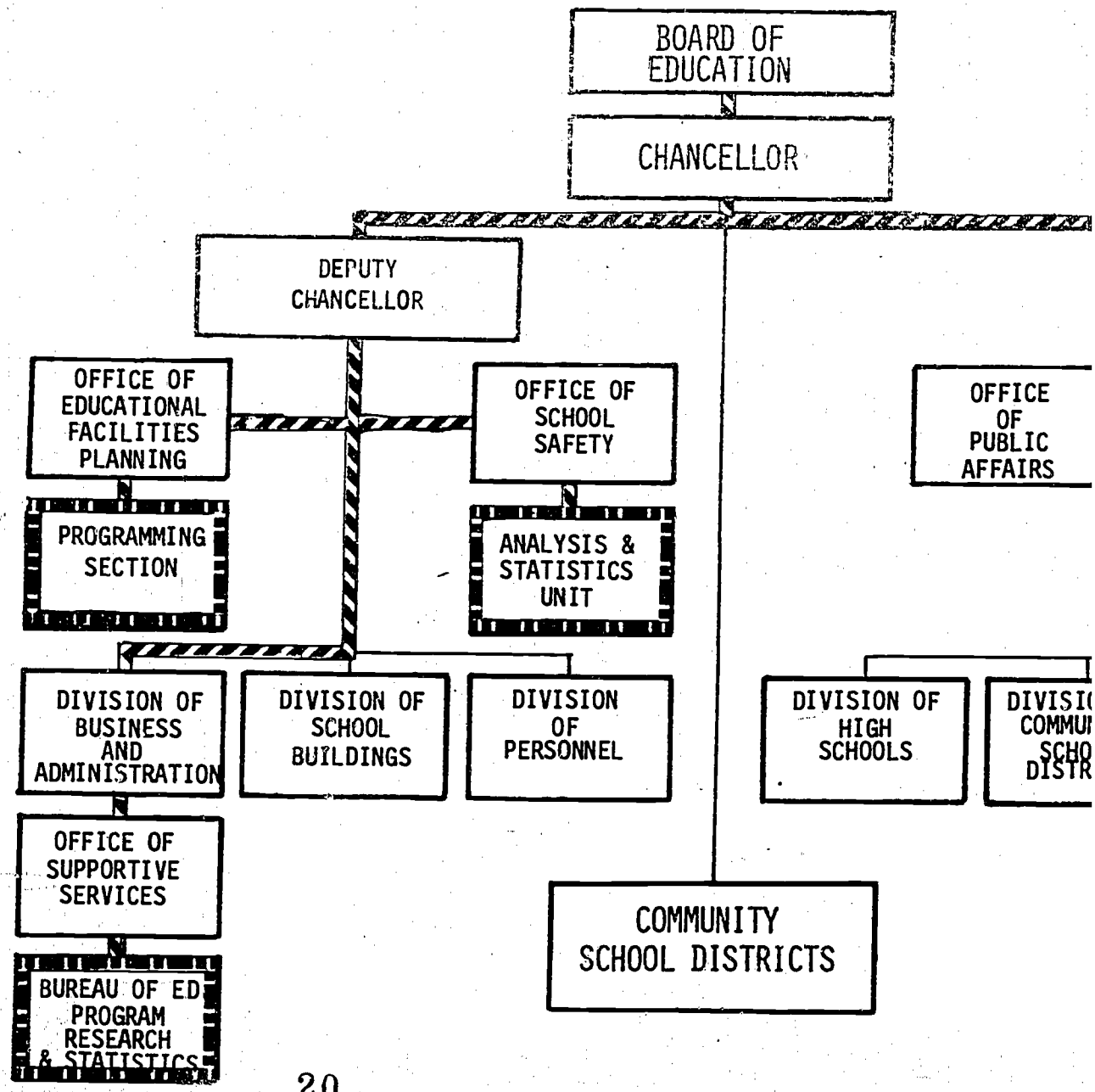
In all of these reorganizations, the data collection, processing and dissemination activity was seen as subordinate to the operational function of the particular bureau. In terms of staffing, this meant that expertise was required primarily in the subject function -- personnel, budget, zoning -- and not in whatever data collection, processing and dissemination activities were necessary to support that function. The data process, once highly centralized and professionalized, had become organizationally fragmented and was conducted with varying degrees of expertise and efficiency.

Exhibit 2.1 shows the existing structure of the educational data process for the New York City Board of Education. The organization chart identifies the five primary data process units and their associated lines of authority. The remainder of this section will discuss in some detail the functions, procedures and responsibilities of the following four data process units:

- Bureau of Educational Program Research and Statistics
- Programming Section - Office of Educational Facilities Planning
- Analysis and Statistics Unit - Office of School Safety
- Pupil Accounting and Statistical Unit - Bureau of Attendance

The fifth data process unit -- Office of Educational Evaluation -- is in many

THE EXISTING STRUCTURE OF THE EDUCA



respects unique from the four other units and does not share most of their problems. The role of the Office of Educational Evaluation in the development of the educational data base is discussed in Chapter 4 of this report.

Bureau of Educational Program Research and Statistics

The Bureau of Educational Program Research and Statistics (BEPRAS) is a direct descendent of the old Bureau of Reference, Research and Statistics. Split off from the old bureau in 1949 and given its current name and functions in 1957, BEPRAS became the Board's chief administrative research arm and its principal statistical unit.

BEPRAS' mandate as stated in various Board by-laws and resolutions is comprehensive and quite open-ended. The current stated functions of the bureau are the following:

1. To conduct studies of programs, organizations, personnel, fiscal matters, and school administration, as requested by top Board of Education officials.

2. To report, disseminate, and assist in implementing the findings of research.

3. To collect, record, and analyze systemwide administrative and pupil accounting data.

4. To furnish management information for high level decision-making.

5. To maintain a reference library of pertinent materials in the areas of school administration, school finance, research and evaluation, teacher personnel, and statistics, which will provide resources for the several functions of the bureau.

6. To participate in the preparation and evaluation of circulars, bulletins, guides, and administrative forms.

7. To provide information about the City's school system to Board of Education units, other municipal agencies, civic groups and service organizations.

8. To administer the Basic Educational Data System (BEDS) for the New York State Department of Education and to furnish the unique data provided by this survey to headquarters officials.

9. To conduct Federal surveys, required to maintain the flow of Federal funds.

To perform such herculean tasks, BEPRAS has a staff of 39 pedagogical and administrative personnel and a 1974-1975 personal service budget of $400,000. Exhibit 2.2 shows an organization chart of the bureau as of June, 1974. The bureau is organized into four activity units:

1. Program Research Unit

Under the supervision of a School Research Associate, this unit is responsible for conducting studies in the area of teacher personnel, such as a continuing survey of classroom teacher absence. These data have been utilized in collective bargaining negotiations with the United Federation of Teachers, and have provided estimates of per-diem substitute fund requirements for community school districts and high schools. The unit also prepares comparative studies of teacher salaries for major U.S. cities, and New York City teacher salary distributions by step and schedule for various school levels.

2. Administrative Research Unit

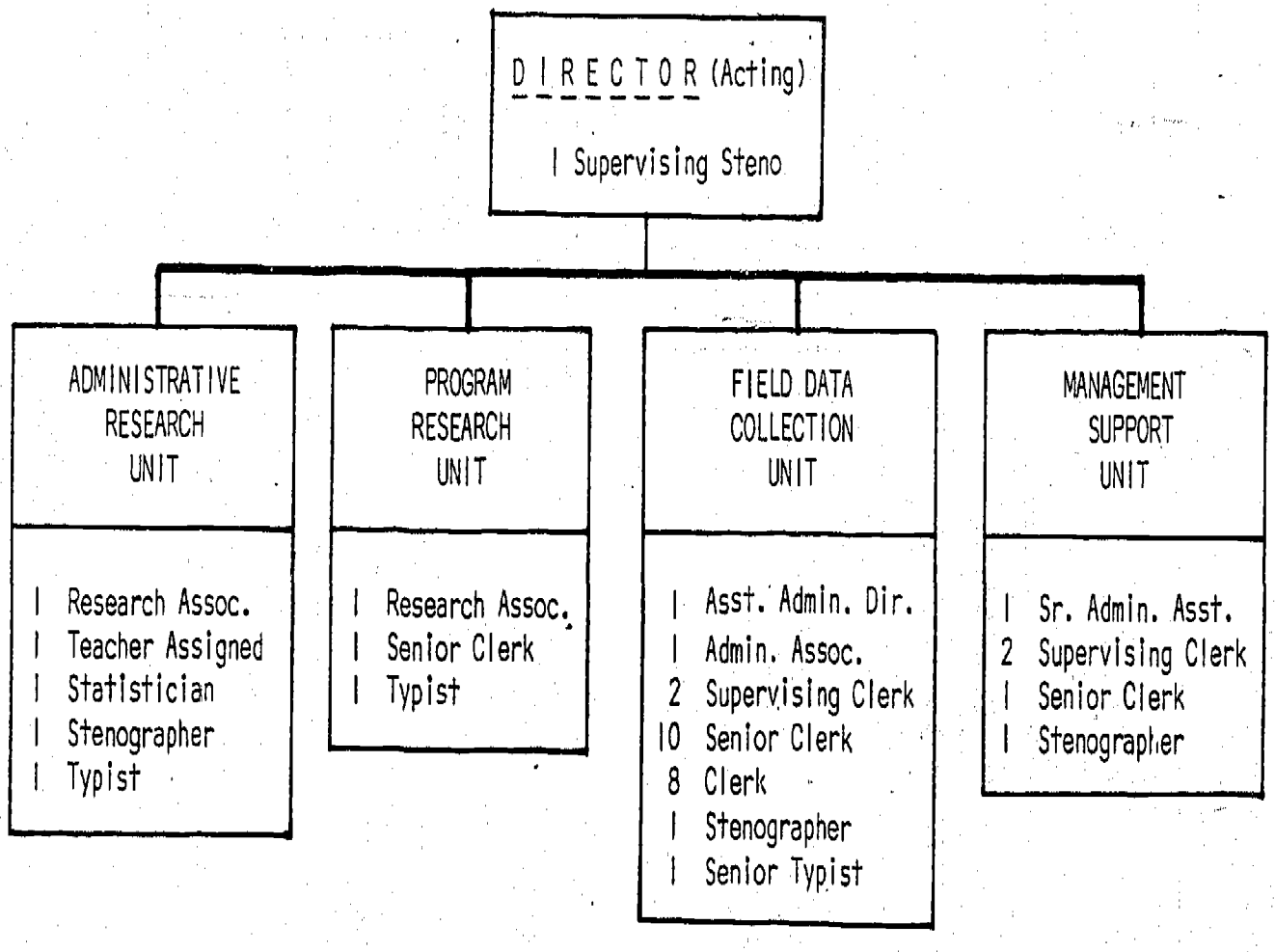
Under the supervision of a School Research Associate, this unit is responsible for conducting an annual survey of pupil eligibility for free lunch, and the annual comparability report of Title I services for the Federal Department of Health, Education and Welfare. This unit assists the bureau head by preparing a weekly activities report, drafting research proposals, and summarizing data and the results of investigations requested of the bureau by Board officials. The unit also consults with HEW Officials on the Office of Civil Rights Survey and the Office of Equal Employment Opportunity Survey.

3. Field Data Collection Unit

Under the supervision of an Assistant Administrative Director, this unit is responsible for the collection, editing, processing and disposition of 90 percent of the Bureau's statistical data. Included in this are the major data requirements - pupil attendance, ethnicity, language ability, and register - for the Board's budget, accounting, and fiscal operations, and a number of minor and secondary statistical data requirements. The unit also administers the New York State Basic Educational Data Survey (BEDS) of pupil, staff, school and district data profiles.

EXHIBIT 2.2

BUREAU OF EDUCATIONAL PROGRAM RESEARCH AND STATISTICS
ORGANIZATION CHART - JUNE 1974



4. Management Support Unit

Under the supervision of a Senior Administrative Assistant, this unit is responsible for providing specific statistical information requested by the Board of Education or outside agencies, institutions and individuals. The unit summarizes and disseminates BEPRAS data in the form of special reports, copies of computer printouts, and mimeographed releases. The unit maintains a historical file of most of the bureau reports and data sources.

In order to separate performance from promise, a detailed work distribution analysis of existing operations and practices was conducted of BEPRAS (and of the other three data process units to be discussed in this chapter). The work analysis was conducted for each member of the bureau staff to determine work loads and procedures involved in the collection and processing of each data item (by type or group), examine line and staff relationships, understand control activities and functions of senior bureau staff, and identify activity flow and time requirements of all phases of the bureaus data process responsibilities. Exhibit A.1 (see Appendix A) shows the summary work distribution analysis for the entire bureau. In general categories, the bureau's activities consume the following percentages of total available man-hours:

Supervision	- 6%
Data Process Activities	-75%
Clerical and Support	-19%

Over half of the bureau's data process activities' time is devoted to five major statistical reports -- pupil information (free lunch eligibility) survey, pupil attendance, grade and register, pupil ethnicity, and pupil language ability. Miscellaneous surveys (see Exhibit 2.3 for an inventory of all BEPRAS Reports) consume an additional 20 percent of the data process activity time. Most of the time spent on report functions involves routine clerical tasks such as calling schools for delinquent reports or missing data, checking for proper coding, legibility and obvious data errors, and going over the many edit listing printouts

EXHIBIT 2.3

BEPRAS' REPORTS LISTING

	REPORT TITLE	FREQUENCY	REPORT DESCRIPTION
1.	Period Attendance	Monthly-Annually	Pupil attendance rate and register
2.	Preliminary Register	Annually	Fifth school day's attendance and register
3.	Time Schedule and Register	Annually	Pupil register on Oct. 31 for all grades with data on special schedules, short time, and number of classes
4.	Transportation	Annually	Documentation of reimbursement claims for public and non-public school transportation by pupils and carrier
5.	Age Grade	Annually	Pupils' age, by sex, for each grade
6.	H.S. Graduate Ages	Semi-Annually	Age and sex of H.S. graduates
7.	J.H.S. and H.S. Examinations	Semi-Annually	Percent passing and distribution of test scores for Regents and citywide exams
8.	Elem and J.H.S. Promotions	Annually	Pupil promotions by grade
9.	Library	On Request	Library media center data on staff, materials and services
0.	Ethnic Census	Annually	Pupil ethnicity by grade
1.	Ability to Speak English	Annually	Pupil English-speaking ability by language group within grade
2.	H.S. Register and Attendance	Semi-Annually	H.S. attendance and register on State scholarship and Regents test days
	School Reorganization	Annually	End of year school reorganization by grade and school level

from the Board's Bureau of Management Information and Data Processing (BMIDP). Given the poor quality of much of the data received from the schools, these clerical tasks are absolutely necessary and the bureau staff, with many years of experience in data collection, performs with a high degree of competence and professionalism.

Exhibits A.2, A.3, A.4, and A.5 provide work distribution analyses for each of the four BEPRAS units. These analyses point out a major shortcoming of the bureau's organization. Data collection and processing of forms received from the schools are not handled exclusively by the Field Data Collection Unit (as might be expected) but are also processed by the Program Research Unit (Teacher Absence Survey) and the Administrative Research Unit (Pupil Information Survey). Also, all three units spend from 5 percent to 17 percent of their time in various phases of the pupil language and ethnic survey. This lack of task specialization among the units is evident in other bureau activities -- statistical analysis, administrative record-keeping -- as well. Given the fact that 80 percent of the bureau's time is devoted to two activities -- collection of field data and manual tabulations of data summaries -- the existence of the three separate units, with the attendant duplication of supervisory overhead, is both artificial and costly. The Management Support Unit, while primarily responsible for the unique task of data dissemination, suffers from the lack of an information retrieval system and the lack of a common, automated data base and report system to generate many of the statistical tabulations and summaries requested by board officials and now produced manually. The implications of these shortcomings on the board's information needs will be discussed later in this chapter.

Programming Section - Office of Educational Facilities Planning

The programming section of the Office of Educational Facilities Planning was created in 1951 upon the recommendation of the Education Management Study

(Strayer-Yavner Report). In the report's recommendation, the proposed division (now section) of programming would be responsible for formulating and adopting policy actions necessary to achieve the best use of existing school facilities and the improvement of those facilities to meet educational standards. The new division was to have two subdivisions:

(1) A school population analysis unit for conducting all analysis and planning necessary for the capital budget and long-range building programs: and

(2) A school facilities analysis unit for inspecting school buildings and analyzing space utilization.

The current stated functions of the programming section are the following:

1. Participation in the development of the master plan for public school building construction, promulgation of the annual space procurement program, and the preparation of the five-year capital improvement plan.

2. Development and evaluation of research techniques and procedures for enrollment and other demographic forecasting.

3. Preparation of the annual report on school capacity, enrollment and utilization.

4. Estimating the impact of residential housing growth and decline on public school enrollments.

5. Participation in the preparation and review of proposed capital budgets for school construction.

6. Compilation, classification, publication, and distribution of information on school use, school construction needs, school life-expectancy and auxiliary facilities.

7. Preparation of five-borough school utilization maps.

8. Preparation of analysis of capital budget provisions for school facilities projects.

9. Participation in studies by special consultants employed by the Board of Education and outside agencies.

10. Preparation of school district profiles of current and anticipated future utilization of primary and intermediate schools.

11. Review and development of school capacity formulas.

The programming section has a staff of 20 pedagogical and administrative personnel and a 1974-1975 personal service budget of $280,000. Exhibit 2.4 shows an organization chart of the section as of June 1974. The section is organized into three activity units:

1. School Utilization Unit

   Under the supervision of a Teacher assigned, this unit prepares the annual report on school capacity, enrollment and utilization. This report incorporates data on leased and temporary facilities and their pupil enrollments, use of school facilities for non-instructional purposes, and the organization of special classes for special education programs. The unit prepares the annual issue of the five-borough set of school utilization maps showing the locations of all schools (existing, under construction, or in planning phase), leased facilities, and large-scale housing developments. The unit also conducts a periodic review with the N.Y.C. Department of City Planning and the N.Y.C. Bureau of the Budget of all level school capacity formulae for official modification to reflect changing conditions in the schools' organization and curriculum.

2. Program - Planning Research Unit

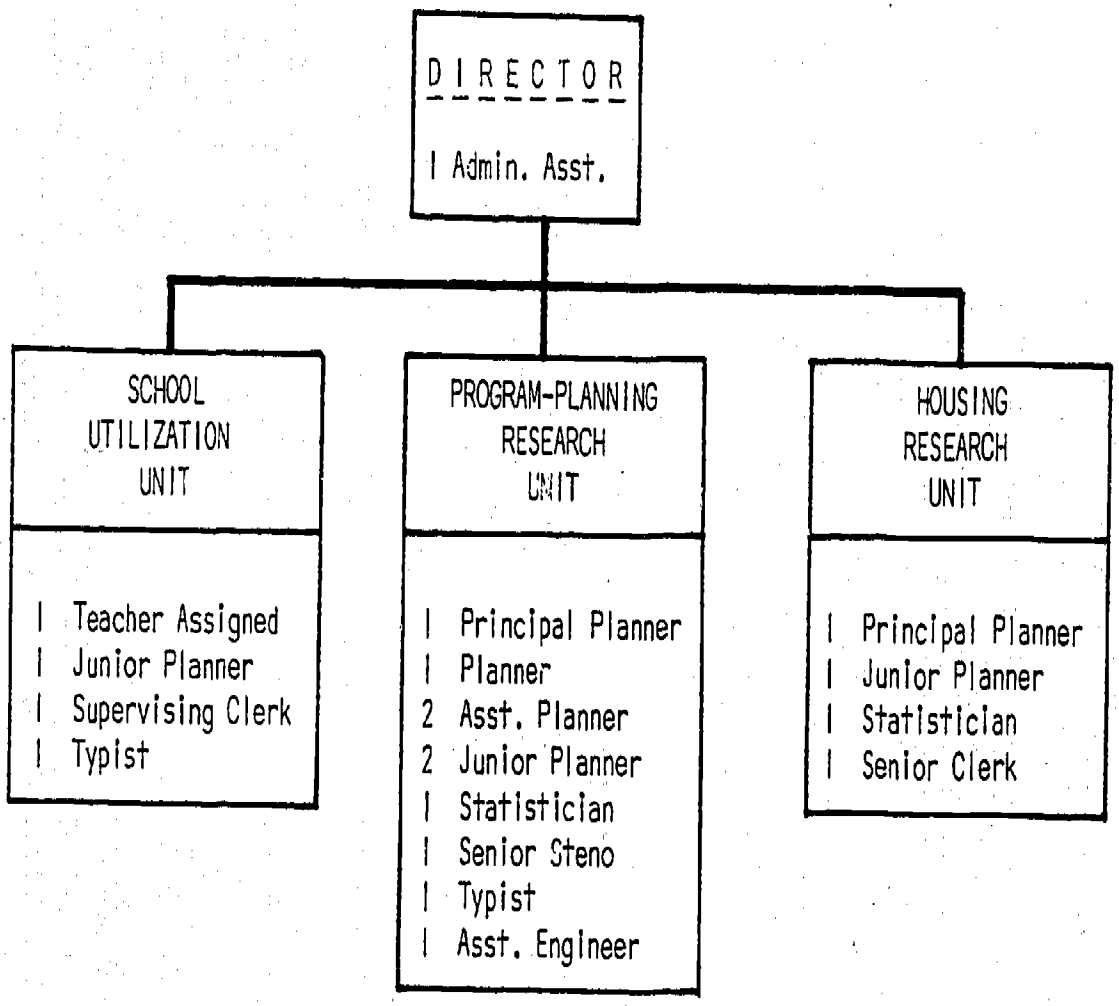
   Under the supervision of a Principal Planner, this unit participates in all phases of the development of the annual space procurement program and ensuing five-year Capital Improvement Plan of the Board of Education for submittal to and action by the City Planning Commission, Mayor, Board of Estimate and The City Council. Activities involved in this process include demographic studies of neighborhoods and community school districts involving the compilation, manipulation and interpretation of Census enumeration data, population characteristics, birth statistics, population migration, ethnic data, housing data, and historical trends of public and non-public school enrollments. The Unit also participates in the preparation of school district profiles and in the continuing section development and evaluation of enrollment forecasting methodologies.

4. Housing Research Unit

   Under the supervision of a Principal Planner, this unit evaluates the impact of proposed new residential housing (public, private and institutional) on public school enrollments based upon special annual questionnaires sent to the schools for collecting data, on enrollments of children from housing projects and for the yearly updating of these data for caluculating pupil/dwelling unit ratios of residential housing. These studies are used in the development of the annual Space Procurement Program.

EXHIBIT 2.4

PROGRAMMING SECTION - OFFICE OF EDUCATIONAL FACILITIES PLANNING
ORGANIZATION CHART - JUNE 1974



As with BEPRAS, a work distribution analysis of current operations and procedures was conducted of the programming section and its staff. Exhibit A.6 shows the summary work distribution analysis for the entire section. In general categories, the section's activities consume the following percentages of total available man-hours:

Supervision	-10%
Data Process Activities	-61%
Clerical and Support	-29%

Approximately 75 percent of the section's data process activities' time is devoted to three major statistical activities -- capacity and utilization inventory, housing analysis, and enrollment projections. Unlike BEPRAS, the programming section's miscellaneous analyses consume only 3 percent of the unit's time.

Exhibits A.7, A.8, and A.9 provide work distribution analyses for each of the three programming section units. As was the case with the BEPRAS' units, but not to the same degree, there is overlapping of activities among the three units. This is particularly true of the Program-Planning and Research, and Housing Research Units, both of which spend significant amounts of time engaged in public school enrollment analysis. The question arises as to why the Housing Research Unit exists as a separate entity at all since the data it collects and analyzes form an integral part of the enrollment and space procurement studies performed by the Program-Planning and Research Unit.

One major shortcoming of the programming section's operations is not evident in the work distribution tables. All of the section's data processess -- capacity and utilization, enrollment projections, housing analysis -- are completely manual. None of the section's data collections forms are coded for keypunch, no systems exist for computations of utilization rates or enrollments forecasts, and all reports and data tables have to be typed by hand. This lack of mechanization not only imposes a great burden on the staff in processing its own data but also

means that data secured from outside agencies (much of which is available on computer tapes) must be manually transferred from agency printouts to section data worksheets before being subject to further manual processing. Perhaps worse is the fact that much of the data relating to pupil registers and ethnicity is, of course, collected by BEPRAS and available on computer files at BMIDP. As a result the Programming Section's lack of automation imposes an additional clerical burden not only on its own staff but also on the staffs of every district and school who are being asked for the same data twice.

Analysis and Statistics Unit - Office of School Safety

The Analysis and Statistics Unit is part of a Planning Unit funded by a grant from the Criminal Justice Coordinating Council and established in the Office of School Safety in February, 1973. The grant award terminated on June 30, 1974 and the Planning Unit staff was paid out of the Safety Office's tax-levy budget for the 1974-1975 fiscal year.

The stated functions of the Analysis and Statistics Unit are the following:

1. To create a research and planning capability for the Office of School Safety and to provide a sound data base for analysis which will allow informed planning, deployment and budget decisions as regards school security.

2. To analyze the incident data collected from the schools and to produce regular and special reports on these incidents for use by the Central Board Members, Chancellor, Office of Public Affairs, and the Office of School Safety.

3. To provide information and assistance to the schools relating to their incident reporting and general security problems.

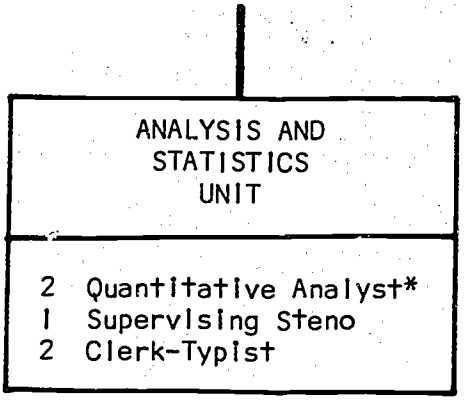
4. To computerize all aspects of the incident reporting process and utilize quantitative analysis techniques in studying crime in the public schools.

The analysis and statistics unit has a staff of 5 administrative personnel and a 1974-1975 personal service budget of $48,300. Exhibit 2.5 shows an organization chart of the unit as of June, 1974.

EXHIBIT 2.5

ANALYSIS AND STATISTICS UNIT - OFFICE OF SCHOOL SAFETY
ORGANIZATION CHART - JUNE 1974

[UNIT REPORTS TO O.S.S. TRAINING ADMINISTRATOR]



*Formally called Security Systems Analyst while the unit was funded by a Criminal Justice Coordination Council grant.

A work distribution analysis of the unit given in Exhibit A.10 shows that almost half of the unit's time is devoted to activities termed "Miscellaneous Clerical." The bulk of these tasks involved typing the various daily, monthly and annual logs and reports of school incidents. Much of the unit's remaining time was devoted to tabulating and summarizing the incident data for the unit's various reports.

Overall, approximately 85 percent of the unit's professional and clerical staff time is consumed by the manual manipulation of the data contained on the incident report forms. In addition to its daily incident log and regular monthly and annual incident reports, the unit was often requested to prepare special reports on individual security matters. These requests came from a variety of offices and individuals, including the Chancellor, other Board of Education offices, the Mayor's office The City Council, and special interest groups. Included in these special reports were the following:

- Study of crimes committed with handguns
- Analysis of crimes committed in school lavatories
- Analysis of crimes committed in school by intruders
- Study of robberies against different types of individuals
- Breakdown of sex offenses by type, victim and perpetrator
- Study of crimes by school, district and neighborhood
- Study of attacks against school guards

Most of these special reports consist of basic descriptive statistical analyses - frequency distributions, histograms and cross-tabulations. With almost 5,000 incidents reported in 1973-1974, even these simple studies extremely time consuming when computed using only desk calculators. The incident report form is coded for keypunching but requests by the unit staff to BMIDP for the development of a computerized incident reporting system have been turned down on the grounds that the relatively low annual volume of data did not justify an EDP system.

Pupil Accounting and Statistical Division - Bureau of Attendance

The Pupil Accounting and Statistical Division of the Bureau of Attendance is responsible for a variety of clerical and statistical functions relating to pupil attendance and transfers. For this study, only the operations of two of the division's units were analyzed:

1. Statistical Unit

   This unit is responsible for preparing preliminary monthly pupil attendance reports by school and district.

2. Coding and Reports Unit

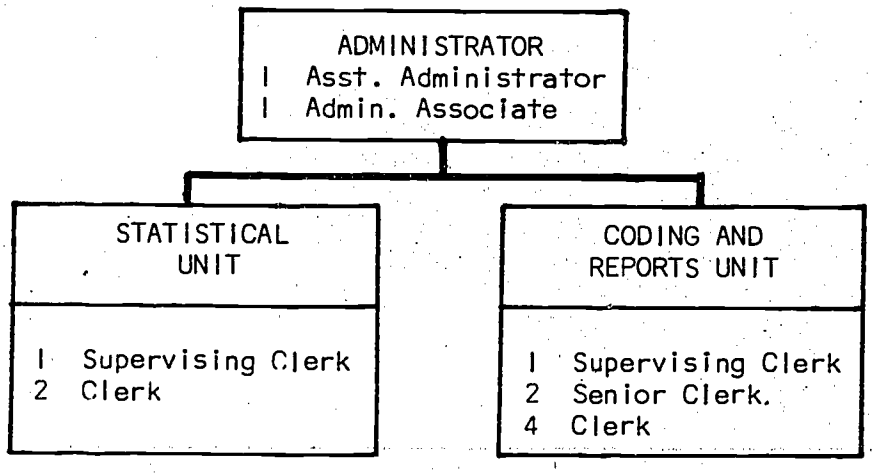
   This unit is responsible for receiving, processing, and coding data on pupil admissions, discharges and transfers prior to keypunching by BMIDP.

These two units have combined staff of 10 administrative personnel and a 1974-1975 personal service budget of $73,000. Exhibit 2.6 shows an organization chart of the two units within the Pupil Accounting and Statistical Division as of June 1974.

A work distribution analysis of the units given in Exhibit A.11 shows that 60% of the units' time is devoted to checking and coding data forms. The statistical unit spends most of its time preparing a monthly tabulation of pupil attendance rates by school from photocopies of the BEPRAS' Period Attendance Report (PAR) forms. This activity provides the Director of Attendance with a "preliminary" report for a given month's pupil attendance six to eight weeks before the final printout for the particular month is provided by BMIDP. BEPRAS staff also produce a manual preliminary pupil attendance report each month for the Chancellor's Office. This is a needless duplication of effort. These two parallel activities should be consolidated into a single effort and single report to serve the needs of the Chancellor and the Attendance Director.

EXHIBIT 2.6

PUPIL ACCOUNTING AND STATISTICAL DIVISION -
BUREAU OF ATTENDANCE
ORGANIZATION CHART - JUNE 1974



The Coding and Reports Unit Staff annually process approximately 35,000 209a and 209b admission and discharge forms containing over one million lines of information on individual pupils. The 209 forms are an invaluable source of detailed information on inter- and intra-city poplulation movements, and contain pupil home addresses (both old and new) as well as school and district identification. Unfortunately the school and pupil address data are not keypuched and the computer reports presently available provide pupil mobility data at only the district and borough levels.

MAJOR PROBLEMS HINDER THE EDUCATIONAL DATA PROCESS

The existing fragmentation of organizational responsibility greatly limits the Board of Education's ability to successfully meet its educational data requirements. This limitation not only affects the ability to meet specific, one-time data needs, but also affects the mandatory and routine reporting needs of the school system.

While the current situation gives rise to many detrimental consequences, there are three major problems that seriously hamper the educational data process.

1. Existing Data Units Lack Direct Contact With Management

This particular problem area is due primarily to the present organizational fragmentation. Historically, the educational data units were created as the need for particular activities -- facilities planning, zoning, school safety -- developed. Most data units, therefore, see their mandate in terms of the particular data requirements of their function (or of their immediate organizational superior). Unit contact with management -- the Board of Education, Chancellor, Deputy Chancellor, and Executive Directors -- is infrequent.

This lack of contact with management has two important consequences. First, the passage of time has rendered some data "mandates" obsolete. Data which were necessary for the operation of the school system in the 1950's are no longer critical or even used in the 1970's. As a result scarce resources of time and staff are employed on activities having little or no value. The data units themselves, located far down in the organizational hierarchy and lacking any authority to terminate a "mandate" on their own, continue to produce reports which serve no useful purpose. An example of this is the age-grade report which BEPRAS has produced for years. The age-grade report is an annual survey on the distribution of pupils by age, sex, and grade. The survey imposes a great clerical burden on the classroom teacher (who, to do the survey properly, must look up the dates of birth for each of his or her students), and its accuracy is, therefore, highly suspect. The survey results in six copies of a massive computer printout which are all neatly bound and shelved. Within the last few years, the only organization which has regularly consulted the age-grade reports is the Boy Scouts of New York. Pupil data by age and sex are apparently very useful in the Scouts' membership drives.

The second consequence of the data units' lack of contact with management is by far the more critical. During the past two decades, the Board of Education has had to deal with a number of issues arising out of a dynamic social environment. Integration, decentralization, and bilingualism have all imposed great demands on the Board's decision-making ability. As a result, the Board has been repeatedly faced with the need for timely, accurate and detailed data on a variety of factors not routinely collected. Such situations call for clear lines of authority and responsibility to provide the necessary information. The present organizational fragmentation of data units, however, has repeatedly resulted in costly and embarassing delays in meeting the information needs of the System's policy-makers.

One recent example can best illustrate the consequences of this situation. In 1972, the Puerto Rican Legal Defense and Education Fund Inc. (ASPIRA) instituted an action against the New York City Board of Education concerning the lack of educational services provided to students with English language difficulty. Early in 1974, the Board was requested by the Court to make a survey of the services provided to all Category 2 (ability to speak little or no English) pupils. The Board assigned the task of preparing the survey forms and instructions to a data unit not responsible for conducting the regular language survey. The survey was conducted in February 1974, with data returns of such poor quality that the entire survey was considered useless. It was found that the inadequate instructions had led some schools to include only Puerto Rican Category 2 pupils, while other schools included all Category 2 pupils or even all Puerto Rican pupils regardless of their language category. In addition, the data collection form used in the survey had no provision for keypunch coding so that all tabulations of the survey data would have had to been done manually.

Because the February survey was found to be useless and there was a Court-imposed deadline for the information, a second survey had to be made in May, 1974. Due to the time delay caused by the abortive first survey, the May survey placed the Board and the schools under a great deal of pressure to complete the task before the close of the school year. This pressure, combined with the resentment on the part of many school personnel in having to conduct the detailed and difficult survey a second time, resulted in scores of data errors which could not be corrected before the schools closed.

The Court's final decision in the ASPIRA suit based in part upon the results of the May survey, will affect the education of tens of thousands of children and involve the expenditure of millions of dollars. The need for high-quality information in this and similar situations is obvious. Equally obvious is the

need for a single agency within the Board to have sole responsibility for working with the system's policy-makers in defining information requirements and in ensuring that these requirements are met in an accurate and timely fashion.

2. Data Unit Operations Are Too Labor-Intensive

The collection and processing of educational data from the field invariably requires careful manual inspection of the data forms for correct coding, legibility, and missing or obviously erroneous data. The work distribution analysis of the data units revealed that a good deal of clerical time is spent on the telephone with school secretaries in order to make corrections before the forms are processed.

Manual inspection of completed data forms undoubtably saves more time in the overall process than if errors were corrected after initial processing. What does not save time, however, is the fact that much of this data processing itself is done manually. Of the four data units studied, only BEPRAS had the bulk of its data processing and reporting done by computer. Both the Programming Section of the Office of Educational Facilities Planning and the Analysis and Statistics Unit of the Office of School Safety process all of their data manually.

In the case of the Programming Section, this manual processing becomes an extremely costly and time-consuming activity. Exhibit 2.7 shows the worksheet used by programming section personnel to calculate school building capacity. Data on enrollments and rooms are transcribed from other reports and forms to the worksheets and then all of the computations are made with desk calculators. The possibilities for error in transcription and computation are obvious. There is no reason why such purely mechanical tasks cannot be fully automated with only manual inspection of the raw data forms and the computer edit listings.

EXHIBIT 2.7

WORKSHEET FOR CALCULATING SCHOOL BUILDING CAPACITY
PROGRAMMING SECTION - OFFICE OF EDUCATIONAL FACILITIES PLANNING

1. CLASSROOMS

a. Total number of classrooms in building: _____

b. Classrooms excluded for authorized special services and activities as provided in official school capacity formulas: _____

c. Number of classrooms available for instructional purposes (1a minus 1b): _____

2. ENROLLMENT

a. Total School Enrollment _____

b. I - Pre-Kindergarten enrollment _____
II - Kindergarten enrollment _____
III - CRMD enrollment _____
IV - Junior Guidance enrollment _____
V - Health Conservation enrollment _____

c. Total Pre-Kg., Kg. and special class enrollment (2bI through 2bV): _____

d. Remaining regular class enrollment, Grades 1- ____ (2a minus 2c): _____

3. UTILIZATION OF FACILITIES USED ONLY BY KINDERGARTENS AND SPECIAL CLASSES

Rooms			CAPACITY
a. ____	Single Unit Kg. rooms	x 45	_____
b. ____	Double Unit Kg. rooms	x 90	_____
c. ____	Pre-Kg. rooms	x 30	_____
d. ____	CRMD rooms	x 15	_____
e. ____	Junior Guidance rooms	x 30	_____
f. ____	Health Conservation rooms	x 15	_____
g. ____	Total number of rooms used by kindergartens and special classes (3a through 3f).		

h. Total CAPACITY of rooms used by kindergartens and special classes. (3a through 3f): _____

i. Rate of utilization of facilities used by kindergartens and special classes:

$$\frac{\text{Enrollment (2c)}}{\text{Capacity (3h)}} = \frac{\quad}{\quad} = \quad\%$$

j. Overload + / Underload - of facilities used by kindergartens and special classes (2c minus 3h): _____

4. UTILIZATION OF FACILITIES AVAILABLE TO REGULAR CLASSES (Grades 1 - ____ (Exclusive of Kgs. and Special Classes)

a. Number of classrooms available to regular classes (1c minus 3g): _____

b. CAPACITY of rooms available to regular classes (4a multiplied by 29/31): _____

c. If Non-Title I school, number of Title I pupils enrolled _____

d. Adjustment for Title I pupils enrolled in Non-Title I school (4c multiplied by .069): _____

e. ADJUSTED CAPACITY available to regular classes (4b minus 4d): _____

f. Rate of utilization of facilities available to regular classes:

$$\frac{\text{Enrollment (2d)}}{\text{Capacity (4e)}} = \frac{\quad}{\quad} = \quad\%$$

g. Overload + / Underload - of facilities available to regular classes (2d minus 4e): _____

5. Total ADJUSTED CAPACITY OF BUILDING (3h + 4e): _____

OFFICE OF EDUCATIONAL FACILITIES PLANNING

Room 504
110 Livingston Street
Brooklyn, N. Y. 11201

UTILIZATION OF ELEMENTARY SCHOOLS

OCTOBER 31, 1973

School _____

Borough _____

District _____

Organization _____

Title I
Non-Title I

Outside of their routine reporting responsibilities, none of the data units have the capability to process and analyze data other than manually. Any request for even the most rudimentary data analysis (such as a frequency distribution of schools by ethnic composition) which has not been generated by the regular units reports, will require a manual effort which may take days or weeks to complete. Not one of the four data units studied has a single staff member who can write a small computer program or use a programmable desk calculator. Even after certain requests for data analysis become institutionalized and required on a monthly basis, staff are pulled away from other jobs to pound desk calculators for days on end to get the "special" analysis out.

Whatever problems this lack of automation creates for the data units pales before the problems it creates for management. The Board of Education is frequently required to provide information pertaining to pupils, programs and schools. Frequently, these information requirements, whether from the City, State, or Federal Governments, are of such urgency that the luxury of one week's time to do a manual analysis simply does not exist. And frequently, the Board is forced to use whatever data is on hand to meet the request. One can only imagine the ultimate cost to the city's schools because of this unresponsive data processing and analysis capability.

3. Redundant Data Operations Are Common

In addition to performing many of their operations manually, the data units also duplicate each other's manual operations. Because of the existing organizational fragmentation, data units are either assigned (or take upon themselves) data processing and analysis functions already handled by other data units.

BEPRAS is required to produce a monthly pupil attendance analysis for the Chancellor's Office. This analysis involves computing school and district attendance rates from the raw data on the monthly period attendance reports and comparing these rates with those of the same month for the previous school year. The Pupil Accounting Statistical Unit of the Bureau of Attendance, however, also uses the raw data on the Period Attendance Reports to produce a similar analysis for the Director of Attendance.

Because the computerized pupil ethnic census reports are not fully corrected and available until four months after the census is conducted in October, the Chancellor has required BEPRAS to produce a preliminary ethnic census report using the raw survey form data. This preliminary ethnic report provides school, district, and level summaries of pupil composition weeks before the computer report is ready. The Central Zoning Unit, however, also uses the raw survey form data to compute a preliminary census similar to BEPRAS.

These redundant data processing and analysis operations have two detrimental consequences. Most apparent, of course, is that redundant efforts are a waste of staff time which could be better used on other activities. Perhaps more critical to the overall educational data process is that redundant efforts result in a proliferation of differing statistics all proporting to be the same. Instead of one ethnic census, we have three -- the final census and two preliminary censuses. Instead of one pupil attendance rate for District 15, there are three.

The idea of producing preliminary reports from raw data is justified when the relative immediacy of these reports is required by management. Such preliminary reports, however, cannot be allowed to propogate within the system at will. And in the Board of Education, data, having been created once for perhaps a single purpose tend to appear in reports and studies for years to come. It is important that such preliminary reports be produced by a single unit,

which will be responsible for their distribution and will be able to account for any future data discrepancies due to the reports' misuse.

* * * * * * * *

This chapter has discussed the organizational fragmentation of the educational data process and how this framentation limits the Board of Education's ability to meet its management information requirements. Poor organization is only part of the overall problem, however. The next chapter details the more serious problems inherent in the structure and standards of the educational data base.

3 - DEVELOPING THE EDUCATIONAL DATA BASE

The flow of educational data and information is the administrative life-blood of the Board of Education. This data flow is a continuous record of the status of many of the pertinent factors that affect the successful operation of the public school system. A major staff responsibility is the development of a mechanism for the selection of the key/critical data from this flood of information and the means to have it captured, processed, and fed back to assist management in making more effective decisions.

The educational data base is, or more properly should be, such a mechanism. There has been considerable debate among school administrators about the nature of the data base; about the elements of information that ought to go into it; about the technical complexities created by the concept; and about the real value of the concept to the operation of a school system. This chapter examines the major shortcomings of the N.Y.C. Public School System's educational data base -- its structure and standards -- and the problems this creates for the Board's top decision-makers.

EXISTING DATA SYSTEMS ARE OUTMODED

At the present time, decision-makers within the Board of Education are hard put to manage -- and use -- their educational data to full potential, for reasons that are largely historical. Because of the rapid growth of computer technology, managment of data has developed haphazardly and in laggard fashion over the years. A general approach to data managment has emerged only very recently, and consequently, applications have developed discretely from one another in an unintegrated and wasteful fashion. Further, each increase in the complexity and capabilities of computers has brought new generations of applications -- but these applications still, for the

most part, have been specialized in nature, designed for a specific operational use or for a specialized staff function.

Hence, managment of data has continued to develop in framented fashion and at rather low organizational levels. Exhibit 3.1 represents the traditional approach to educational data processing at the Board -- collecting and coding data for specific programs and thereby linking them more or less permanently and exclusively to those programs. This traditional approach has resulted in three significant disadvantages for the data process.

1. Files And Records Have Tended To Become Redundant

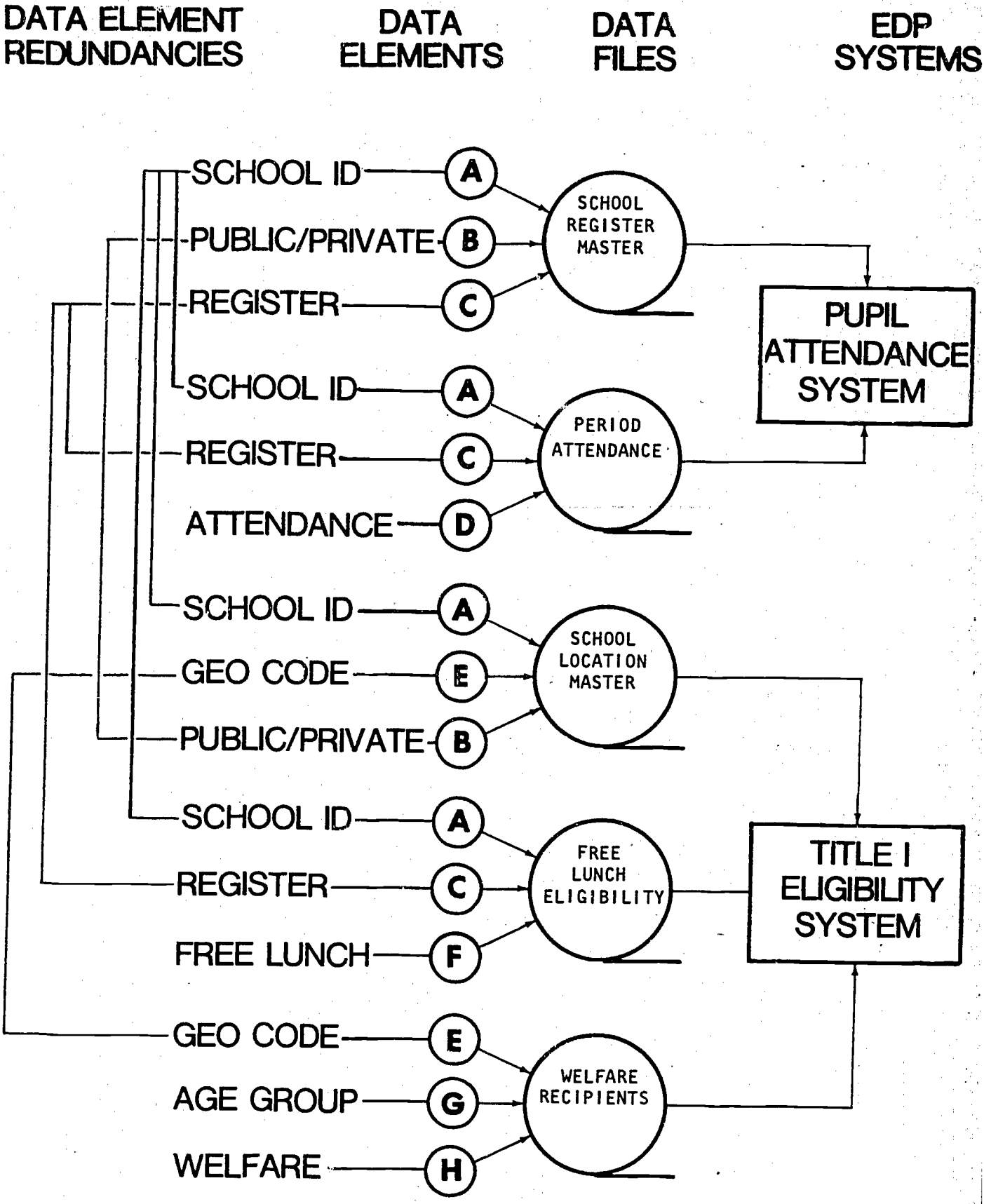
Exhibit 3.1 shows an over-simplified and hypothetical model of two educational data systems -- Pupil Attendance and Title I Eligibility. In the model, the Pupil Attendance System uses two data files: The School Register Master File and The Period Attendance File. The School Register Master File consists of data elements A, B, and C (representing the school identification code, public or private school category code and the school register, respectively). The Period Attendance File consists of data elements A, C, and D. Notice that data elements A and C are common to both files.

The Pupil Attendance System is a relatively old reporting system. A few years ago, the Board was required to develop a computer system for determining Title I Eligibility. In the model, the Title I Eligibility System consists of three data files: The School Location Master File, The Free Lunch Eligibility File, and the Welfare Recipients File. Notice that three (A, B, and C) of the seven data elements used in the Title I system are common with those used in the Attendance System.

The redundancy of data is obvious. In just this little, highly simplified model, 4 out of 8 (50%) of the data elements in the files are redundant.

EXHIBIT 3.1

THE EXISTING APPROACH TO DATA PROCESSING



During the initial development of data systems, redundancy does not cause much trouble. As soon as data elements must be updated, however, it can cause a great deal of trouble. Within this simple model alone, for example, the recent creation of Community School District 32 involved changing the school identification codes (data elements A) on four of the five files. Given the plethora of data systems maintained by the Bureau of Management Information and Data Processing (BMIDP), the process of updating all the redundant files and reports in a systematic and synchronized fashion becomes exceedingly difficult and costly.

2. Separate Files Restrict Data Analysis

The traditional approach to data processing results in separate data files feeding into specialized reporting systems. This type of data structure severely limits the ability to combine and analyze data elements from separate data files. For example, Exhibit 3.1 shows that pupil attendance data (element D) and free lunch eligibility data (element F) are contained in two different data files. If one wanted to correlate these two data elements, it would be necessary to first perform a school-by-school match sort for the two files and then produce a new data file containing elements A (school identification), D, and F. The time and effort required to do this often discourages requests for such analyses or leads to a manual computation of the data from printouts.

3. The Traditional Approach Undercuts The Advances of Computer Technology

Computer memory was once a great deal more expensive than it is today. The costs of random-access storage have been significantly reduced by the development of extremely large disc devices. Virtual-memory techniques make possible the analysis of relationships between elements in a relatively huge pool of data, not all of which need necessarily be present in literal fact.

Originally, the high cost of on-line storage or memory was a main factor for limiting the scope of programming and the amount of data needed during any given run. In effect, this reinforced the practice of creating and maintaining separate files for each application required by the Board's data users. Within the near future, the Board will acquire a new IBM 370/158 computer which will have the capacity to keep relatively huge amounts of data alive in the system. But the Board's educational data are still organized and coded along first-generation computer lines -- that is, by specific files and programs.

The traditional approach to educational data processing is tied into the history of the computer. The computer was first used to replace existing manual functions, primarily within the Pupil Accounting Function. Next came the integration of computer-based systems within and between functional areas. This resulted in data files and systems created originally for one function -- child-accounting -- being used for another function -- resource allocation, for example.

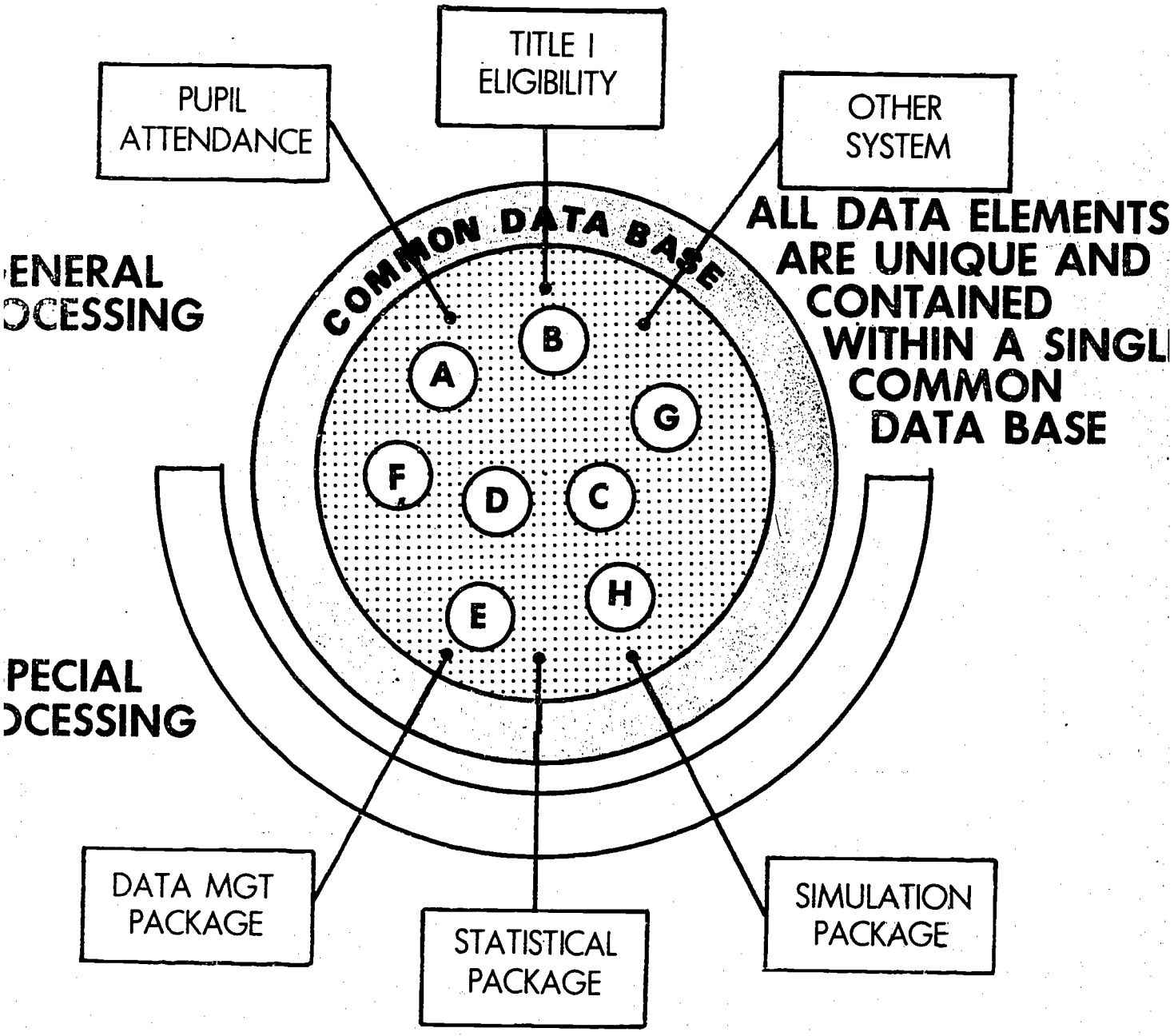
Now Board managment is requesting that the existing cross-functional systems be improved to serve the needs of many organizational levels as well as functions. At this point, the redundancies and inefficiencies resulting from the traditional approach to educational data managment have become so extensive that applications can be adequate only if they are developed in such a manner that specific programs are separate from the data. Ideally, all of the Board's educational data should be structured into a common flexible data base.

As shown in Exhibit 3.2, the data-base concept structures Electronic Data Processing (EDP) activity so that all of the Board's educational data are merged in a single pool, which is used to run both routine programs and programs written in response to ad hoc requests. Note that in the simplified model shown no files appear -- the base of data elements constitutes the general file for the school system, and specific files are by and large unnecessary. In the data-base approach,

EXHIBIT 3.2

THE DATA BASE APPROACH TO DATA PROCESSING

GENERAL EDP SYSTEMS
CONTAINING SOFTWARE FOR ACCESSING DATA ELEMENTS



SPECIAL EDP SYSTEMS CONTAINING
DATA BASE MANAGEMENT SOFTWARE
AND SPECIAL APPLICATION PACKAGES

an interface exists between the common data base and both the general and special EDP Systems containing the programs and software for accessing the data elements and producing reports. The data-base approach enables a programmer to organize and structure the data elements in a manner that minimizes or eliminates redundancy and optimizes the economic costs of data storage and accessibility.

MANY DATA FILES ARE NOT COMPUTERIZED

Inflexible and redundant computer data files are only part of the overall problem affecting the Board's educational data base. More serious perhaps is the fact that a number of important data "files" are not computerized at all. As was discussed in Chapter 2, of the four data units studied, only the Bureau of Educational Program Research and Statistics (BEPRAS) had the bulk of its data processing and reporting done by computer. Both the Programming Section of the Office of Educational Facilities Planning and the Analysis and Statistics Unit of the Office of School Safety process and maintain all of their data manually.

Both of these latter organizations are responsible for data of great importance to the management of the school system. The Programming Section; for example, annually collects the following information:

- Inventory and capacity of instructional classrooms, shops, and auxiliary facilities
- Number and grades of pupils enrolled in schools outside of their school zone
- Auxiliary organizations housed in public school buildings
- Pupil contribution of large-scale housing developments

These and other data are used by the Board in the development of the master plan for public school building construction and the annual space procurement program. In addition, they could be used for large-scale analyses of school

integration programs and pupil mobility. Such analyses, however, would require combining these data with other pupil and demographic information, most of which presently exist on computer files. A true management information capability cannot exist half-mechanized and half-manual. It is, therefore, necessary that all educational data of likely importance to management be computerized and integrated into the common data base.

DATA INVENTORY AND DISSEMINATION PROCEDURES ARE POOR

A data base characterized by inflexible reporting systems and lack of automation will undoubtably suffer from an inadequate data inventory and retrieval system. The Board's educational data base is no exception.

In all areas of records management, the four educational data units included in this study suffer from similar problems:

- Immediate requests for information can generally be satisfied only if the data, in terms of format and content, are contained in regular unit reports, printouts, or publications. All of the units are tied into their routine report formats; any non-routine requests must await time-consuming manual computations before being satisfied.
- Requests for historical data more than two or three years in age often face delays because of chaotic or inaccesible filing systems. Printouts are often left unbound and unlabeled in their shipping cartons. Source documents are often consigned to a watery fate in the basement due to a lack of proper storage space.
- Unit staff are not always familiar with the types of data available in their offices. Data documentation manuals and information libraries are non-existent and requests are often dependent upon the availability of a single individual who knows which pile of paper can satisfy the request.
- Much valuable intermediate data contained in tables and worksheets are either unobtainable due to poor filing or are unusable due to inadequate annotation and documentation.

- Common sense data summaries are often lacking. Data collected by school may not be summarized by district. Data summarized by district may not be totaled for the entire city. Again requests for summary data not routinely reported must await hand computation.

Data dissemination at the Board of Education is virtually nonexistent. With the exception of the small public relations booklet "Facts and Figures", the Board has not produced a comprehensive publication of educational statistics since the Annual Superintendent's Report was discontinued almost ten years ago. Those reports it does produce are often merely retyped versions of computer printouts, limited in both scope and interpretation.

An example of the decline in data dissemination is shown in Exhibit 3.3. The exhibit gives the four current BEPRAS reports and a sample of some of the now-discontinued reports the Bureau used to produce annually. While not all of the old reports were of equal quality or value, they did represent an attempt to interpret some of the massive data collected each year by the Bureau. The four current reports suffer by comparison. With the exception of the Language Survey Report, the reports are limited to data tables, some graphics, and a page or two of boilerplate - all of which could be generated directly from the computer. The language report contains ten pages of narrative and attempts to highlight historical trends in English language difficulties over a three-year period. The time and effort expended on these limited reports is not justified by their limited circulation and value to management.

In the data dissemination process, too much can be as bad as too little. For a number of years, the Programming Section of the Office of Educational Facilities Planning has published a multi-volume "Program Planning Data Book" for school planning communities and, most recently, for Community School Districts. The data books included information on pupil enrollments by grade, existing school capacities and utilization rates, detail matrices for three enrollment projection

EXHIBIT 2.3

BEPRAS PUBLICATIONS - THEN AND NOW

1. Current BEPRAS Publications (Annual)

   - "Day School Registers by Grade and School Group"
   - "Survey of Pupils who have difficulties with the English Language"
   - "Annual Census of School Population"
   - "Day School Register by School District"

2. Discontinued BEPRAS Publications (Annual)

   - "Teacher experience Index in Elementary and Junior High Schools"
   - "Survey of Teacher Absence Policy and Problems in large cities 500,000 and over in Population"
   - "An Analysis of Cessations of Teacher Service in the N.Y.C. Public Schools"
   - "Teacher turnover in the N.Y.C. Public Schools"
   - "Teachers' salaries in the N.Y.C. Public Schools"
   - "Trends in ethnic composition of Pupil Population in N.Y.C. Schools"

techniques, projected pupil contributions from new large-scale housing, and miscellaneous demographic data. The Data Books' value as a planning and information tool was undermined by a surfeit of methodological detail on projection techniques. This detail was unaccompanied by an explanatory document discussing the methodology used. It seemed particularly inappropriate for a planning document intended for a lay audience of professionals and public to include countless pages of numeral data (presumably in the name of full disclosure) and yet exclude any discussion of what the data signify and how the all-important summary enrollment projections were made.

As a result of these shortcomings, the "Program Planning Data Book" series was discontinued in 1973. Much of the data contained in the Data Books, however, are extremely valuable and should be disseminated in a more intelligible format in the future.

DATA BASE STANDARDS NEED IMPROVEMENT

Fragmented administrative control and inadequate computerization of the educational data base at the Board has created serious problems for the proper maintenance of data integrity and security. In a number of situations, standards and conventions governing data base integrity and security simply do not exist. Where such standards do exist, they are often enforced either informally or not at all.

The enforcement of data base standards, as with data base administration and structure, is a function encompassing all three phases of the data process-collection, processing, and dissemination. This study has found three aspects of the data standards function that need immediate improvement:

1. Data Quality Control Varies Greatly

Quality control of educational data involves the degree to which the sources of data are held responsible, the clarity of data element definitions, and the extent of edit checks built into the processing system. Because the data is defined and collected by four separate units, data quality control is variable.

In terms of holding the data sources -- usually school or district offices -- responsible for data accuracy, all four data units attempt to do a conscientious job. In this they are primarily hampered by personnel and time constraints, and an inability to conduct field audits. Of all the data elements collected, only the October 31 register and the period attendance reports are subject to an on-site audit. The register audit is conducted by the Office of Audit and Investigation, and the attendance checks are made by attendance officers and teachers assigned to the districts or the Central Bureau of Attendance. The auditing of all other data collected by the four data units is generally limited to telephone calls to the schools by unit staff to check on missing or obviously erroneous data.

In all instances, data audits are limited to quantitative factors -- numerical counts. Qualitative errors in categorization are only picked up if the qualitative error results in a quantitative error on comparison with previous data. For example, the annual language census conducted by BEPRAS asks each homeroom teacher to classify her pupils in eight language/ethnic categories for one of the three levels of English-speaking ability. The census requires the teacher to make two relatively subjective judgements about his or her pupils:

- In terms of ability to speak and understand English, what criteria differentiate pupils having a moderate difficulty with English from pupils having severe difficulty. The criteria provided on the classroom census worksheet allow for a good deal of subjective leeway on the teacher's part.

- In terms of pupils language group, what criteria differentiate categorizing a Greek-surnamed and -speaking child who has no difficulty with English (Category 3) as an English-speaking Category 3 pupil or as a Greek-speaking Category 3 pupil. One teacher would classify the pupil as English-speaking, another as Greek-speaking.

The existing audit procedures for this language census would only notice large discrepancies among total pupils in the various categories by comparing the census totals with the previous years' figures. If a teacher or school continued to erroneously categorize a particular type of pupil year after year, the error -- being consistent -- would never be questioned. The problem to be solved here is not so much an improvement in audit procedures as it is a rigorous redefinition and classification of categories requested on the data form.

For all computerized educational data reports, systems prepared by the Board's Bureau of Management Information and Data Processing (BMIDP) conform to N.Y.C. Data Processing Standards. BMIDP personnel meet with data clients during the development of a new system to ensure that certain edit procedures are built into the system. Unfortunately the BMIDP staff is dependent upon the client's knowledge of his own data and needs. Because there are many clients from many separate bureaus and offices, data edit standards will vary in both degree and quality. Systems staff alone can only ensure that the most basic edit checks on totals are made by the system. Of course, for those data reports that are prepared manually, even these most basic edit procedures cannot be guaranteed although, as stated above, all data units try their best.

2. Data Security Standards are Inadequate

Data security standards ensure that a particular data file or document will be maintained and available for use during a designated period of time. In the case of computer files, BMIDP has a standard procedure for retaining data tapes:

- When a system is first designated, the BMIDP systems analyst meets with the user bureau and prepares an EDP Standard Retention Form 10.50. This form indentifies the system, file ID number and retention period (one year, two years, indefinite) for each file produced.

- If a user bureau has a new requirement to hold tapes for longer periods than initially specified, they write a memo to BMIDP to modify the original 10.50 form and also modify BMIDP's Tape Library Control System.

The existing organizational fragmentation of the educational data units has led to a partial breakdown of the above system. Data units have no sense of the relative importance of their various files. As a result, while some tape files are scratched (erased) within a month of creation, most are retained for only a year or two. Valuable ethnic and language tapes are lost for further analysis and the necessary data must be recreated from printouts whose own existence, as was shown, is none too secure. The answer, proposed by some data bureaus, is not to retain these files for an indefinite period. BMIDP is currently saving over 5,000 reels of tape containing data on various applications. Every tape retained indefinitely should be recopied annually to refresh its magnetic impulses. This recopying would only add to BMIDP's workload. Rather, the answer is to establish a data retention hierarchy wherein certain key elements from several master files are saved on single annual summary tapes which are retained indefinitely. The master tapes themselves can be put on microfilm or microfiche before being scratched thereby eliminating the dependence upon printouts for historical detail data.

3. Data Collection Forms are Poorly Designed

One area of data base standards which lends itself to immediate correction is in the design of the data collection forms. Each year, the schools and districts are the unfortunate recipients of hundreds of data forms requesting information on every activity and process imaginable. There are dozens of forms for educational

data collection alone. Some of these forms are professionally printed in easy-to-work-with colors while others are mimeographed from typed copy. Some forms are boxed and coded for keypunching while most are not. The layout of header information on most forms is not consistent even for forms from the same data unit. Some forms have excellent instructions for completion while others leave much up to the imagination of the person completing the form. Inevitably, many forms ask for the same information. Inevitably, many forms asking for the same information are returned containing different figures.

This quantitative and qualitative multiplicity of data collection forms stems out of a lack of central control and expertise over the collection process. The only workable solution is the establishment of a forms control procedure wherein no bureau or office requiring educational data from the field would be allowed to send out its own form without prior authorization from the forms control unit. Ideally, if the data collection activities themselves were centralized, the delay caused by a forms contol review procedure could be largely eliminated since the central data collection agency would have the responsibility, and presumably the expertise, to develop its own forms.

* * * * * * * * *

This chapter concludes the investigation of the problems inherent in the Board's educational data process due to organizational fragmentation and an inadequate data base. The next chapter provides specific recommendations for an immediate restructuring of the educational data process to alleviate these problems.

4 - ACTION PLAN FOR CHANGE

This study has identified a number of serious problems in the Board's educational data process. Strengthening this data process, thereby enabling it to more effectively serve the information needs of the city school system, will require a number of major changes in the administration and structure of the educational data base. Such changes, to be effective, must impact not only on the procedures and systems used by the present data process units, but also on the units themselves - their internal structure and traditional relationships within the system.

Accordingly, the action plan consists of the following changes:

- Create a New Bureau of Educational Statistics
- Strengthen the Staff Organization
- Develop New Computer Systems
- Establish a Data Center
- Expand Field Data Audits
- Adopt a Two-Phase Reorganizaton Plan

CREATE A NEW BUREAU OF EDUCATIONAL STATISTICS

One major point regarding the Board's educational data process has clearly emerged from this study: almost all of the existing data process problems result from the lack of central responsibility for the operation of the process. No effort to strengthen or improve the mechanisms by which the Board collects, processes, or disseminates educational data will succeed unless there is prior formulation of data responsibilities and authority within the framework of a single agency. Top priority must therefore be given to the elimination of the existing data unit organizations and the restructuring of their staff and functions into a new Bureau of Educational Statistics.

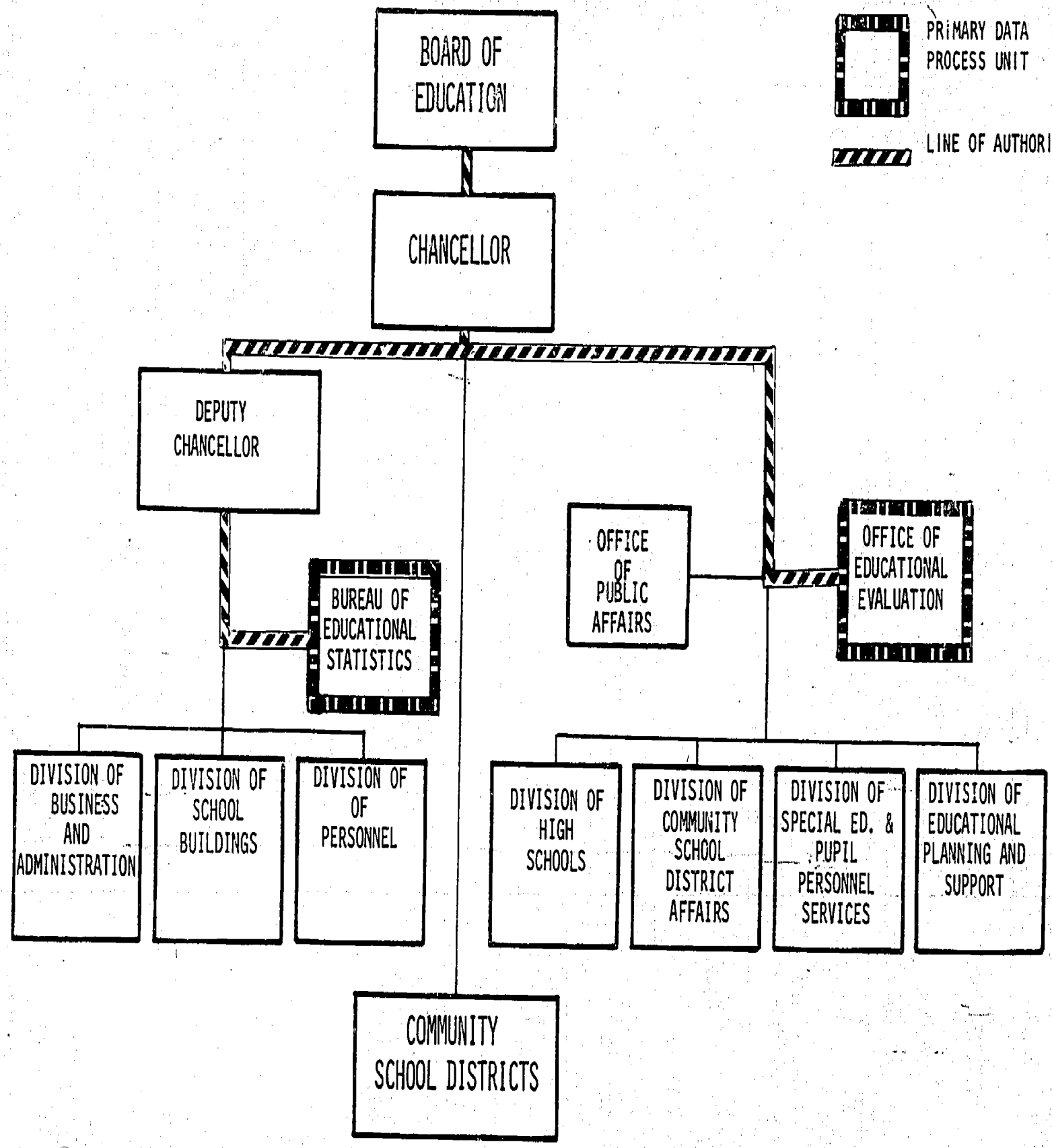
Exhibit 4.1 shows the proposed structure of the educational data process. Instead of the four existing data units reporting to various offices (see Exhibit 2.1 for comparison), the new Bureau of Educational Statistics (BES) will report directly to the Deputy Chancellor. This new reporting structure will establish the necessary communications link with management that was missing from the old organizational structure. If, in the future, a Division or Office of Information Systems is created within the Board of Education, BES should be organizationally reassigned to that new operation.

As shown in Exhibit 4.1, no change in the reporting structure or organization of the Office of Educational Evaluation (OEE) is being recommended at this time. In addition to its other functions, OEE is responsible for the administration of all pupil testing. This activity is completely computerized, and the only change required (securing copies of pupil test-score tapes for all grades, not just those processed by the Board) can be accomplished by a change in the contracts made with the test publishers. Also, the creation of the new Accountability Unit within the Office of the Chancellor will undoubtably create changes in OEE functions and staff. The ultimate place of OEE in the educational data process must await the announcement of these changes.

It is recommended that BES have the sole responsibility for the collection, processing (excluding, of course, actual machine processing), and dissemination of all educational data not involving pupil testing. This responsibility should extend not only to that data handled by the four existing data units, but also to data collected from the field by other Board offices and units. This responsibility should include a final review authority to ensure adequate forms design, proper coding standards and audit procedures, and to prevent the collection of duplicate data. Whenever possible, BES should serve as a data user clearinghouse, consolidating similar data requests by client offices to provide for maximum data utility. No Board unit requiring educational data should be able to send a collection

EXHIBIT 4.1

THE PROPOSED STRUCTURE OF THE EDUCATIONAL DATA PROCESS



IV–3

form to the field or specify a report system from the Bureau of Management Information and Data Processing (BMIDP) without prior review and approval by BES. This review and control procedure for BES is necessary if there is to be effective management of the educational data base.

STRENGTHEN THE STAFF ORGANIZATION

Assigning extensive authority to the Bureau of Educational Statistics will have little real effect on the management of the educational data base if the proper staff organization for the Bureau does not exist. This proper staff organization includes the restructuring of sub-bureau units along strictly functional lines and the creation of appropriate staff positions.

Exhibits 4.2 shows the proposed organization of the Bureau of Educational Statistics for the period from Janaury 1, 1975 through June 30, 1975 (Phase I of the reorganization plan). It is recommended that the new Bureau be organized into three units:

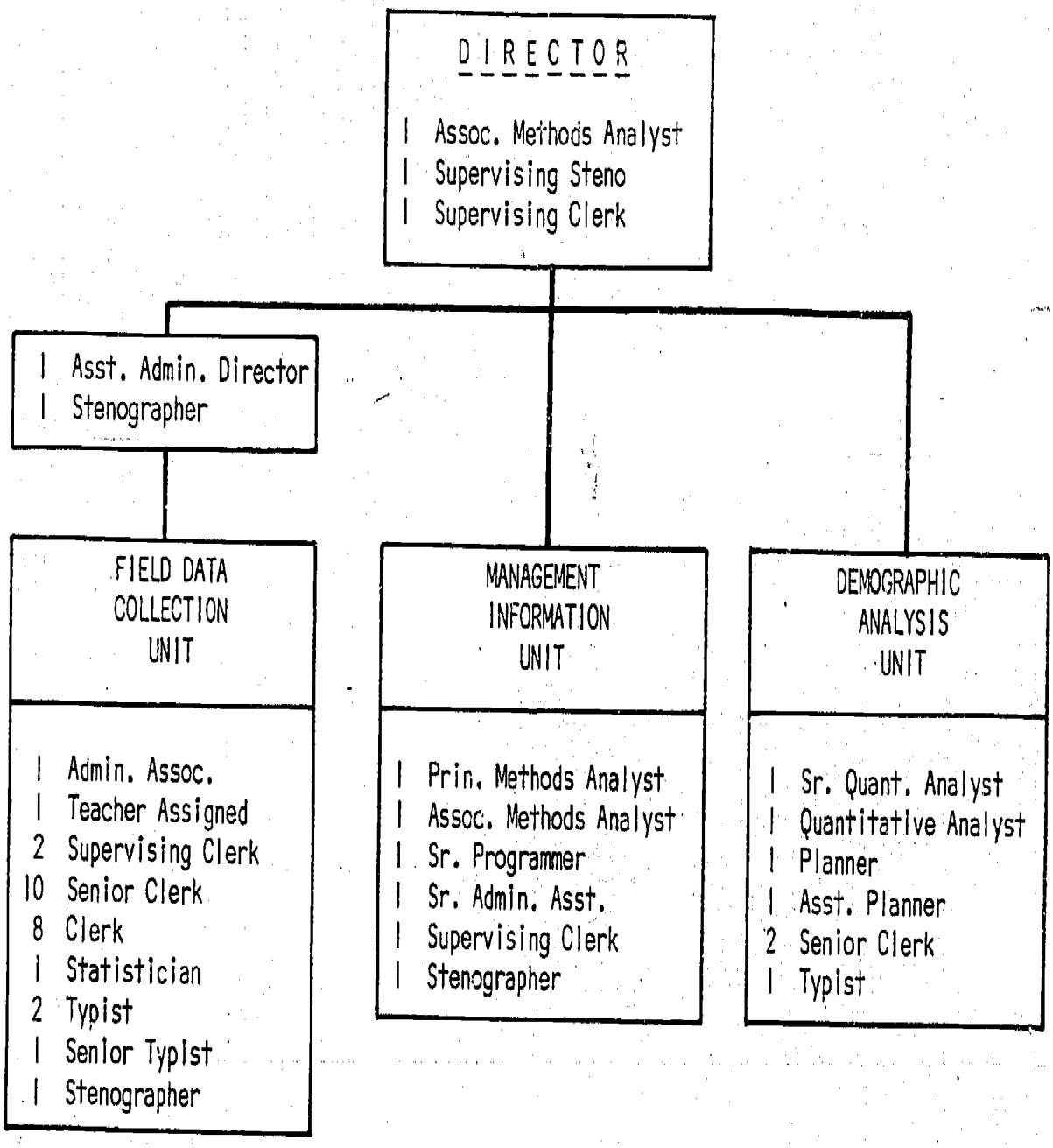
- Field Data Collection Unit
- Management Information Unit
- Demographic Analysis Unit

1. Field Data Collection Unit

Under the supervision of an Assistant Administrative Director, this unit will be responsible for the collection, processing and editing of all statistical data collected form the field. Along with the regular pupil-related data collected by BEPRAS' units, this unit will collect and process school facilities data, pupil admissions and discharge data, and school incident data. In addition, the unit will be responsible for conducting all special surveys mandated by Board of Education management of State and Federal agencies.

EXHIBIT 4.2

BUREAU OF EDUCATIONAL STATISTICS
PROPOSED ORGANIZATION - PHASE I



2. Management Information Unit

Under the supervision of a Principal Methods Analyst, this unit will be responsible for the development of new computerized reporting systems to replace both existing manual procedures and inadequate computer systems. The unit will have primary responsible for maintenance of the educational data base, installation and operation of microfilm equipment for data storage and retrieval, and dissemination of all statistical information requested by the Board or outside agencies.

3. Demographic Analysis Unit

Under the supervision of a Senior Quantitative Analyst, this unit will be responsible for the development of a computerized geographic data base for generating enrollment projections, facilities requirements, and demographic analyses at various geographic levels. This unit will also maintain a library of population and socioeconomic data files produced by City, State and Federal statistical agencies.

Because the proposed BES organization will require a range of new skills and expertise, certain changes in staffing will be necessary. It is recommended that the following new positions be created for BES:

1. Director of Educational Statistics

This administrative position will be responsible for the overall supervision of BES and will replace the two existing pedagogic director positions in BEPRAS and the Programming Section. Because the BES reorganization places very heavy emphasis on the development and operation of management information systems, it is recommended that the BES Director position be established as a Principal Quantitative Analyst line at the M-IV salary level in the Managerial Pay Plan. This action will ensure that future incumbents in the BES Director position will possess the necessary technical background for the position.

2. Associate Methods Analyst

This administrative position will be assigned to the BES Director and will be responsible for conducting work analysis and improvement studies of data process activities within BES and other Board offices. This position will also prepare and maintain a BES Procedures and Standards Manual of the Bureau's functions.

3. Senior Quantitative Analyst

This administrative position will supervise the BES Demographic Analysis Unit and will have primary responsibility for the development of the Geographic Data Base System and the preparation of various demographic analyses.

4. Quantitative Analyst

This administrative position will be assigned to the Demographic Analysis Unit and will be responsible for developing the Pupil Mobility Reporting System and for assisting the Unit Supervisor in analyzing demographic data.

In addition to these four new positions, it is recommended that four administrative positions (1 Principal Methods Analyst, 1 Associate Methods Analyst, 1 Senior Programmer, and 1 Supervising Stenographer) from the Project Management Unit be reassigned to the BES Management Information Unit through the duration of Phase 2 (June 30, 1976). This team will be responsible for the development of a number of new computerized reporting systems which should result in significant savings in processing time and labor costs for the new Bureau.

Because the emphasis within BES will be on information systems development, there will be little need for the three BEPRAS pedagogic research positions (1 Assistant Director and 2 School Research Associates) within the new Bureau. These positions should be transferred to other Board activities such as Educational Evaluation or the Accountability Project where their traditional research expertise could be more appropriately utilized.

DEVELOP NEW COMPUTER SYSTEMS

This study indentified a number of shortcomings in the existing systems and procedures used in processing educational data. Most of these shortcomings centered around manual data processing or limited and inflexible computer programs and files. Accordingly, it is recommended that the following new computer systems be developed during Phase 1 of the reorganization:

1. Annual School Census System

This system will replace the many existing overlapping manual and computer systems now used to collect pupil and school facility data for the annual October 31 School Census. This system will form the

basis of a comprehensive grade-within-school data base. Data will be collected on a single fan-fold data form coded for keytape, replacing a dozen printed and mimeographed forms now used to collect the data. This new form will eliminate the collection of duplicate data and should significantly ease the clerical burden imposed upon the schools and consequently eliminate many clerical errors. The new system will provide for exception and special summary reports in addition to the regular detail reports.

2. Geographic Data Base System

This system will provide for the collection and processing of demographic data down to the block level of detail. Through the use of the NYC Department of City Planning's Street Address Matching System (SAMS), data now collected by various agencies at the street address level can be summarized by school attendance zones, neighborhood boundaries and community district areas. Included among these data are Welfare files, N.Y. State Income Tax files, Resident Births and Deaths by ethnic group, Real Estate Assessed Valuations, Sanborn Housing files, and Pupil Admissions and Discharges. As all of these data are collected annually, they can provide very detailed and up-to-date inventories of demographic information to support such Board activities as school zoning, enrollment forecasting, redistricting, pupil busing and integration studies. The Geographic Data Base System will also produce a variety of computer-generated maps for informational and analytic needs.

3. Incident Reporting System

This time-share computer system will provide for the entry and processing of school incident data, replacing the existing manual system used by the Office of School Safety. The computerized Incident file created by this system can be accessed via remote terminal to generate a variety of incident reports and statistical analyses. In addition, monthly summaries of data by school from the incident file will be incorporated into the comprehensive grade-within-school data base to support more sophisticated, multivariate analyses of school incidents.

4. Pupil Mobility Reporting System

This system will generate detailed reports of pupil admissions and discharges down to the school level, replacing the present systems which provide only borough and district mobility summaries. A sample of the admission and discharge reports will have old and new pupil addresses keypunched to provide detailed mobility data for analysis by the Geographic Data Base System.

5. Professional Staff Reporting System

This system will provide flexible access to position and salary data contained on the regular (R710) and per-diem (DEI70) professional staff payrolls. Replacing an existing and inadequate system, the new system will provide staff salaries and step-distributions for any geographic or organizational level, salary schedule, or position title. The system will generate information necessary for analyzing personnel survival trends and for determining long-range costs of collective bargaining salary offers.

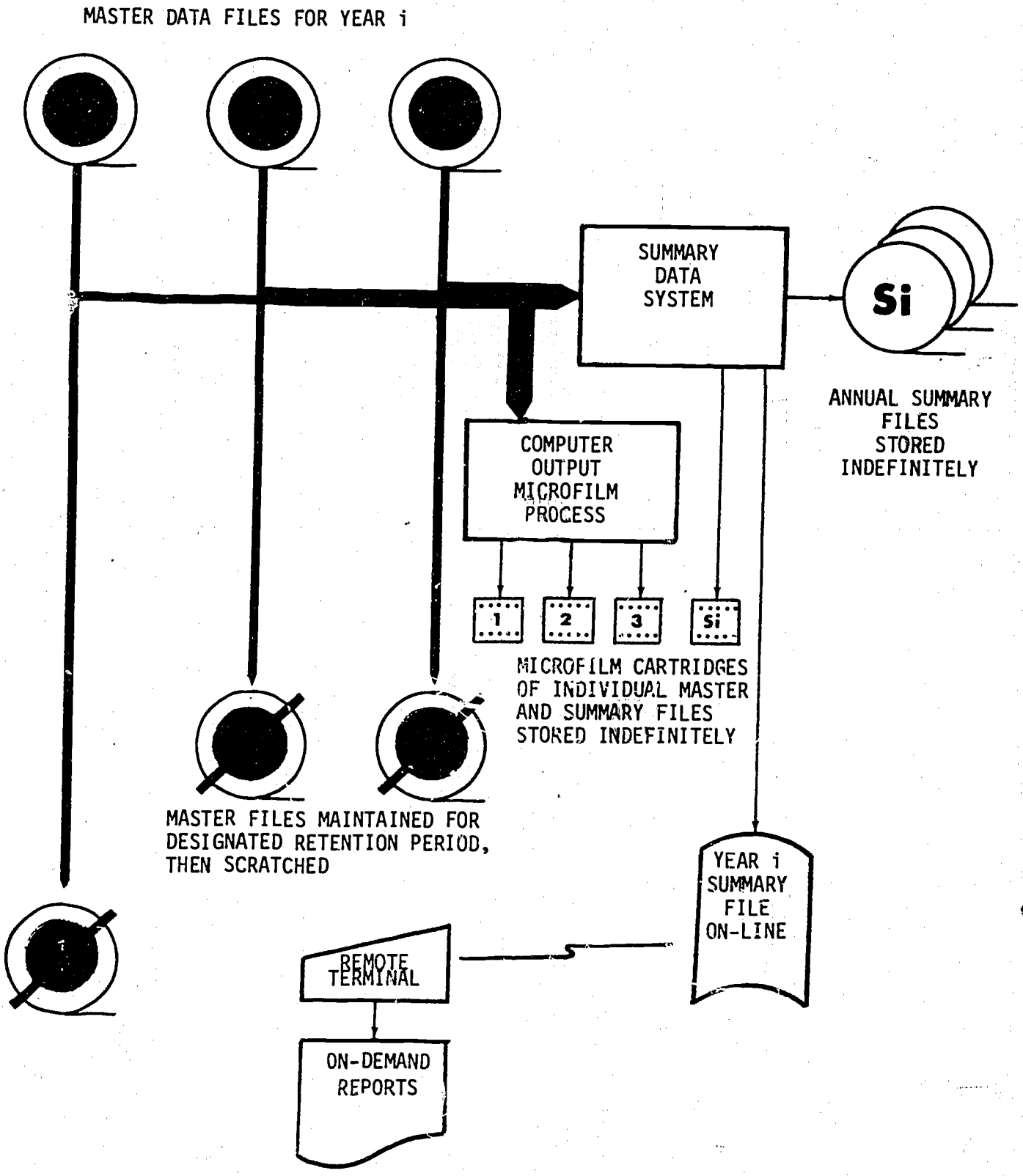
6. Preliminary Reports System

This time-share computer system will produce on-demand reports and analyses of "raw" or preliminary data such as pupil attendance or ethnic composition. Using a small and interactive data base report program, this system will replace many of the costly and time-consuming manual procedures now used regularly to produce preliminary or special data reports.

The development of these new computer systems will form a part of an overall improvement in the educational data storage and retrieval process. Exhibit 4.3 shows a schematic diagram of the proposed process to be initiated during Phase I of the BES reorganization. In the process, master data files of annual, monthly and daily data are created and maintained for designated retention periods based upon newly-established user requirements. Formatted print tapes for each of these files are sent out on a regular basis to a commercial Computer Output Microfilm (COM) company for conversion to microfilm for permanent storage. These tapes are also run through a Summary Data System on an annual basis to produce annual summary tapes for permanent storage. The most recent year summary data file is maintained on-line on a disk file to permit the generation of on-demand reports and analyses using a remote terminal.

Properly developed, the proposed data storage/retrieval process described above will be able to support most of the Board's data and analysis requirements through the balanced maintenance of tape, disk, and microfilm data files.

EXHIBIT 4.3
PROPOSED DATA STORAGE/RETRIEVAL PROCESS



ESTABLISH A
DATA CENTER

As was discussed in Chapter 3, this study found that data inventory and dissemination procedures at the Board are inadequate. Data tapes are prematurely scratched, surviving printouts are in daily peril, data tables and records are misfiled, and many data requests must await time-consuming manual computations before being satisfied.

Organizational and systems efforts to improve the educational data base will be largely wasted if the means by which this data can be stored, retrieved and disseminated are not developed. It is therefore recommended that a data center be created within the BES Management Information Unit. The data center will be the central repository for all of the Bureau's data files, reports and sources, as well as data from other Board offices and City, State and Federal sources. The center, in addition to handling all requests for data, will be responsible for the following activities:

1. Microfilm Existing Data Records

   The data center will lease a 16mm microfilm recorder (camera) to copy existing data printouts and records on microfilm cartridges. All cartridges will be sequentially indexed to permit rapid access of specific records. A priority schedule will be developed to determine the categories of data to be microfilmed, as well as the necessary level of detail and the number of historical years to be copied for each data category. The center will also lease a microfilm reader/printer for data retrieval by display screen or hardcopy. Data center staff will be trained to handle all aspects of the microfilm operation.

2. Recreate Historical Computer Files

   Data center staff will be assigned to code certain printout or tabular data onto keypunch forms for the creation of machine-readable files of those data. A review will be made to determine the types of data and historical years of interest to be created. Because of the clerical effort involved and the possibilities for transcription error, only those data (such as pupil ethnicity by school) necessary for computerized longitudinal analyses will be keypunched.

3. Supervise Production Of Data Reports

The data center will be responsible for the preparation and distribution of all BES data reports to clients within the NYC Public School System and from outside agencies. This will include all aspects in the production of the annual School Profiles Handbook which will serve as the Board's primary source of educational statistics. All data inquiries and publication sales will be processed through the data center.

EXPAND
FIELD DATA AUDITS

If data quality standards are to be maintained, it will be necessary to expand the number and extent of field data audits. As discussed in Chapter 3, only the October 31 Register and the period attendance reports are currently subject to an on-site audit. The auditing of all other educational data collected at the Board is generally limited to telephone calls to the schools by data unit staff to check on missing or obviously erroneous data.

It is recommended that a more comprehensive field data audit be made of BES-collected data. This is particularly true of school facilities data regarding the reported use of instructional rooms. Deliberate errors in these reported data can result in lower school capacities and restrict Board efforts to promote school integration. In most instances, field data audits should be conducted on a sample basis, stratified to cover more of those schools which have given inaccurate or inconsistent data in the past. Because educational data audits are primarily required only in the Fall, the field audit staff should not be assigned to BES. Such staff should be attached to a unit having responsibility for auditing a wide variety of data over the course of the entire school year.

ADOPT A TWO-PHASE
REORGANIZATION PLAN

The above recommendations for the restructuring of the educational data

process should be implemented over an eighteen month period consisting of two phases.

> Phase 1 - This phase will extend from January 1, 1975 through June 30, 1975. At the outset of this phase, the Bureau of Educational Program Research and Statistics (BEPRAS) and selected staff from the Office of Educational Facilities Planning's Programming Section and the Office of School Safety's Analysis and Statistics Unit will be incorporated into the new Bureau of Educational Statistics (BES). Work will begin on the development of the six new computer systems recommended above, and on microfilming educational data files. It is expected that three (Incident Reporting System, Professional Staff Reporting System, and Preliminary Reports System) of the six new systems will be operational by the end of Phase 1.
>
> Phase 2 - This phase will extend from July 1, 1975 through June 30, 1976. At the outset of this phase, Educational Facilities Planning's Programming Section and School Safety's Analysis and Statistics Unit, together with units of the Bureau of Attendance's Pupil Accounting Division will be merged into BES. In addition, Phase 2 will see the incorporation into BES of other data units not included in this initial study. As of this writing, likely candidates for merger include the Bureau of School Financial Aid's Survey Unit and certain functions of the Central Zoning Unit.

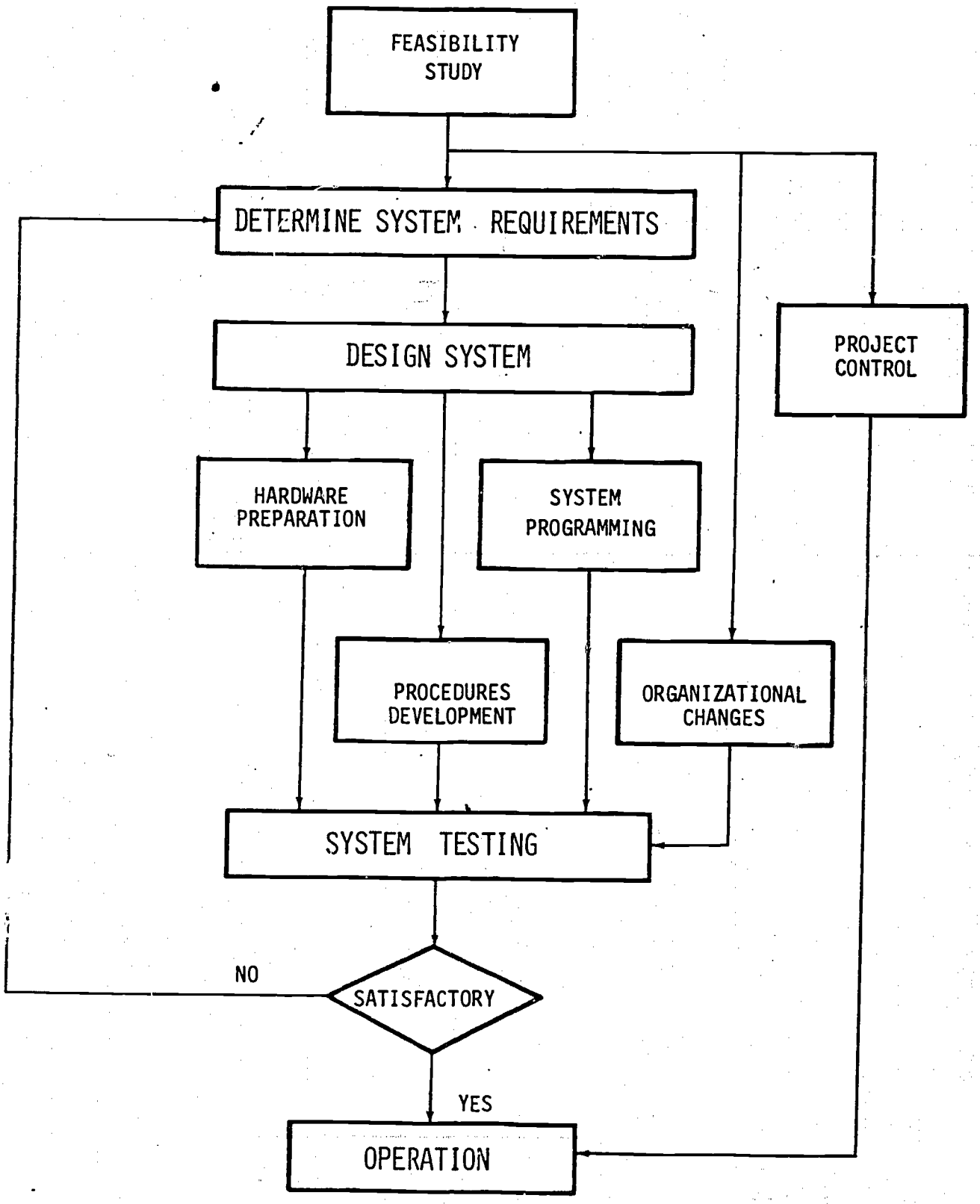
During Phase 2, the three remaining new computer systems (Annual School Census System, Geographic Data Base System, and Pupil Mobility Reporting System) will be completed and operational. Much of the ongoing Phase 2 effort will be directed toward implementing the proposed educational data storage and retrieval process shown in Exhibit 4.3, and conducting a series of community school district and neighborhood demographic studies of socioeconomic transition and pupil mobility. Systems studies will also be made by BES personnel of other data collection functions at the Board of Education for possible computerization.

Dividing the restructuring of the educational data process into phases will permit the prior mechanization of specific data functions before they are merged into BES. The actual restructuring process for each phase will consist of a number of interrelated steps. Exhibit 4.4 provides a flowchart of the systems

EXHIBIT 4.4

FLOWCHART OF SYSTEMS DEVELOPMENT AND REORGANIZATION PROCESS

PHASE 1 AND PHASE 2



development and reorganization process for Phases 1 and 2. The stages in the restructuring process are summarized below:

Feasibility Study

The first step in the restructuring process is the feasibility study. This is the identification of specific data process needs and an examination of possible alternative solutions given constraints of technology, resource availability, and organizational structure. The end product of the feasibility study is a detailed work plan containing project milestone charts, staff assignments, and resource requirements for each recommended task or activity in the upcoming phase.

Systems Requirements

Following the decision to implement a systems activity, the data requirement statement needs to be defined more precisely and completely than it was in the feasibility study. In this stage, the objectives, policies, and constraints of the user must be stated completely and in operational terms.

Systems Design

The data requirements statement is the basis on which a systems analyst creates and designs the system. The systems design is a set of detailed specifications for each component of the system. The main components are the following:

1. Hardware Preparation - The development of new data systems may involve the selection and installation of equipment such as computer terminals, special filing systems and microfilm hardware. This usually involves technical decisions made by specialists and consultants, but these decisions often co. management, inasmuch as equipment requires allocation of fund., staff training, and space availability.

2. Systems Programming - Once a system is designed, computer programs must be written to instruct the computer as to how to produce the desired reports. Systems programming must take into account the report needs and flexibilities of the data user, as well as the user's technical ability to use and support the system.

3. Procedures Development - Procedures provide information on how, why, and when a job is to be performed. Most systems have procedures which must be designed and tested carefully because they often determine both the effectiveness and efficiency of the system.

4. Organizational Changes - New data systems often require that jobs be performed differently and by different personnel. This may require structural changes in the organization, and may result in displacement and transfer. In addition, personnel using the new system must be trained and the administrators involved must be oriented as to the "how" and "why" of the new system.

Systems Testing

Once the data system is programmed, procedures developed, hardware prepared, and organizational changes implemented, the system is ready for testing. Depending upon the approach required, new systems could be tested in parallel to the old, or by using pilot data on a small scale. The test results are compared with the specifications stated in the Systems Requirements stage. If unsatisfactory, the system is modified or redeveloped. If satisfactory, the system is then ready for operation.

Project Control

The development of a new data system with a large number of interrelated activities is organized as a project. Its activities must be planned, scheduled, and controlled if it is to be completed within the desired time and within the resources allocated for the project. To accomplish this, project management techniques such as the Gannt chart, the Critical Path Method (CPM), or the Program Evaluation and Review Technique (PERT) are used.

In order to begin the Phase I reorganization and systems development on January 1, 1975 it is recommended that the Phase I Feasibility Study and Work Plan be completed by December 16, 1974. The Phase 2 Feasibility Study and Work Plan should be completed by May 1, 1975 so that the Phase 2 restructuring can begin on July 1, 1975.

APPENDIX A

WORK DISTRIBUTION ANALYSIS - PRIMARY DATA PROCESS UNITS

As part of the educational statistics study, work distribution analyses were conducted for each section of the four primary data process units. In essence, a work distribution analysis is a list of the major work activities done in a particular unit, how much time each employee spends on each activity, and what specific contribution he makes to that activity. The analysis helps to spotlight uneven work distribution, improper use of skills, misdirected effort, and activities requiring the most time, as well as whether or not assigned tasks are related, imbalanced, or spread too thinly.

In this analysis, each unit employee was requested to list on a form all of his specific tasks and give an estimate of the number of hours spent per week on each. Wherever possible, these tasks were grouped into unit activities. Thus the BEPRAS activity "Pupil Attendance Report" consists of such tasks as mailing forms, logging returned forms, checking data accuracy, telephoning schools for missing data, and reviewing computer edit listings.

Exhibits A.I through A.II show the summary work distribution analyses for each data process unit and its sections. Not apparent in the analysis displays is the high proportion of manual effort which makes up most data unit activities. This problem is discussed in detail in Chapter 2.

EXHIBIT A.1

WORK DISTRIBUTION ANALYSIS
BUREAU OF EDUCATIONAL PROGRAM RESEARCH AND STATISTICS

BUREAU ACTIVITIES	MAN HRS/WK	% OF TIME
Bureau Supervision	78	5
Inter-Agency Liaison	13	1
Administrative Research	14	1
Pupil Information Survey	51	4
Comparability Report	2	0
EEOC Survey	2	0
BEDS Survey	39	3
Comparative Statistical Studies	2	0
Pupil Attendance Report	238	18
Grade and Register Report	102	8
Language and Ethnic Report	120	9
Miscellaneous Reports	177	13
Teacher Absence Survey	72	5
Teacher Salary Reports	7	2
Internal Bureau Surveys	7	2
HEW Surveys	7	2
General Report Processing	91	7
Data Dissemination	31	2
Bureau Publications	14	1
Statistical Tabulation	29	2
Records Maintenance	13	1
Correspondence	25	2
Mail Handling	39	3
Personnel Records	40	3
Other Clerical	152	10
Bureau Total	1,365	100

EXHIBIT A.2

WORK DISTRIBUTION ANALYSIS
BUREAU OF EDUCATIONAL PROGRAM RESEARCH AND STATISTICS
PROGRAM RESEARCH UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	4	4
Comparative Statistical Studies	2	2
Language and Ethnic Report	5	5
Miscellaneous Reports	7	7
Teacher Absence Survey	72	68
Teacher Salary Report	7	7
Miscellaneous Clerical	8	8
Unit Total	105	100

EXHIBIT A.3

WORK DISTRIBUTION ANALYSIS
BUREAU OF EDUCATIONAL PROGRAM RESEARCH AND STATISTICS
ADMINISTRATIVE RESEARCH UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	4	2
Inter-Agency Liaison	2	1
Administrative Studies	14	8
Pupil Information Survey	51	30
Comparability Report	2	1
EEOC Survey	2	1
Language and Ethnic Survey	30	17
Internal Bureau Studies	7	4
HEW Surveys	7	4
Miscellaneous Studies	5	3
Mail Handling	4	2
Miscellaneous Clerical	47	27
Unit Total	175	100

EXHIBIT A.4

WORK DISTRIBUTION ANALYSIS
BUREAU OF EDUCATIONAL PROGRAM RESEARCH AND STATISTICS
FIELD DATA COLLECTION UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	32	4
Inter-Agency Liaison	9	1
Pupil Attendance Report	238	28
Grade and Register Report	102	12
Language and Ethnic Report	85	10
Miscellaneous Reports	170	20
General Report Processing	9[illegible]	11
Data Dissemination	4	1
BEDS Survey	39	5
Mail Handling	35	4
Miscellaneous Clerical	35	4
Unit Total	840	100

EXHIBIT A.5

WORK DISTRIBUTION ANALYSIS
BUREAU OF EDUCATIONAL PROGRAM RESEARCH AND STATISTICS
MANAGEMENT SUPPORT UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	3	2
Inter-Agency Liaison	2	1
Data Dissemination	27	15
Bureau Publications	14	8
Statistical Tabulations	24	14
Records Maintenance	3	2
Bureau Personnel Records	40	23
Miscellaneous Clerical	62	35
Unit Total	175	100

EXHIBIT A.6

WORK DISTRIBUTION ANALYSIS
PROGRAMMING SECTION - OFFICE OF EDUCATIONAL FACILITIES PLANNING

BUREAU ACTIVITIES	MAN HRS/WK	% OF TIME
Section Supervision	64	9
Inter-Agency Liaison	7	1
School Utilization Report	31	5
School Utilization Maps	12	2
School Capacity Analysis	23	4
School Utilization Analysis	8	1
Room Inventory Analysis	10	1
School Facility Analysis	10	1
Leased Facility Analysis	9	1
Annual Housing Analysis	62	8
Capital Budget Analysis	18	3
Pupil Transportation Analysis	13	2
Public School Enrollment Analysis	125	18
Non-public Enrollment Analysis	2	0
Census Data Analysis	19	3
Space Procurement Program	8	1
Annual Birth Data	12	2
Graphics	33	5
Miscellaneous Analysis	18	3
School Site Analysis	5	1
Records Maintenance	24	3
Correspondence	31	4
Miscellaneous Clerical	156	22
Section Total	700	100

EXHIBIT A.7

WORK DISTRIBUTION ANALYSIS
PROGRAMMING SECTION - OFFICE OF EDUCATIONAL FACILITIES PLANNING
SCHOOL UTILIZATION UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	5	4
Inter-Agency Liaison	3	2
School Utilization Report	18	13
School Utilization Maps	12	8
School Capacity Analysis	15	11
Room Inventory Analysis	10	7
School Facility Space Analysis	5	4
Leased Facility Space Analysis	3	2
Graphics	3	2
Miscellaneous Analysis	3	2
Records Maintenance	20	14
Miscellaneous Clerical	43	31
Unit Total	140	100

EXHIBIT A.8

WORK DISTRIBUTION ANALYSIS
PROGRAMMING SECTION - OFFICE OF EDUCATIONAL FACILITIES PLANNING
PROGRAM-PLANNING AND RESEARCH UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	21	6
Inter-Agency Liaison	2	1
School Utilization Report	21	6
School Capacity Analysis	8	2
School Facility Space Analysis	5	
Leased Facility Space Analysis	5	1
Annual Housing Analysis	2	1
Capital Budget Analysis	16	5
Pupil Transportation Analysis	4	1
Public School Enrollment Analysis	107	33
Non-public Enrollment Analysis	2	1
Census Data Analysis	19	5
Space Procurement Program	6	1
Annual Birth Data	12	3
Graphics	30	8
Miscellaneous Analysis	15	4
School Site Analysis	5	1
Miscellaneous Clerical	70	20
Unit Total	350	100

EXHIBIT A.9

WORK DISTRIBUTION ANALYSIS
PROGRAMMING SECTION - OFFICE OF EDUCATIONAL FACILITIES PLANNING
HOUSING RESEARCH UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Unit Supervision	3	2
Inter-Agency Liaison	2	1
Leased Facility Space Analysis	1	1
Annual Housing Analysis	60	44
Capital Budget Analysis	2	1
Pupil Transportation Analysis	9	6
Public School Enrollment Analysis	18	13
Space Procurement Program	2	1
Correspondence	8	6
Miscellaneous Clerical	35	25
Unit Total	140	100

EXHIBIT A.10

WORK DISTRIBUTION ANALYSIS
PLANNING SECTION - OFFICE OF SCHOOL SAFETY
ANALYSIS AND STATISTICAL UNIT

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Daily Log of Incidents	12	7
Monthly Incident Report	3	2
Special Reports	3	2
Liaison with Schools	15	9
Inter-Agency Liaison	2	1
Systems Design	15	9
Data Tabulation and Analysis	13	7
Forms Design	3	2
Records Maintenance	31	18
Miscellaneous Clerical	78	43
Unit Total	175	100

EXHIBIT A.11

WORK DISTRIBUTION ANALYSIS
PUPIL ACCOUNTING AND STATISTICAL DIVISION - BUREAU OF ATTENDANCE
STATISTICAL, AND CODING AND REPORTS UNITS

UNIT ACTIVITIES	MAN HRS/WK	% OF TIME
Supervision	33	11
Forms Coding and Checking	186	59
Records Maintenance	13	4
Telephone Data Checking	24	8
Mail Handling	20	6
Other Clerical	39	12
Unit Total	315	100