State Department of Education Information System

Program Evaluation Division
Office of the Legislative Auditor
State of Minnesota

Program Evaluation Division

The Program Evaluation Division was established by the Legislature in 1975 as a center for management and policy research within the Office of the Legislative Auditor. The division's mission, as set forth in statute, is to determine the degree to which activities and programs entered into or funded by the state are accomplishing their goals and objectives and utilizing resources efficiently. Reports published by the division describe state programs, analyze management problems, evaluate outcomes, and recommend alternative means of reaching program goals. A list of past reports appears at the end of this document.

Topics for study are approved by the Legislative Audit Commission (LAC), a 16-member bipartisan oversight committee. The division's reports, however, are solely the responsibility of the Legislative Auditor and his staff. Findings, conclusions, and recommendations do not necessarily reflect the views of the LAC or any of its members.

The Office of the Legislative Auditor also includes a Financial Audit Division, which is responsible for auditing state financial activities, and an Investigations Unit.

State Department of Education Information System

March 1982

PREFACE

In 1981, the Minnesota Legislature and the Legislative Audit Commission directed the Program Evaluation Division to evaluate the development of the State Department of Education Information System (SDE-IS). Legislators wanted to take stock of a complex and costly project which has been underway since 1975.

We believe this report will help legislators better understand important issues relating to administrative data processing systems in education. The report presents an analysis of the problems that now exist, as well as recommendations designed to improve data processing support and to reduce the reporting burden on school districts.

We thank the Department of Education for its full cooperation during the course of this study. Our report has benefitted from the thoughtful participation of the department's management and staff.

Arthur Young & Company assisted us in evaluating certain aspects of SDE-IS. This report was written by Allan Baumgarten and Elliot Long (Project Manager).

Gerald W. Christenson
Legislative Auditor

James R. Nobles
Deputy Legislative Auditor
for Program Evaluation

PROGRAM EVALUATION DIVISION

The Program Evaluation Division has been established to conduct studies at the direction of the Legislative Audit Commission (LAC). The division's general responsibility, as set forth in statute, is to determine the degree to which activities and programs entered into or funded by the state are accomplishing their goals and objectives and utilizing resources efficiently. A list of the division's studies appears at the end of this report.

The findings, conclusions, and recommendations in Program Evaluation Division reports are solely the product of the division's staff and not necessarily the position of the LAC. Upon completion, reports are sent to the LAC for review and are distributed to other interested legislators and legislative staff.

Currently the Legislative Audit Commission is comprised of the following members:

Senate	House
Donald Moe, Chair	Ann Wynia, Vice-Chair
Robert Ashbach	Lon Heinitz, Secretary
John Bernhagen	John Clawson
Jack Davies	William Dean
Frank Knoll	Shirley Hokanson
Steven Lindgren	Joel Jacobs
Robert Tennessen	Randy Kelly
Gerald Willet	Tony Onnen

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

EXECUTIVE SUMMARY

The State Department of Education Information System (SDE-IS), is part of an ambitious plan to meet the data processing needs of school districts and the State Department of Education (SDE). SDE-IS includes all data processing systems that serve the administrative functions of the department and provide management information to decision makers in the department and legislature.

The department began to develop SDE-IS in 1975. It spent more than $1.4 million on development of the system and now spends more than $1 million each year on system development, modification and operation. It was expected that SDE-IS would make comprehensive information on education readily available to legislators and other policy makers, and would result in a simplified and coordinated flow of information from school districts to the State Department of Education.

The Legislature directed the Program Evaluation Division to evaluate SDE-IS and report on its current status. The study reported here examines the following questions:

- What is the current status of SDE-IS? What has been accomplished at what cost, and what remains to be done?
- Is the system technically adequate in light of its purposes? Is it flexible and adequately documented?
- How effectively has the department managed the development of SDE-IS? How well has it used consultants, regular staff, and other resources?

A. CURRENT STATUS

Today, SDE-IS is a collection of more than 30 data processing systems that support SDE's administrative functions. Various components of SDE-IS:

- Calculate levy limitations and seven different school aids;
- Analyze and report the financial condition of school districts;
- Project future student enrollment; and
- Calculate statistics relating to federal and state equal opportunity requirements.

SDE-IS also allows users to obtain information that is not included in scheduled reports and to simulate the effects of proposed changes in law and policy.

Thus, the department has achieved tangible and useful results. Furthermore, SDE-IS users are generally satisfied with the data processing support provided by the Department of Education's Data Systems Section (EDSS). However,

- SDE has not achieved other important goals which it set for SDE-IS, and which it promised when it sought and obtained legislative authorization and funding.

1. DATA MANAGEMENT

The Department of Education has offered SDE-IS as a means to relieve the reporting burden on school districts. School districts would not have to complete manual forms. Instead, SDE's information needs would be met by using information that is a by-product of the districts' data processing systems, which were developed at the same time. (The computer systems serving school districts are known as the Elementary, Secondary, and Vocational Management Information System, or ESV-IS.)

However, we found:

- SDE has made only limited progress in reducing the reporting burden on school districts.

While some forms were consolidated or eliminated, SDE has not imposed adequate controls over data collection within the department. Furthermore,

- SDE never performed an essential step, the definition of the information requested from school districts and used in SDE-IS.

- SDE never completed a dictionary listing all SDE-IS data elements, even though the legislature mandated it twice. More than $400,000 was spent on these efforts, but no useful product resulted.

As a result:

- The contemporary need and use of the information provided by districts are not carefully reviewed in order to separate what is nice to know from what is required. Thus, the reporting burden on school districts is larger than it needs to be. Different sections within SDE request the same or nearly the same information, so there is over-lap or redundancy in reporting.

While it is feasible to simplify data collection and reduce the reporting burden on districts, we do not believe the goal of automatic transfer of information between ESV-IS and SDE-IS can be achieved on a widespread basis. First,

- Much of the information required by SDE for its operations is not a natural by-product of local administrative data processing systems, nor is it needed at the local level for purposes other than meeting state reporting requirements. Furthermore,

- ESV-IS and SDE-IS were not developed using standard data elements with standard names. This delayed--perhaps forever--the time when a link between the systems will be established and the flow of paper between districts and the department will be reduced.

To date, the only completed link between ESV-IS and SDE-IS involves the direct transfer of annual financial reports. (Some districts are able to use the computer to produce their annual student count report.) This required a legislative mandate to employ a uniform financial accounting system in all districts. However, there is no mandate requiring sections of the department to use that information. Parallel financial reporting systems are still used within the department for computation of special education and vocational education aids.

Another important goal of SDE-IS was to establish integrated data bases of information about public education in Minnesota. Data base oriented systems are intended to reduce redundancy in data collection and storage, to make programming modifications less complex, and to improve user access to data. In our review of the technical design of the system, we concluded:

- SDE-IS has few of the capabilities of a genuine data base system.

Because of the way that data are stored, some of the most important features of the data base management software are not used. We did not find a higher level of data sharing or coordination among files beyond that which would be expected in a collection of computer files in a similar organization.

We conclude that a significant one-time effort to develop a data element dictionary and the establishment of a permanent SDE data management function are required. Otherwise, the integrated data base approach of SDE-IS will never bear fruit.

2. DOCUMENTATION

A basic level of computer system documentation includes written documentation of each system, production job, and program. Basic documentation is necessary to support maintenance and modification of computer systems and to train staff to work on the systems.

We found:

- SDE-IS documentation does not meet minimal standards and is inadequate for support, maintenance, and enhancement of the systems.

- The absence of basic documentation leaves SDE dangerously exposed and dependent on the consultants who developed SDE-IS.

There is only a one paragraph description of each program. There are no program comments, which makes it difficult to quickly grasp and modify programs. Similarly, there is no documentation for each system and production job, and no schedule for completing this basic documentation. User manuals were produced for only two of 30 systems.

3. FUTURE NEEDS

In authorizing this study, the Legislature asked us to review the extent to which SDE-IS meets SDE's reporting requirements and the cost and effort required to complete development of the system.

We found:

- The scope of SDE-IS was not adequately specified for planning purposes. The department has not performed the analysis of data processing needs and other design phases that should have preceded development. The fact that this still remains to be done six years after the start of the project is one of the principal failures of SDE-IS.

- As a result, it is impossible to realistically estimate the cost of completing the system.

Because SDE-IS is synonymous with "administrative data processing for the Department of Education," the cost of completing the system is therefore the cost of developing data processing support for the department.

A ball park estimate of what the system will cost is possible. Little new development is currently underway, and more than 80 percent of the SDE-IS budget now goes for modification and operation of the systems.

- The systems are not stable and require a great deal of costly maintenance and modification.

Unusally high maintenance costs are largely the result of inadequate analysis and planning but also reflect frequent changes in statutes governing educational finance.

- Because of the lack of systems design, maintenance of the current system will consume most of EDSS's resources in future years.

We conclude that the present staff complement and level of effort will be needed to continue operation and modification of the system.

SDE needs to pay more attention to its future hardware needs. In the past year, heavy use of SDE-IS's on-line capabilities resulted in saturation of the central processors and degraded service during peak shifts. Since the current master contract for computer hardware will expire within 18 months, it is important that SDE plan for its hardware needs. However,

- SDE has no system hardware plan, nor does it have much of the information needed to project its future hardware needs.

Our report describes the steps SDE should take in planning for its hardware needs and in making efficient use of its current hardware configuration.

B. MANAGEMENT REVIEW

We reviewed the management of SDE-IS development and examined:

- The effectiveness of the systems development methodology used by SDE, including the adequacy of managerial controls;
- The use of consultants; and,
- The adequacy of staffing resources and the appropriateness of the staffing pattern.

1. SYSTEMS DEVELOPMENT METHODOLOGY

In our view, meeting the challenges to successful systems development requires a formal systems development methodology that includes an analysis of data processing needs, separation of development into logical phases, and the careful use of project budgets and timetables. Signoffs by management and technical leaders are required at the end of each phase, and an appropriate level of documentation should be produced during each phase. By law, the department should use a systems development methodology approved by the Commissioner of Administration. Instead, we found:

- SDE has not used any formal development methodology in a consistent manner.

In the past, SDE developed or improved computer systems starting with the program design phase. Only the briefest attention was given to the logically prior phases of needs analysis and general systems design. The department has not divided development into phases, has not required signoffs, and has done little to budget or schedule projects.

When we began our study, we wanted to know how much was spent to develop SDE-IS. We soon learned that:

- SDE paid scant attention to accounting for the costs of developing, improving, and operating SDE-IS.

SDE was unable to provide any useful allocations of its overall budget to specific applications or to provide costs among development, improvement, and production activities. This problem is partly due to SDE's failure to organize its work by projects and to budget and schedule each project. Since EDSS does not adequately track the cost of its activities, it cannot report these costs to its users.

2. USE OF CONSULTANTS AND CONTRACTORS

Data processing consultants and contractors developed most of the systems that comprise SDE-IS and played an important role in improving and operating the systems. However, SDE did a poor job of managing the work of these contractors. Specifically,

- The department negotiated contracts which did not specify tasks to be performed, deliverables, and performance standards in adequate detail.

Instead, the contracts were agreements to buy hours of expertise in order to progress toward goals described in very general terms. The contracts did not specify applications to be developed or modified, or how much time and money should be devoted to tasks. Furthermore,

- SDE delegated too much management authority to consultants.

The department relied on consultants to manage SDE-IS since 1977, and to make basic decisions about projects, design, and staff. Finally,

- SDE relies heavily on its consultants and has no realistic plan for becoming independent.

A large amount of unique knowledge about design and operation of the systems is possessed by consultants and has not been transferred to SDE staff. Recent efforts to provide state staff with exposure to the operation of the systems and the work of the consultants are not aggressive enough to have a major impact.

3. SDE-IS STAFFING

We reviewed the staffing of SDE-IS and conducted an inventory of skills and of activities that staff members perform. We found several problems with SDE-IS staffing. First,

- EDSS analysts and programmers are not effectively deployed.

The six EDSS analysts spend relatively little time designing systems, managing projects, or supervising the work of programmers. Even though programming skills are a scarce resource, the four staff programmers spend less than one-half of their time actually writing programs.

- In both cases, EDSS staff members spend much of their time setting up operations runs and assisting users.

Contractors perform most of the development programming, and they are generally more productive and more knowledgeable about Burroughs systems and about systems in general. Most of the EDSS analysts are not technically qualified to perform their traditional duties of designing systems and directing programmers. Even if EDSS analysts spent more time on their traditional duties,

- The ratio of programmers to analysts in EDSS is wrong.

One systems analyst should be able to keep three to six programmers busy. In EDSS, the analysts outnumber the programmers. This staffing arrangement impedes the section's ability to get its work done.

C. RECOMMENDATIONS AND POLICY ISSUES

Our report includes many recommendations for strengthening SDE-IS and for correcting its technical and managerial problems. Our major recommendations include:

- SDE should assign staff to complete basic documentation of the systems, particularly at the system and job level.

- User manuals should be completed for each SDE-IS application.

- Consultant contracts should require documentation which meets EDSS standards as a deliverable which must be completed before signoff.

- A department-wide data administration function should be established and located in EDSS. The data base administrator should receive all requests for data and attempt to fill those requests using data from existing files.

- Using an appropriate, commercially available, data dictionary package, SDE should build a basic data element dictionary which catalogues and defines each data element in the SDE-IS applications.

- SDE should use an appropriate systems development methodology for all new development and modifications. Needs analysis and systems design should be part of that methodology.

- EDSS should organize its work and assign its staff around projects and not around systems. These projects should be based on approved user requests, and priorities should be assigned to each project.

- Once projects have been identified and work begun, EDSS should track all costs associated with each project, including staff time, computer time, and contractors.

- The costs of developing and operating systems should be reported to all users, including the legislature.

- Furthermore, EDSS should consider billing all users for the costs of data processing. Users would then have to budget these costs and would be encouraged to review requests and operations more closely.

- EDSS should attempt to staff appropriately to attain self-sufficiency in maintaining the existing systems. This will require increasing the number of staff who actually write programs, increased training, and development of staff members capable of managing projects.

1. ALTERNATIVE STRATEGIES

We believe that these improvements are needed. We also believe the department needs to make some fundamental decisions about the future of SDE-IS. We propose two alternatives:

- Alternative I endorses the current systems architecture and calls for strengthening documentation and staff skills.

- Alternative II would halt new development pending analysis of information needs and completion of a master plan for future development.

There are advantages and disadvantages to both alternatives. Nevertheless, we favor Alternative II as a means of achieving the objectives the department and Legislature have established for SDE-IS.

2. GOVERNANCE

The problems reported in this study are partly due to the failure of department management to oversee and control SDE-IS. EDSS, by default, has made managerial decisions that a support unit should not make. Governance of SDE-IS should be the responsibility of the top management of the department, not EDSS. The ESV Computer Council should play a role in reviewing all plans and requests for software because it can offer a unique perspective on regional and district concerns and can help to coordinate development of SDE-IS and ESV-IS.

INTRODUCTION

In 1975, the State Department of Education (SDE) began an ambitious project to develop computer systems. These systems are known as the State Department of Education Information System, or SDE-IS. They are intended to support the department's administrative data processing needs and to provide management information to decision makers in the department and the Legislature.

In the 1981 session, the Legislature directed the Office of the Legislative Auditor to evaluate SDE-IS.[1] In response, we conducted a comprehensive evaluation of the department's efforts to develop and operate computer systems. Our study focused on the department's accomplishments and the work remaining for the future. We engaged Arthur Young & Company to assist us in evaluating certain technical aspects of SDE-IS.

Chapter I of this report presents background information abou the history, staffing, and finances of SDE-IS. Chapter II discusses the extent to which the department has achieved its goals, user satisfaction, and work remaining for the future. In Chapter III, we report on technical aspects of SDE-IS, including systems design, data management, documentation, and efforts to develop a data element dictionary. Chapter IV presents our analysis of how well the department has managed SDE-IS, particularly its performance of needs analysis and planning, its use of systems development methodologies and consultants, and the adequacy of SDE's own staff resources. Finally, Chapter V presents a discussion of policy alternatives for the future development and governance of SDE-IS. Arthur Young & Company's findings and recommendations have been incorporated throughout this report.

---

[1] Laws 1981, Chapter 359, Section 6, Subdivision 6(g). The rider is reprinted in an appendix to this report.

I. THE STATE DEPARTMENT OF EDUCATION INFORMATION SYSTEM: HISTORY, ORGANIZATION, AND FINANCES

Since the late 1960's, Minnesota has been a national leader in the use of computers by educational agencies and school districts for classroom instruction and administrative data processing. During this time, the State Department of Education (SDE) played an important role in these efforts by developing computerized systems to support its administrative functions and to provide information for management.

The department's computer systems are collectively known as the State Department of Education Information System, or SDE-IS. This chapter describes the history of educational data processing in Minnesota, reviews the organization and staffing of data processing in the Department of Education, and analyzes the cost of SDE-IS development and operation.

A. HISTORICAL BACKGROUND

1. MECC AND THE REGIONS

The history of educational data processing in Minnesota is usually traced to 1967, when individual institutions of higher education and large school districts began to use computers to support their operations. The first regional computing network was established in 1967, when 19 school districts in the Twin Cities metropolitan area created the Minnesota School District Data Processing Joint Board, known as TIES--Total Information Educational Systems. Other regional networks followed, providing both instructional and administrative data processing support for their subscribers.

Planning for a statewide network for educational computing began in 1970, with publication of Information Systems in the State of Minnesota--1970-1980. This report recommended that the computing needs of the state's institutions of higher education should be met through cooperative planning and sharing of computers. The report did not address the needs of local school districts, and so task forces were created which reviewed those needs. A series of studies and reports resulted in creation of the Minnesota Educational Computing Consortium (MECC) in 1973. The members of this joint powers agency were the University of Minnesota, the state college system, the junior college system, the Department of Education, and the Department of Administration.

MECC developed a statewide timesharing network for instructional computing and developed and distributed instructional materials for computer use. To support the administrative data processing needs of school districts, MECC helped to establish seven

computing regions and began developing software in the areas of financial accounting, personnel/payroll, and student support. The software was known as the Elementary, Secondary, and Vocational Management Information System, or ESV-IS.

Financial accounting systems received top priority. In 1973, the legislature directed the Department of Education to prepare a plan for implementing a uniform financial accounting and reporting system for use by school districts. The plan was published in 1974, and called for a computer-based, multi-dimensional, accounting system to be operated at regional processing centers. In 1976, the Legislature mandated that school districts adopt the proposed Uniform Financial Accounting and Reporting System (UFARS) by 1977 and process their accounting and reporting on a computer-based system located at the regions, or elsewhere.

By 1979, seven regions had been established, five of which operated computer installations (see Figure 1). The ESV software had been developed, and each subsystem was operating in at least one region.

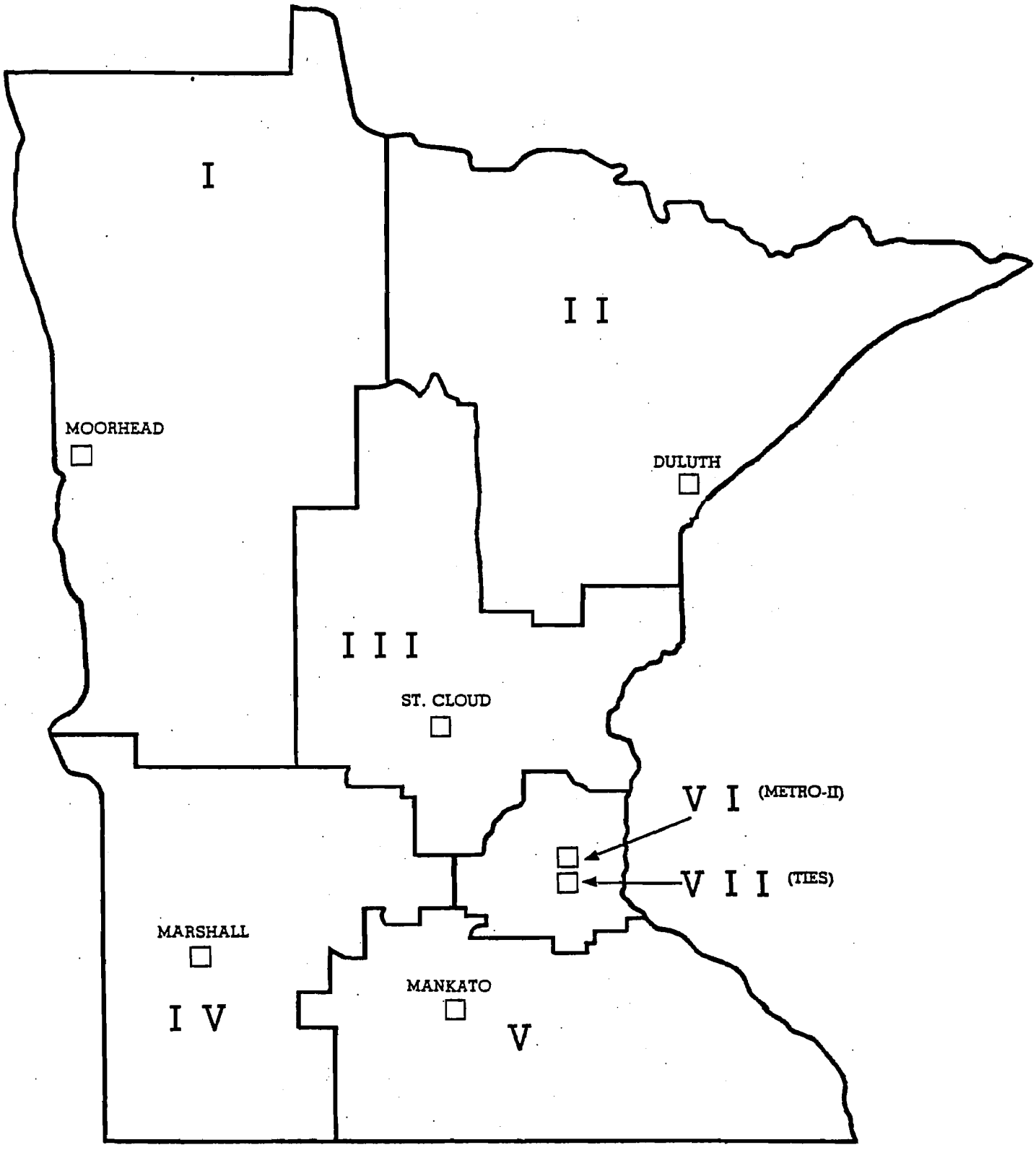
In order to make instructional computing and administrative data processing available throughout the state, and to encourage their use, the state appropriated large sums of money to develop the systems software, to establish the regional centers, and to subsidize the costs of local district participation. For example, about $11 million was appropriated to finance these activities in the 1979-1981 biennium. At the same time, however, the legislature was concerned about the efficiency and effectiveness of the statewide network and requested a comprehensive review of the development of the statewide systems.

Peat, Marwick, Mitchell & Co. was engaged to conduct the study. It found problems with the organization and governance of the systems, and found that the software developed would not serve the needs of school districts of different sizes. Based on the consultant's report, the legislature created the ESV Computer Council to advise and assist the State Board of Education in the development of a systems architecture and long range plan, the development of applications software for ESV-IS and SDE-IS, and in reviewing and approving the budget and plans of the regional centers. The Legislature also created two advisory task forces to recommend policies for the reporting of personnel/payroll and student data and to develop standards for the data.

Due to appropriations recissions, the ESV Computer Council was not appointed and operating until the end of 1980. By November 1981, the Council had published drafts of the systems architecture plan and was working on the long range plan. The two advisory task forces submitted broad policy statements in November 1981, and began work on specific data standards.

FIGURE 1

ESV REGIONS



□ Regional Service Center Site

Source: Minnesota Educational Computing Consortium

2. DEPARTMENT OF EDUCATION DATA PROCESSING

During the late 1960s, two major studies reviewed the information needs of the Department of Education, and how those needs could be supported by computers. The systems proposed in these studies were never developed. The department's first major computer system--teacher licensing--was implemented in 1967, and operated at the Department of Administration's Information Services Bureau (ISB).[1] Other systems to support the department's administrative functions were also developed at ISB.

As MECC planned the development of software to support school districts' operations and to enable them to convert to UFARS, the department wanted its own computer system to capture the information produced by the ESV systems. That data would be more timely and of higher quality than the data previously available to the department.

The original concept of the SDE-IS was that most of the information needed by the department to support its functions and to report to the legislature and federal government would be a by-product of the daily operations of districts. The data would be extracted from ESV-IS and would be transferred directly from the regional processing centers to the State Department of Education. Once loaded into the SDE statewide data base, the information could be shared by different users in the department and serve multiple purposes, thus eliminating often redundant and burdensome data collection activities. One early report suggested that, "When the final SDE-MIS is operational, practically no forms will be sent out to the school people in the fall when they are trying to get the schools running."[2]

Toward those goals, a team of systems analysts from MECC, ISB, and SDE was assembled in 1975 and began a traditional approach to computer systems development. The analysts contacted users in the department and elsewhere and reviewed the department's forms to see what information was collected from districts and how that information was used.

In 1976, the original development team was succeeded by a data processing consultant who was then under contract with MECC. He began experimenting with loading data bases on the MECC Burroughs 6700 computer. The data bases were created from data files used in existing applications, such as the school district statistical profile report. Once the data bases were loaded, he was able to use inquiry software to produce ad hoc reports.

---

[1] Known as the Information Systems Division (ISD) before 1979.

[2] Implementation Plan for State Department of Education Management Information System Development -- Executive Summary (July 1975), p.2.

The experimental use of data bases set the pattern for the development that followed. In early 1977, the consultant loaded files from the teacher certification system and began producing reports. This was seen as a useful experiment in the development and use of data bases and as a way of demonstrating the potential of the system to users in the department and the legislature.

During the 1977 legislative session, the department requested and received an appropriation of $341,000 for development of SDE-IS during the 1977-79 biennium. The consultant thought that development would take about two more years and that implementation and pilot testing would require another year. The system would be ready in 1980, the scheduled time for all school districts to be using ESV-IS.

During the second half of 1977, computer programs to calculate levy limitations for each school district were developed. The consultant redesigned the data base, changing it from the original hierarchical ("tree") design to a flat structure in order "to provide more efficient processing capabilities." Additional data bases were loaded; they included information about pupils and levy limit calculations.

In the next three years, 1978-1980, work continued in these areas: developing new applications on the Burroughs machine to support department functions and loading the necessary data in the data bases; converting applications and data files that had been operating at ISB to operate on the Burroughs machine; and maintenance and improvement of existing applications, particularly the levy calculation which underwent major changes each year.

In 1979, the department shifted operations from the MECC computer to Burroughs machines at the Metro II regional computing center in Saint Paul. However, some systems and data entry remain at ISB, and the department frequently uses the University Computer Center for research and administrative applications. ISB is not involved in SDE-IS design and development.

The department continued to rely on contract personnel for SDE-IS design and development, as well as much of the associated maintenance. In 1981, the department used a competitive proposal process for the first time to engage contractors to work on the SDE-IS. The incumbent consultant was rehired for two additional years.

Until 1980, the department collected almost all school district data on manual forms. In 1981, virtually all school districts were finally using the ESV-IS accounting subsystem, and SDE installed the software at the regional centers needed to extract summary data from the districts' data bases and to transfer the data on magnetic tape to the department. The department produced the first series of financial condition reports based on ESV-IS data in January 1982.

B. EDSS STAFFING AND ORGANIZATION

The Education Data Systems Section is located in the School Management Services Division of the department. The section's authorized complement grew from seven positions in 1975 to 23 positions in the 1979-81 biennium. However, three vacant positions were cut from the section in its 1981-83 biennial appropriation.[1] Table 1 shows the changes in the EDSS complement since 1975 and a breakdown by job classification and funding source.

EDSS has three major responsibilities. Figure 2 is an organizational chart of the section which shows the number of people assigned to each activity. EDSS's primary[2] responsibility is SDE-IS development, maintenance, and production. Ten systems analysts and programmers work under a systems supervisor and are responsible for supporting the SDE-IS applications and providing liaison to specific users of the systems. Additional support is provided by Information Systems Support, Inc. (ISSI), under contract with EDSS to provide analysis, programming, and project management services. ISSI has been primarily responsible for development and operation of SDE-IS since 1976, though EDSS personnel are gradually assuming more responsibilities.

While EDSS is the central source of data processing expertise in the department, it has not been chartered to provide data processing services to the entire department. Many users are able to

---

[1] Due to recent budget reductions, two currently vacant positions will not be filled. An additional position may be cut in FY 83.

[2] We have followed the definitions used by the Departments of Finance and Administration in data processing budgeting:

- "Development includes all costs associated with the creation of a previously nonrecurring information system or replacement of currently existing information system." This includes the conversion and transfer of existing applications from ISB to SDE-IS and the design and implementation of report-writing software.

- "Production includes ongoing costs associated with storing, maintaining and arranging data." This includes the rearrangement of data files or programming changes needed to maintain the capabilities of existing applications, and the use of currently existing report-writing software.

- "Improvement includes all costs associated with the creation/modification of a subsystem of an information system." This generally includes significantly expanding the capabilities of existing applications.

TABLE 1

EDUCATION DATA SYSTEMS SECTION STAFF COMPLEMENT: 1975-1983[a]

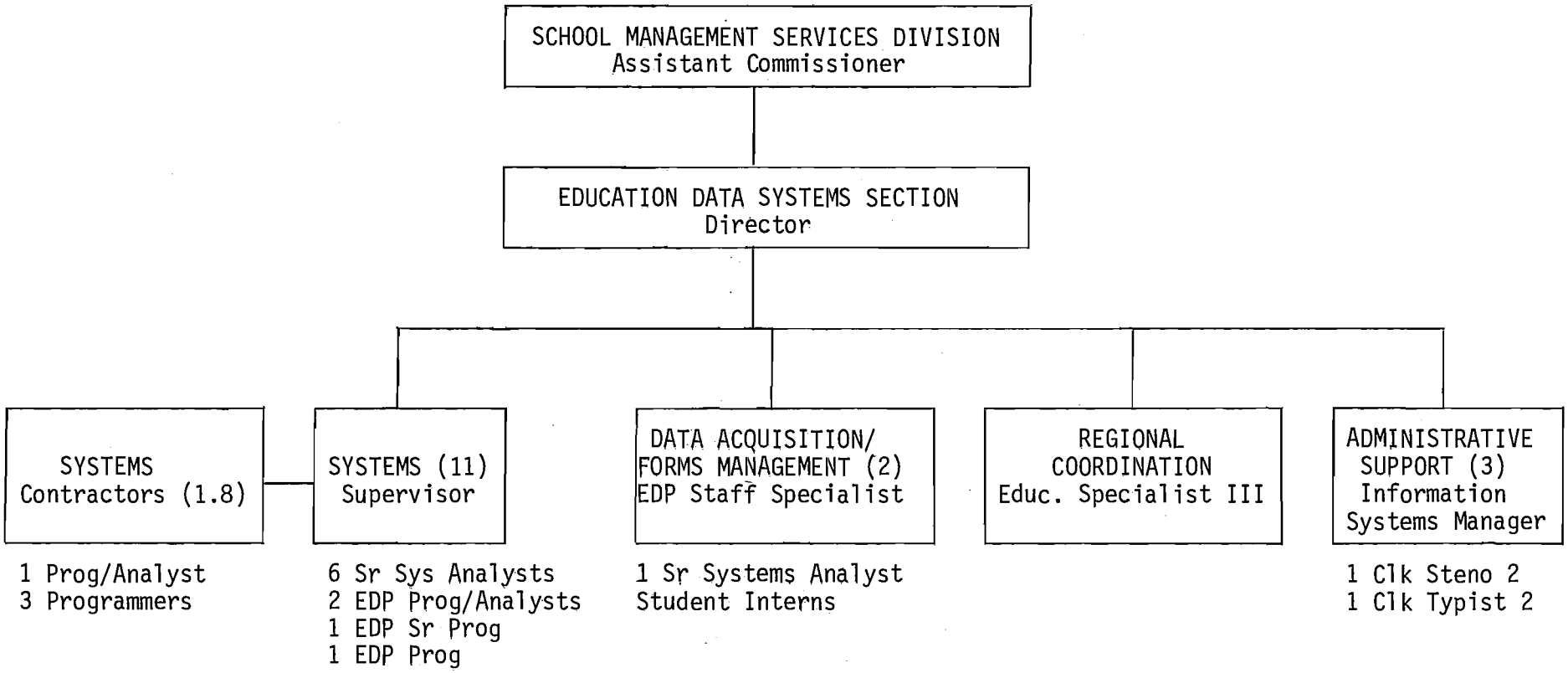
Year	Total	Classification		Funding Source	
		Professional	Clerical	State	Federal
FY 75	7	5	2	1	6
FY 76	9	6	3	2	7
FY 77	10	7	3	2	8
FY 78	12	9	3	4	8
FY 79	12	9	3	4	8
FY 80	23	20	3	16	7
FY 81	23	20	3	16	7
FY 82[b]	20	17	3	15	5
FY 83[b]	20	17	3	15	5

[a]Source: Department of Education Fiscal Services, EDSS

[b]Data before January 1982 budget reductions.

FIGURE 2

EDUCATION DATA SYSTEMS SECTION ORGANIZATION CHART



write specifications for production systems or to write programs for analytical research applications. A few major systems, such as teacher licensing, run with virtually no EDSS involvement.

One EDSS staff member is responsible for coordination of the seven ESV regions. His work includes reviewing the regions' budgets and plans and assisting in hardware procurement. In the past, EDSS staff members were called upon to work closely with newly-established regions whose staff and operations had not yet stabilized.

EDSS is also responsible for the development and maintenance of a data element dictionary and for management of the forms used by the department. Each fall, as required by statute, EDSS issues a Data Acquisition Calendar which tells school districts what forms they will be expected to complete during the year, when the forms are due, and who the responsible SDE contact is. Staff help operating units to design forms and to make them more effective, but EDSS has no control over the content of forms or over what information is requested. Several times the department has considered--but never implemented--proposals that would establish department-wide authority over data collection and require review and approval of proposals for data collection. In Chapter III, we will report our review of the department's efforts to develop a data element dictionary and to manage the flow of data between SDE and school districts.

C. FINANCES

1. EDSS BUDGET

The Department of Education is a major user of data processing services. In FY 81, it spent more than $1 million on data processing and ranked seventh among executive branch agencies in data processing expenditures.[1] Among executive branch agencies, only the Departments of Administration and Economic Security employ more data processing professionals than SDE. In addition to internal data processing expenditures, about $5 million passes through the department each year and is spent on data processing and telecommunications by the ESV regions and MECC.

The Education Data Systems Section (EDSS) is funded from two major sources. As shown in Table 2, about 87 percent of its budget during the 1981-83 biennium comes from the state General Fund. The federal government provides the rest, mostly under Title IV-C of the Elementary and Secondary Education Act of 1965 (ESEA). Additional federal funding is provided to EDSS under the Common Core Data (CCD) program, which supports reporting by state education agencies to the National Center for Educational Statistics.

---

[1]This includes only Line 17 expenditures--data processing and systems services. Agency personnel costs are not included.

TABLE 2

EDUCATION DATA SYSTEMS SECTION BUDGET: 1975-1983[a]

	Funding Source			
Year	State (%)	Federal (%)	TOTAL	Personnel Budget
FY 75	$ 53,306 (23.3%)	$ 175,811 (76.7%)	$ 229,117	$ 122,582
FY 76	141,053 (43.2%)	185,427 (56.8%)	326,480	156,806
FY 77	257,924 (57.2%)	193,200 (42.8%)	451,124	181,200
FY 78	393,600 (70.6%)	164,300 (29.4%)	557,900	291,200
FY 79	744,900 (79.7%)	189,700 (20.3%)	934,600	297,500
FY 80	790,500 (81.6%)	177,700 (18.4%)	968,200	320,500
FY 81	1,036,200 (82.7%)	217,400 (17.3%)	1,253,600	595,600
FY 82[b] (Approp.)	1,009,000 (86.9%)	152,100 (13.1%)	1,161,100	545,500
FY 83[b] (Approp.)	1,041,700 (87.3%)	152,100 (12.7%)	1,193,800	545,500
TOTAL	$5,468,183	$1,607,738	$7,075,921	$3,056,388

[a]Sources: Biennial budgets, EDSS files.

[b]Budget for 1981-83 biennium before January 1982 budget reductions.

Development of specific applications, such as the Minnesota Civil Rights Information System (MINCRIS), was financed partly by federal data capacity building grants. Federal funding once accounted for three quarters of the section's budget, but has not increased in recent years, while state funding has grown.

After substantial growth during the 1970's, the annual EDSS budget leveled off at about $1.2 million. EDSS estimates that, in FY 81, about two-thirds of that amount was spent on SDE-IS development, improvement, and production. (These costs are discussed below in more detail.) The remainder was spent on coordination of the seven ESV regions, development of the data element dictionary, and management of forms.

2. SDE-IS COSTS

We wanted to identify the costs of developing, improving, and operating SDE-IS, since development began in FY 76. We did not attempt to perform a financial audit, but rather to compile meaningful descriptive information.

Our task was made difficult by the limited amount of useful data that the Department of Education was able to provide.[1] The numbers that are reported below are based on the best information we were able to collect from project documents, interviews with SDE staff and contractors, Statewide Accounting System (SWA) files, budget documents, and SDE written responses to specific questions.

a. SDE-IS Development

We based our estimates of SDE-IS development costs on five factors:[2]

- Contractors: As noted above, contractors played a major role in developing and operating SDE-IS. They also performed SDE-IS work for sections besides EDSS.
- ISB Development: Some of the applications that comprise SDE-IS were originally developed and operated at ISB, and were later converted to the Burroughs machines.
- EDSS: We attributed portions of the staff and overhead budgets of the section to development of SDE-IS.

---

[1] Chapter IV of this study reports our analysis of how well the department has managed the development and operation of SDE-IS.

[2] We were guided by standards developed by the U.S. General Accounting Office. See GAO, Guidelines for Accounting for Automatic Data Processing Costs, Federal Government Accounting Pamphlet Number 4, 1978.

- MECC: We attributed certain hardware and analysis costs to SDE-IS development that do not appear in the EDSS operational budget.

- Other Projects: The system which pays special education aids was developed outside of EDSS, although it is now considered an SDE-IS application.

These numbers are department-wide, and include more than the EDSS budget. Where we could not find precise figures, we made conservative estimates based on the best information available to us.

While staff in other sections of the Department of Education played a major role in development and operation of SDE-IS, we were unable to develop useful information about the costs of their participation. Such costs, therefore, are not included in our calculations. Also, we have not included any costs reflecting the involvement of department management particularly the former Deputy Commissioner for Management and the Assistant Commissioner for School Management Services.

Table 3 summarizes our calculations of SDE-IS development costs. We identified costs of more than $1.4 million between FY 76 and FY 81. Development expenditures peaked in FY 79 and have declined since then. This reflects a shift in activity and spending from new development to operation and improvement of existing applications. However, some major applications have been identified for future development or transfer from other sites, so development expenditures will probably continue for several years. We discuss the future costs of SDE-IS in Chapter II of this report. Note that ISB development charges were once substantial, but declined to zero, as EDSS has taken over that activity.

b. Non-Development Activities

Table 4 summarizes our estimates of department-wide costs for four other activities associated with SDE-IS: production, improvement, data element dictionary/forms management, and regional coordination. In some cases, we were unable to produce reliable estimates of the costs involved and left those cells blank.

The table shows a dramatic increase in the costs of operating and improving the department's computer systems in the last two years. These costs exceeded $800,000 in FY 81. This growth is partly because of increased expenditures for use of hardware. Prior to FY 80, SDE used the MECC computer, which was financed by a special appropriation to MECC. Since then, the department and MECC contracted for services with the Metro II regional computing center in Saint Paul. SDE paid $266,081 in FY 80 and $336,248 in FY 81 for those services.

Expenditures for the data element dictionary/forms management activity are listed here as non-development costs. However, documentation of the source and use of data elements is an essential

TABLE 3

SDE-IS DEVELOPMENT COSTS: 1976-1981

Year	Contractors[a]	ISB Development[b]	EDSS[c]	MECC[d]	Other Projects[e]	TOTAL
FY 76	$ --	$110,312	$ 36,222	$22,000	$ --	$ 168,534
FY 77	14,613	180,095	45,100	--	--	239,808
FY 78	66,624	12,302	84,166	18,000	--	181,092
FY 79	107,081	894	147,416	18,000	47,900	321,291
FY 80	104,155	--	172,706	--	6,000	282,861
FY 81	79,897	--	140,854	--	7,500	228,251
TOTALS	$372,370	$303,603	$626,464	$58,000	$61,400	$1,421,837

[a]Source: Consultant contracts and SWA vendor file, adjusted to correct for shifts across fiscal years. In FY 79, FY 80, and FY 81, contractors' fees were attributed separately to SDE-IS development, production, and improvement. Total contractor payments were $142,775 in FY 79, $160,239 in FY 80, and $145,269 in FY 81.

[b]Sources: EDSS; SWA BEE reports. Note that distribution of ISB costs between development and production is not very reliable for any agency. Note also that EDSS disagrees with inclusion of ISB charges in calculating SDE-IS development costs.

[c]EDSS costs for FY 76-79 were calculated by reducing the section budget by specifically identified costs (such as contractor payments and ISB charges), attributing a portion of the section complement to SDE-IS development and applying that factor to the adjusted budget. In FY 76 and FY 77, one FTE was attributed to development; in FY 78 and FY 79, 2.5 FTE were attributed.

EDSS costs for FY 80 and FY 81 were calculated by reducing the section budget by specifically identified costs and applying percentages of spending, as supplied by EDSS. In FY 80, EDSS estimated that 56 percent of the budget was devoted to SDE-IS activity, 35 percent of which was for development. In FY 81, EDSS estimated that 66 percent of the budget was for SDE-IS, of which 20 percent was for development.

[d]In FY 76, a MECC analyst worked full-time on an analysis of SDE's information needs. Based on project memos, we attributed ten percent of the annual lease and maintenance charges for the Burroughs 6700 computer at MECC to SDE-IS development in FY 78 and FY 79.

[e]The Special Education Aids system was developed by the Special Education section, using computers at the University of Minnesota.

TABLE 4

SDE-IS NON-DEVELOPMENT COSTS

Year	Production[a]	Improvement[b]	Forms Management/ Data Element Dictionary[c]	Regional Coordination[d]
FY 76	$149,263	$ --	$ --	$ --
FY 77	192,143	--	--	--
FY 78	109,146	--	84,166	--
FY 79	133,470	--	147,391	--
FY 80	391,188	137,532	158,608	229,101
FY 81	530,613	279,905	192,073	170,732

[a]For FY 76-79, production costs were calculated by adding machine charges from ISB, UCC and MECC. The ISB charges are for systems associated with SDE-IS, and not for SWA or personnel/payroll computing. However, some UCC charges are for ad hoc research not directly tied to SDE-IS.

Production costs for FY 80 and FY 81 were calculated by reducing the EDSS budget by specifically identified costs, and applying percentages of spending (as supplied by EDSS) to the adjusted total. In FY 80, EDSS estimated that 56 percent of the budget was devoted to SDE-IS, 45 percent of which was production. In FY 81, EDSS estimated that 66 percent of the budget was for SDE-IS, 45 percent of which was production. To these figures, we added identified ISB and UCC charges and a portion of contractors' fees.

[b]EDSS estimated that improvement costs were 20 percent of SDE-IS activity in FY 80, and 35 percent in FY 81. These percentages were applied to the total EDSS budget, as adjusted, and a portion of the contractors' fees was added.

[c]Based on project memos, we attributed 2.5 FTE of the EDSS complement to the data element dictionary in FY 78 and FY 79. EDSS estimated that this activity was 18 percent of the total budget in both FY 80 and FY 81. These percentages were applied to the adjusted annual budget.

[d]EDSS estimated that regional coordination comprised 26 percent of the budget in FY 80 and 16 percent of the budget in FY 81. These percentages were applied to the adjusted annual budget.

part of computer systems development, and the costs of that work could be appropriately attributed to SDE-IS development. We estimate that more than $400,000 was spent in the last four years to develop the data element dictionary, or about 60 percent of total expenditures for the data element dictionary/forms management activity.

Costs for regional coordination have declined since FY 80 and should continue to decline this year. Only one staff member is now involved in this activity on a full time basis.

II. CURRENT STATUS AND FUTURE PLANS

The Department of Education has worked on SDE-IS since 1975. We wanted to know what progress has been made so far, and what work remains to be completed. Our review focused on these questions:

- What is the current status of the SDE-IS systems? How closely do the systems correspond to original plans and concepts?
- Are users of SDE-IS satisfied with the systems? How do they rate the support provided by EDSS?
- What work remains for the future? What resources, including hardware, will be needed?

A. CURRENT STATUS OF SDE-IS

When work began on SDE-IS in 1975, the Department of Education had an annual data processing budget of about $360,000 (Line 17 only). It operated about 13 small and medium sized computer systems at the Department of Administration's Information Services Bureau (ISB), and had a data processing section staff of nine.

SDE's use of computers increased substantially in the last six years. The department now runs about 26 systems at Metro II (including many originally developed at ISB) as well as four at ISB and one at the University Computing Center (UCC).[1] Its annual data processing budget exceeds $1 million, and EDSS more than doubled in size.

1. CAPABILITIES OF SYSTEMS

What does SDE-IS look like in 1982? It is a collection of more than 30 different computer systems which support SDE's administrative functions. Computer systems:

- report on and analyze the financial condition of school districts;
- calculate levy limitations and seven different school aids;

---

[1] We say "about 26" because we saw several different and inconsistent listings of systems.

- tabulate current school enrollments and project school population for the next five years;

- calculate and report whether school districts are meeting federal and state equal opportunity requirements; and

- issue and renew the licenses of teachers throughout the state.

Figure 3 summarizes the status of the different systems which comprise SDE-IS.

SDE-IS also provides SDE with the capacity to answer questions about the financial condition or staffing of school districts, or to analyze the effect of proposed changes in law and policy. The department is often able to respond by using generalized report writing software and the same data files that support its administrative systems. Some of this software was available through Burroughs and other vendors, and the rest was developed specially for SDE-IS.

EDSS and other users have on-line access to most of the data files and can readily update files or request reports. Some users enter their data on-line, without the need for EDSS assistance, while others continue to rely on data entry clerks at ISB.

SDE-IS data files are organized into three large groups.[1] The groups are:

- SDEDB: Contains data files from several major systems, including levies, annual financial report, and student count, as well as basic information about each school district.

- TESTSDEDB: Contains data files from several systems still considered to be in testing stage, including SDE-FIN, MINCRIS, and Assessment. Files are moved to SDEDB when systems are out of testing.

- LICDB: First and largest group of data files. Contains files from teacher licensure and assignment systems. The files are transferred each year from ISB, where these systems are still running.

Several smaller groups of data files also exist, including one for enrollment projections and one for migrant students. (The files for the migrant student system were archived in 1981 because the system is not used.)

---

[1] SDE calls these groups of data files "data bases." See our discussion in Chapter III.

FIGURE 3

STATE DEPARTMENT OF EDUCATION INFORMATION SYSTEM: STATUS OF APPLICATIONS

ADMINISTRATIVE APPLICATIONS	First Implemented Year/Site	Converted to Burroughs? Year	Major Rewrites Year(s)	Status/Comment
FINANCIAL				
1. Levies	1977/MECC	--	1978-81	Major rewrites each year. Missed deadline past three years.
2. Annual Financial Report	1975/ISB	1979	--	To be replaced by SDE-FIN. Historic data retained.
3. SDE-FIN	1981/Metro II	--	--	First reports due in January 1982.
4. Foundation Aid	1977/ISB	1980	1980	
5. Transportation Aid	1979/Metro II	--	1980	1980 formula change required major rewrite.
6. Community Service Aid	1978/MECC	--	1981	
7. Abatement Aid	1979/Metro II	--	1980	
8. Aid Recission	1980/Metro II	--	--	
9. Post Secondary Vocational Instructional Aid	1980/Metro II	--	--	
10. Post Secondary Vocational Program Budget	1977/ISB	1980	--	
11. Secondary Vocational Program Budget	1981/Metro II	--	--	
12. Special Education Aid	1979/UCC/ISB	--	1980	
13. Financial Statistics	1979/MECC	--		
14. Child Nutrition	1975/ISB	--	--	Still at ISB.
PERSONNEL				
15. Teacher Licensing	1967/ISB	--	1972	Still at ISB, though conversion frequently proposed.
16. Teacher Assignment	1967/ISB	--	1972	Still at ISB, though conversion frequently proposed.
17. Reports: Licensed Staff Summary	1977/MECC	--	--	
18. Reports: Instructional Area Staff	1980/Metro II	--	--	
19. Reports: Vocational Staff	1979/MECC	--	--	
STUDENT				
20. Student Data Collection	1979/Metro II	--	1981	
21. Annual Fall Report	1975/ISB	--	--	
22. EI Enrollment Projection	1978/ISB	1980	--	
23. ADM Enrollment Projection	1979/ISB	1980	--	
24. School Census	1975/ISB	1980	--	
25. Profiles	1973/ISB	1978	1978	

Figure 3 (continued)

	First Implemented Year/Site	Converted to Burroughs? Year	Major Rewrites Year(s)	Status/Comment
STUDENT				
26. Assessment	1981/Metro II	--	--	
27. Post Secondary Vocational Quarterly Enrollment	1979/Metro II	--	--	
28. Special Education Child Count	1980/Metro II	--	--	
29. MINCRIS (Minnesota Civil Rights Information System)	1980/Metro II	--	--	First year of data was very poor.
30. Migrant Student	1979/Metro II	--	--	Not used--data archived.
31. Indian Scholarship	1980/Metro II	--	--	Never fully implemented.
32. Post Secondary Vocational Follow Up	1979/Metro II	--	--	Not actually part of SDE-IS. Developed, operated by contractor.
FACILITIES				
33. ORGUNIT (Organizational Unit)	/ISB	1980	--	
GENERALIZED INQUIRY, REPORT WRITING, AND SIMULATION SOFTWARE				
SDE DEVELOPED				
1. VISION/Mapping	1981/Metro II	--	--	
2. Trends	1978/MECC		--	
OTHER VENDOR				
3. SPSS (Statistical Package for the Social Sciences)	1981/Metro II	--	--	More often used at UCC.
4. SFEMS (School Financial Equivalents Management System)	1979/UCC	--	--	
OTHER SUPPORT SOFTWARE				
SDE DEVELOPED				
1. DEEP (Data Entry & Edit Program)	/Metro II	--	--	
2. Documentation	1981/Metro II	--	--	
3. CRUM (Computer Resource Usage Management)	1981/Metro II	--	--	
4. MEDID (Minnesota Educational Data Information Directory)	1977/MECC	--	--	
5. DADS (Data Acquistion and Documentation System)	1981/Metro II	--	--	

SDE has amassed a great deal of data since 1977. According to SDE, about 150 million characters of data were in the files in December 1977. By 1981, the volume had grown four-fold and exceeded 600 million characters.[1]

2. ACHIEVEMENT OF ORIGINAL GOALS

EDSS and its contractors have accomplished quite a bit since 1976. Government and industry are filled with examples of projects that were funded more lavishly than SDE-IS and have less to show for the investment.

However, SDE-IS is far from achieving its original mission and design. Figure 4 compares the early concepts and assumptions of SDE-IS with their current status. Recent activities drifted from the original goal of accumulating an integrated data base of information to the current emphasis on writing programs to respond to information requests using data that have already been collected. EDSS spends so much time responding to requests for ad hoc reports or improvements in existing systems that almost no time remains for developing new systems. Only one new system was developed in FY 81, and no new systems are planned for development in FY 82.

One of the central goals of SDE-IS was to meet SDE's information needs by summarizing the operational data of districts using ESV-IS and directly transferring that data to SDE by computer tape or other medium. This direct transfer of data would replace much of the often redundant data collection activities of SDE divisions. Furthermore, SDE-IS was promoted as a tool for reducing the reporting burden placed on local school districts.

We found:

- Only limited progress was made in this area.

The most important step was the replacement of the annual financial report by the SDE-FIN system in 1981. Until 1981, each district had to prepare the lengthy report. SDE installed software at the regional centers which produces the report on magnetic tape, which is then loaded at Metro II. But this accomplishment required a legislative mandate to use a uniform financial accounting system in all districts.

However, there is no mandate requiring sections of the department to use financial data that will be available through SDE-FIN. Furthermore, two divisions (Vocational Education and Special and Compensatory Education) told us that SDE-FIN does not provide the data they need from local districts. Therefore, they plan to continue to collect separate financial data from school districts.

---

[1] Over 500 million bytes of data storage is used by the files; combined with the programs, working storage, and audit trails, SDE-IS utilizes nearly a billion bytes of storage.

FIGURE 4

SDE-IS: PLANS, ASSUMPTIONS AND ACCOMPLISHMENTS

GOALS	ACCOMPLISHMENTS
1. SDE-IS would be the "corporate level" portion of a statewide management information system serving the school districts and the state department.	1. SDE-IS and ESV-IS were developed independent of each other. Data naming conventions are not standardized. First genuine link occurred only in 1981 with transfer of financial reports.
2. SDE's information needs could be met by data produced through the daily operations of districts using ESV-IS.	2. Much of the data currently collected on forms by SDE is not needed to support district operations, or requires narrative. Although all districts are now using ESV financial subsystem, most districts will probably never use personnel/payroll or student support subsystems.
3. This direct transfer of data would eliminate the need for districts to complete the many, often redundant, forms required by divisions of SDE.	3. Some forms have been eliminated or consolidated and some reporting tasks have been simplified. But, SDE has never established firm control over data collection by its units. Also, some units are not convinced that their data needs can be satisfied by the financial data that is now available and will continue to collect their own data.
4. The districts and regional centers (and not SDE) would be responsible for collecting, verifying, editing, and maintaining data.	4. SDE has major, time-consuming responsibilities for data collection, editing, and maintenance.
5. Periodically, the summary data required by SDE would be extracted from ESV-IS and directly transferred (through tape or other medium) to reload the SDE statewide data base.	5. Direct transfer has only occurred with financial data, and only on an annual basis. Expanded direct transfer of data is unlikely. Districts complete some SDE forms using the computer.
6. The information needs of users in SDE and elsewhere for periodic and ad hoc reports would be served by using generalized report writers available from Burroughs in the statewide data base.	6. Burroughs report writers are used, but EDSS needed to develop its own reporting and simulation software and to spend a lot of time programming ad hoc reports. It did not anticipate the high demand for special reports.
7. On-going applications to serve administrative functions (aids, levies, federal reports) would run off the statewide data base.	7. Most of the on-going applications run off their own files, which are organized using Burroughs data base management software. Some applications required major rewriting, which was apparently not anticipated in 1977.
8. The system would be flexible so that new applications could be added and existing ones changed with minimal disruption to ESV-IS and the SDE data base.	8. The system is flexible, not because of its design, but because of its lack of design. In the near future, SDE will face heavy maintenance responsibilities because of the lack of design.

The new student count system is another step toward reducing the local reporting burden. That system for year-end attendance counting reduced the number of forms used from eight to four or five. The system performs calculations previously done by the district and reports the data back for local verification.

SDE is trying to make reporting easier for school districts in two other ways:

- Having the computer produce a turnaround form for each district, so the district only has to complete information about what SDE doesn't already know (used in 1980 for the levies calculation, but not in 1981).

- Some districts are able to report some data by using the computer to produce a printout or magnetic tape which is the electronic image of the manual form (used in student count system).

B. USER SATISFACTION

EDSS provides data processing support for SDE sections and for users elsewhere, particularly in the Legislature. In order to find out if users are satisfied with the support they receive, we interviewed 20 individuals in the department and legislature who use 26 different SDE-IS applications, and who use inquiry and report writing capabilities.

1. CURRENT SUPPORT

We found users are generally satisfied with the data processing support received from EDSS. Users said:

- They were pleased with the performance and capabilities of EDSS staff members and contractors;

- They had good rapport with EDSS, though some noted this was due to recent improvements in EDSS; and

- Systems that have been implemented generally run well and provide accurate, useful, and timely information.

Even individuals who said that their applications had not performed to their expectation said positive things about the performance of EDSS, and its responsiveness to their problems and questions.

Users were not completely satisfied with systems performance. Several noted that while their systems worked well, they were not particularly sophisticated or flexible. Examples were cited

of aids systems that require manual steps to produce the warrant, require moving data between ISB, Metro II, and the University, or are cumbersome to operate for only a few districts at a time.

Several users were dissatisfied with EDSS procedures that require them to work through an EDSS analyst where the work requested will be performed by a contract programmer. This is particularly true for users who perform much of the user analysis required to improve or develop systems. They feel that the analysts' role is not useful and would prefer to work directly with a programmer. Because the contract programmers generally work at home, outside of regular working hours, turnaround time is sometimes slow. Even though the change or correction is minor, a week may pass before the user can explain the problem to an EDSS analyst, the analyst conveys the task to the programmer, and the contractor completes the job during the evening or on a weekend.

Finally, some users said their requests for assistance with special reports are not always handled satisfactorily, particularly if new programming is required to produce the report.

2. USER TRAINING AND DOCUMENTATION

The quality of user training and documentation is an important source of dissatisfaction among the users we interviewed. In general,

- Training and documentation are inadequate; much more is desired.

Much of the training that does take place is informal--a user learns by trial and error and asking questions of someone who knows. (EDSS staff members are responsive to these questions.)

Some users noted they were not always informed of changes affecting them, such as reorganization of data files. Several users told us the documentation of what information was in the data files and how it can be accessed is particularly incomplete. This hindered their efforts to pose queries or write reports independently.

3. IDENTIFYING AND MEETING NEEDS

While SDE users are generally satisfied with the data processing support now provided, they are often eager for more. During our interviews, many users identified manual operations which they believe need to be automated. However, the impression among these users is that EDSS does not have enough programmers to meet current demands for service, much less new requests.

Most of the users that we interviewed said they had not been involved in analyzing needs for data processing or in planning future development. We found that some sections which are major users of data processing do not coordinate and plan their use of data processing and their requests for new services within the section.

C. FUTURE ACTIVITIES

In authorizing this evaluation, the Legislature asked us to consider the extent to which the SDE-IS meets SDE's reporting requirements and the cost and effort required to complete development. It is impossible to report the extent to which a system is complete or to estimate the cost of future development if the scope of the system has not been specified. However, that is the case with SDE-IS. As we discuss in Chapter IV, the Department of Education never specified its reporting requirements and its other needs for data processing. The fact that this is still the case, six years after the project was begun, is one of the principal failures of SDE-IS.

What we can do to address the Legislature's question is to report on the status of SDE-IS and to discuss the level of effort required to complete SDE-IS as it is currently understood as well as to maintain and modify it.

SDE takes the view that SDE-IS will never be complete because new systems or enhancements to old systems will always be needed to meet the needs of SDE and other users. The department believes that SDE-IS has been designed with the "capacity to evolve--accomodate extensive changes with a minimum of system restructuring."

Having said this, it is possible to discuss work that EDSS has identified for the future. We reviewed:

- Proposals for converting systems from other sites to Metro II;
- Proposed new systems;
- Direct transfer of data; and
- Hardware resources required in the future.

In Chapter IV, we discuss the staffing level that will be needed to support SDE-IS.

1. CONVERSION OF EXISTING SYSTEMS

One of the original concepts of SDE-IS was that all SDE systems would run on the same machines used by the ESV regions, and SDE might share the facilities of one regional center. SDE has

run its operations at the Metro II regional center since July 1979. However, it still runs four systems at ISB and one at the University. Furthermore, it uses ISB for some data entry and uses UCC extensively for research and simulation activities. We do not feel that the department's use of several computing centers presents a problem.

In 1981, EDSS identified three systems for conversion to Metro II. ISSI, the consulting firm that developed SDE-IS, estimated analysis and programming costs for those projects of $165,000. However, these estimates were not based on any clear statement of what would be accomplished and are not adequate for planning purposes.

- The practice of estimating costs of a system without analysis, design, or justification is unfortunately typical of SDE's approach to systems development.

2. DEVELOPMENT OF NEW SYSTEMS

EDSS also identified six new systems for development, including two systems to calculate aids and two systems to support vocational education activities. Again, the estimates provided by the contractor were not based on any statement of what the proposed systems would do and are not adequate for planning purposes. Note that in the current atmosphere of high maintenance and rewriting of systems, new development has received a low priority.

3. DIRECT TRANSFER OF DATA

There are no purely technical barriers to direct transfer of data from ESV-IS. Nevertheless, the prospects for implementing it are poor. First,

- SDE has not adequately analyzed the information it needs from districts.

The concept of direct transfer of data presumes SDE has identified what information it needs from districts and how that information will be (or could be) obtained through ESV-IS. In fact, SDE has not specified its needs. ESV-IS development proceeded without clear knowledge of SDE's needs and without knowing how the two systems might eventually interface.

One result of this uncoordinated development is that:

- The data elements used in ESV-IS and by SDE divisions are not consistently named and defined.

Data definitions and naming standards are inconsistent among some of the ESV regions and between ESV-IS and SDE-IS. This problem was identified several years ago and some progress is being made toward a solution. The task forces on personnel/payroll

and student data have begun work on common data standards. When their work is complete, the State Board of Education could adopt those data standards in administrative rules, as was done for the UFARS data standards.

MECC, TIES, and Metro II have worked on more uniform data standards as part of their joint effort to enhance personnel/payroll subsystems. SDE has indicated it would accept those standards and attempt to implement them within the department. However, the absence of a data element dictionary makes that task difficult. Even if standardization can be achieved,

- Most districts will never use ESV-PPS or ESV-SSS.

Absent a legislative mandate like the one requiring the use of ESV-FIN, a majority of school districts will never use the ESV subsystems for personnel/payroll and student support. While no formal estimate has been made, the acting director of MECC suggests no more than one half of the 437 school districts will use ESV-PPS, although there is interest in a state-sponsored payroll system which would run on a microcomputer. Some districts may use commercially available payroll systems. About 100-150 districts may eventually use ESV-SSS, which will probably not be implemented in all seven ESV regions.

Thus, student and personnel/payroll data for most districts will not be directly available from ESV-IS. Instead, districts will continue to report on manual forms. Their data will not be of uniform quality, and SDE will still have major responsibilities for collecting, verifying, and maintaining the data. Finally,

- Much of the data collected by SDE is not a normal by-product of daily operations.

Even if all districts were using all ESV subsystems, SDE demands a great deal of information which is not the product of daily operations. In many cases, districts maintain and report data on different forms only because SDE requires it. In other cases, districts need and maintain the information, but not in the format that SDE needs. For example, districts are required to report how much of what fuels is consumed in their buildings and vehicles each year. Using another form, a district must report how many Kawasaki motorcycles are used in its motorcycle safety program. Other forms require narrative and can not be replaced easily by computerized reports. A narrative application must be completed by districts for many program and categorical aids.

4. HARDWARE NEEDS

We reviewed SDE's current usage of computer hardware and its plans for future support. SDE uses about 25 percent of the capacity of Metro II's computers on a 24-hour basis. But, usage reaches its peak during the first shift, when on-line terminal users

are active. On-line access to SDE-IS's large data files and programming consume large amounts of processing capacity, to the point that the system is nearly saturated during the first shift, and service is degraded. Large batch processing jobs are run overnight or on weekends.

The department has access to the Metro II computers through a Burroughs minicomputer which is used for remote entry and printing jobs. SDE also uses a variety of terminals and microcomputers, a few of which are now located in different sections of the department.

Planning for SDE's future hardware needs is particularly important at this time. The current master contract with Burroughs will expire within 18 months. Before that time, the department will have to specify the hardware needs of the department, MECC, and the ESV regions and prepare to solicit proposals for a new procurement of large computers.

In order to realistically project SDE's future hardware needs, it would need:

- A clear picture of current activity, as it relates to changes in transaction volumes over time for each application, and to the function currently performed by each application;
- A functional plan for the development or conversion of the rest of the known systems, so their impact and resource consumption could be estimated; and
- The projected needs of the others users of Metro II.

SDE does not have this information, nor does it have a formal system hardware plan. The department only examines its hardware needs on an incremental basis. The absence of a formal design or plan for SDE-IS means that the department cannot realistically project its future hardware needs.

To plan for the next procurement, we recommend:

- SDE should closely examine the overall operating design of its systems in order to find and evaluate alternative hardware configurations and vendors.

This should begin with a careful analysis of the current resource use of each application over a period of time. The analysis should separate development and modification from actual operation of the system.

- SDE should examine the capabilities of Burroughs' systems software, particularly the data base management, communication, and report-writing packages.

We found serious limitations in the Burroughs software. These limitations should be considered as SDE plans for procurement.[1]

- SDE should examine the possible use of microcomputers (such as the Apple) in light of its strategic plan for systems development.

Microcomputers represent a new dimension in providing access to data and a means for users to manipulate it. Several SDE sections are now using microcomputers for administrative tasks. Using this technology may enable the department to reduce some hardware costs while increasing service. SDE should analyze an experiment using a microcomputer in the School Financial Management section to see if this approach would benefit other users.

SDE should also consider other uses for microcomputers or minicomputers which would reduce usage of the central processor. For example, programmers who now work on-line with the central processor could use smaller machines. Image files could be down-loaded for program testing and debugging. In that regard,

- SDE should examine patterns of usage of on-line access to the system.

SDE's practice has been to make virtually all data files accessible on-line, but it has little knowledge of what is used, and by whom. An on-line environment is considered very desirable, but it involves increased expenses for data storage, communication, and central processor time. As mentioned above, SDE should consider options for down-loading files to smaller machines or reducing access to files that are not regularly used.

---

[1]We do not recommend that SDE convert from Burroughs equipment to equipment from another vendor. Such conversions can be costly and disruptive. We do recommend that SDE consider all plausible options in planning for the next procurement.

III. TECHNICAL REVIEW

In this chapter, we report how well SDE and its contractors performed the technical tasks necessary to systems development.

We asked:

- Has SDE designed and implemented a system which is appropriate for the department? Has it built the system it proposed?
- Has SDE produced necessary technical and user documentation for the systems?
- How well does SDE manage the flow of data from districts to the department? What is the status of the data element dictionary, in development since 1977?

A. SYSTEMS DESIGN

The Department of Education describes SDE-IS as a series of relational data bases and operational software which support administrative applications and research needs. The concept of data base oriented systems is that an item of data, such as the number of students from families receiving AFDC enrolled in elementary grades in St. Louis Park schools during the 1980-81 school year, is collected once and then stored in its assigned place in the data base. That item and others can be used to calculate the foundation aid for the district (an established SDE application). To answer a unique research question, the same item may be related to other items such as the number of students in that district transported by school buses.

We found important differences between SDE's description of the system design and what actually has been implemented so far. First,

- SDE-IS has few of the capabilities of a genuine data base system.

Data are stored in sets of "flat" files which are supported by separate appplications. Though the files are stored using the Burroughs data base management software (DMS-II), most of the files could be stored without using that software.

The SDE-IS data storage is organized in several "data bases," each of which contains many physical files. For example, the SDEDB "data base" contains 29 separate files. LICDB (personnel data) contains 11 separate files, and TESTSDEDB (development applications) contains 27 separate files.

We analyzed the extent to which SDE-IS possesses the following attributes of data base systems:

- Exhibits a logical structuring of data elements or groups of elements within physical records;

- Re-uses data elements so that data are recorded only once and then shared across applications, thereby minimizing redundancy; and

- The data base management software provides the linkages among data elements, which makes programs less complex and easier to change.

Although the SDE-IS data storage has some of the attributes of a data base, we concluded that SDE-IS is not a data base system, as that is understood in the industry. SDE-IS does not use some of the most important capabilities of the data base software. Furthermore, in our review of documentation and programs, we did not find a higher level of coordination or data sharing in the files than would be expected in any other collection of computer files in an organization of similar size and complexity.

A final problem with the present design is that the linkages among data items are expressed in the applications programs which access them. This is undesirable, since the programs are difficult and expensive to change. In a true data base system, these linkages would be made by data base management software, and the applications programs would see only data they need.

EDSS has described the files' structure as a "relational data base." A relational data base may be defined as a non-ordered association of data elements which are accessible according to abstractions based on the element meanings. At the present time, such a data base is almost always limited to an experimental setting and is rarely found in an operating production environment.

- The SDE-IS files do not comprise a relational data base.

An important reason for trying to develop an integrated, department-wide data base is to eliminate redundancies in data collection and maintenance. We analyzed the extent to which the physical data sets are linked at a level higher than just sharing common key fields. (Key fields are the pointers, such as district number, that help users to access files.) In our view,

- There is very limited, if any, integration of files.

There is a great deal of duplication of key fields in many files. This creates a potential problem because there is no way to independently verify that the keys on all files contain the same data and that all the data are valid. The logic to prevent such a problem must be written in the applications programs.

We could not precisely determine the extent of redundancy of data in the files because of the lack of a data element dictionary or similar documentation. The SDE-IS files include a large amount of very similar information, such as student counts, that is collected and stored many times in a year. The counts may differ slightly because they are taken at different times in the school year, or for different purposes. To a district which sees itself supplying the same data over and over, or to a user who wants a simple answer, there is no benefit in having separate counts.

Is the original concept of a data base system still valid for the department? The absence of a needs analysis which would point to the correct data architecture makes it difficult to answer this question. However, we conclude that a formally designed, data base oriented storage is appropriate for the department.

The advantages of using a data base include:

- Less complex programs, since the data base software would provide part of the access and retrieval logic;
- A reduction in redundancy and associated errors; and
- Greater flexibility in adapting the system to changes in requirements, since application programs would have access to only those items which they need. This would reduce the number of changes required to existing programs when data elements are added to or deleted from a file.

There are some costs associated with implementing a genuine data base:

- Machine efficiency is reduced. Machine costs, though not trivial, are less important in the long run than personnel costs, which are high, and rising;
- Better front-end planning and design are needed, including department-wide agreement on data element meaning; and
- A technical expert is needed to oversee and manage the data base structure and content, and to set up the data base "calls" for less proficient programmers to use in their programs.

B. DOCUMENTATION

Documentation of computer systems is essential to support maintenance and modification of the system. It is also needed so new staff or contractors can understand the design and operation of the systems.

A minimal level of computer system documentation should include program, production job, and system documentation. The program description should summarize the internal program logic and data file handling, and block or paragraph comments should be coded in each source program. A history of revisions to each program should be maintained.

We found that:

- SDE-IS documentation does not meet minimal standards. It is inadequate for support, maintenance, and enhancement of the systems.

Currently, there is only a one paragraph description of each program; the other program documentation contains many inconsistencies. There are no comments which makes it difficult to quickly grasp and modify the programs.

There is no documentation for each system or for each production job. That documentation is particularly important for training new staff, or to cross-train staff on existing systems. Furthermore, the department has not established a schedule for completing this basic level of documentation.

EDSS recently attempted to improve the program-level documentation and developed an automated documentation system. However, there appear to have been errors in entering the program descriptions into the documentation system. About 20 percent of the entries that we reviewed contained errors which resulted in truncated or redundant narrative.

The automated system works, but is somewhat clumsy to use. We believe that typed documentation would be just as efficient and would allow the use of graphics, such as system flowcharts.

Similarly, user documentation is very incomplete. Manuals were completed for only two of the more than twenty SDE-IS applications. The two existing manuals are thorough and explain how to use the systems. However, the department has no plans for completing the other user manuals.

- The absence of documentation exposes SDE to undesirable dependence on the contractors who developed SDE-IS.

Without documentation, they are the only people who understand the system's design. Indeed, we estimate that a new consultant would need three to six months to acquire a working knowledge of the systems.

C. DATA MANAGEMENT

Various units in the Department of Education collect information from local school districts about students, staff, finances, facilities, and programs. The demand for information has grown over the years, as state involvement in financing and regulating local education has increased. Local school districts regard these reporting requirements as burdensome and have frequently expressed this point of view.

From the time that SDE-IS was initiated in 1975, the department has recognized that controlling the flow of data from districts to SDE was essential to successfully implementing the system. To that end, the department proposed to produce a catalogue of the data items which SDE needed to collect, and to establish a forms control function.

We reviewed SDE's efforts to manage the flow of data from districts, and to produce a catalogue or dictionary of the data items used in the department.

We found:

- SDE has not imposed necessary controls on the collection and maintenance of data about district operations;

- Efforts to develop a data element dictionary have failed. An estimated $400,000 was spent on these efforts, but no useful product has resulted.

Operating units in SDE initiate and administer requests for data; no central authority manages these activities. Thus, there is inadequate control over data collection that is redundant or which has outlived its useful purpose, if it ever had one. Control over data collection requires decisive action from the office of the commissioner of education. Even though SDE has considered several times the imposition of controls on data collection, these proposals have never received the necessary backing of the department's top management. A policy adopted by SDE in February 1982 will place some controls over <u>new</u> data collection, but does not apply to current data collection activities.

The Legislature saw a data element dictionary as a necessary tool for identifying and eliminating data collection that was redundant or unnecessary, thereby reducing the reporting burden on school districts. To encourage the department to do what was needed, the 1979 Legislature mandated that by January 1, 1980, SDE produce "a data element dictionary defining all data elements included in the financial reporting, personnel payroll, and student reporting information system of the department of education."[1] In 1980, the

---

[1] Laws 1979, Chapter 334, Article VI, Section 1, Subdivision 6.

Legislature changed that requirement to read, "The department of education shall maintain a current data element dictionary defining all data elements included in the ESV-IS and SDE-IS."[1]

If EDSS had produced a basic data dictionary, it would be able to determine if requested data already exist in the data files. Knowledgeable SDE-IS users would also be able to use the dictionary to search for data items.

A data element dictionary is an essential tool for design and development of a computer system, particularly one which proposes an integrated, data base approach, such as SDE-IS. It would be particularly valuable to SDE system designers. During the design of new applications, the dictionary could be used to accumulate definitions of new data elements, to combine or change data elements, and to try data structures and simulate changes. When an application design was complete, the data descriptions would already be loaded and available for use during programming.

Programmers could use the data dictionary to understand the data files and to develop programs using the files. The common data element definitions would help ensure that program logic is consistent for each data element. The English names would provide a quick cross-reference to each file and to each COBOL internal data element name.

Work on the SDE data element dictionary, then known as the Minnesota Educational Data Information Directory (MEDID), began in 1977. SDE devoted substantial efforts to developing special software for MEDID, even though appropriate software was commercially available. EDSS managers said their requests to purchase such software were refused by the department.

The data element dictionary project suffered from many problems, one of which was a failure to agree on what the dictionary was to accomplish. SDE management did not provide clear direction in that regard. To some people, the goal was to produce something to show to the Legislature as proof that the department was addressing the reporting burden. The role of a data dictionary as an essential tool for systems development was never well understood. Finally, no one working on the project had worked with a data dictionary before or had a clear idea of what purposes it should serve.

There has not been a consistent definition of what a data element is. As a result, estimates of the scope of the project and the number of elements to be included have varied widely. At one point it was thought 50,000 data elements would be included in the dictionary; the most recent estimate is that 7,000 data elements will eventually be listed. The work which has been completed is inconsistent, reflecting different definitions of the task.

---

[1]Laws 1980, Chapter 609, Article VII, Section 11, Subdivison 1.

- It is significant that even today, SDE does not know which data elements are in SDE-IS.

Identification of a system's data elements should take place during systems design. As we discuss in Chapter IV, SDE has not performed necessary design work.

Development of a data dictionary is a labor intensive task which must be completed quickly so that the dictionary is not immediately obsolete. In the case at hand, staffing was inadequate to complete the designed task although it might have been adequate to complete a carefully limited task. Furthermore, several staff members tired of the project and left.

What has been accomplished so far? The data elements contained in about 160 data collection forms were coded and entered into computerized data files. A microfiche version of the files was produced. However, not all the information needed about each element--source, purpose, authority, use--was coded for each element now on file.

Furthermore, much of the data is stale and doesn't reflect changes in systems. For example, major changes made in the levy system last year are not included in the data dictionary. In the past year, work on the data element dictionary proceeded slowly. Instead, staff members tried to develop a computerized directory of forms and to establish committees that would review new data collection requests.

We estimate that between 1977 and 1981, more than $400,000 was spent on developing a data element dictionary, including staff time, contractors, computer time, and overhead. The department has no useful product to show for these efforts.

D. RECOMMENDATIONS

1. DOCUMENTATION

- EDSS should include in its standards manual an explanation of the items of documentation required for all programs, including the appropriate level of comments to be placed in the programs.

- EDSS should update its program documentation to reflect these standards.

- EDSS should assign staff to complete the basic documentation of the existing systems, particularly the system and job level.

Completing this task will help to clean up program libraries by removing test or duplicate programs and jobs, thus reducing storage costs.

- Consultant contracts should require documentation which meets revised EDSS standards as a deliverable which must be provided before signoff.

- User manuals should be completed for each SDE-IS system. User staff members or a designated user division EDP coordinator should write the manuals. EDSS staff should then review the manuals for compliance with EDSS standards.

This approach will help shift some of the workload from the technical staff and will usually result in manuals which are more useful and readable. Users can also add material which explains how each system interrelates with manual procedures.

2. DATA MANAGEMENT

The department needs to control the data collection activities of its sections. We recommend:

- A department-wide data administration function should be established and located in EDSS. The data base administrator should receive all requests for data and attempt to fill those requests using data from existing files.

If, in fact, new data are required, then the administrator should review whether or not this data should be incorporated into existing files or used to update existing file data. The data acquisition review committee established this year is a step in the right direction.

- Using an appropriate, commercially available, data dictionary package, SDE should build a basic data dictionary which catalogues and identifies each data element in the SDE-IS applications.

For each data element, an English name and a COBOL internal name should be listed, as well as a brief definition of the element and the range of values or codes it may contain. A basic data dictionary should also identify which computer file contains each data element and synonyms (where the same data element is given different names in different files). If resources are available at a later time, the dictionary could be expanded to include other features.

IV. MANAGEMENT REVIEW

Development of computer systems is a challenging task in any organization, public or private. Systems development by the State Department of Education is particularly challenging because it takes place in a dynamic environment in which authority is dispersed, and because the systems must serve the needs of many different users, both inside the department and elsewhere.

We wanted to know if SDE, particularly its Education Data Systems Section, has done a good job of managing the development and operation of SDE-IS. We focused on these questions:

- Has the department effectively analyzed its needs for computer systems?
- How well has the department managed systems development?
- Has SDE used consultants and other contractors effectively?
- Are the staff resources assigned to SDE-IS adequate to continue development of SDE-IS and to operate, maintain, and improve existing systems?

A. DEVELOPMENT MANAGEMENT

1. NEEDS ANALYSIS AND PLANNING

The first step of any systems development project should be an analysis of the user's functions and data processing needs and an evaluation of how those needs can be served by automated methods. We believe that a thorough needs analysis:

- helps to reduce the number of changes requested during development;
- reduces the level of tinkering and maintenance required for implemented systems;
- enables the developers to produce a general systems design and to understand the interrelationships among needs; and
- is essential for department management to establish priorities and plans for computer systems; and
- is needed to cope with the inevitable changes that will arise.

We found:

- There has been no formal needs analysis for SDE-IS.

Development of SDE-IS proceeded without the benefit of a formal needs analysis.[1] Furthermore, there is no consistent plan or general systems design to guide SDE-IS development. In the absence of a needs statement, SDE-IS development is driven by user requests. These may be divided into requests for ad hoc reports and for new or improved software to support the department's administrative functions.

The Department of Education takes a different view of how systems should be developed. SDE staff members told us that SDE-IS has been and should be developed incrementally, by developing one component to meet one need at a time. They say that:

- Because SDE operates in a highly dynamic environment, it is not useful to engage in comprehensive need analysis or to make firm long-range plans, because the needs and objectives will change many times before the original plans can be accomplished.

- Users in the department do not know what they need until you give them something--a prototype--to use. After using the prototype, they begin to understand the capabilities of computer systems and can request changes and improvements for the system.

- SDE has been under constant pressure to respond to requests and to deliver results in a short period of time. It has not had the time needed for planning and documentation.

Data processing experts acknowledge that SDE's approach of prototyping systems may be appropriate in certain instances. It was probably correct in 1976 and 1977, when the consultant wanted to demonstrate the system's potential to skeptical users. However, experts also point out the undesirable results which may follow. Such results apparently have followed in the case of SDE-IS.

- Without a formal needs statement and plan, it is difficult for management to set priorities among competing requests or to evaluate the performance of staff members;

- Without a formal needs statement and plan, it is difficult to predict the impact of implementing new requests on existing operations, or what the costs are likely to be;

---

[1] As described in Chapter I, SDE was involved in three studies of its information needs between 1967 and 1976. However, none of these studies ever served as a needs analysis for SDE-IS.

- This approach to systems development is expensive. It may result in a high and costly level of continual tinkering with and improving the systems, once developed, unless the prototyped systems are rewritten as more stable, production systems; and

- Documentation does not meet minimal standards, and unique knowledge about the system resides only in the developer--here a contractor--and is not shared with the user.

Because of its failure to plan, SDE always operates in a reactive mode. It has not done what it could do to reduce uncertainty in its operating environment.

In the past year, EDSS established a procedure for users to formally request projects and document their need, and for EDSS or its contractors to schedule and budget for the work. Such a procedure is needed for EDSS to plan its work and manage its staff. In the past, user requests were often presented and considered in a very informal manner, without appropriate documentation or justification.

We found:

- The new work requisition procedure is not used consistently.

First, many users do not use the requisition form at all. Among the users that we interviewed, several were not familiar with the procedure. Others knew about it, but said they avoided completing the form. To them, completing the form was an effective way of ensuring that requested work would not be completed soon. Use of the form was seen as a way of queueing up for next year's work.

Where forms are used, it is often to request a run of a specific system or report, sometimes with a minor change. The forms we saw were often incomplete. For example, the section for describing benefits of the work was usually blank. Such information would be needed if the requisition forms were to form the basis for planning work and for assigning priorities among requests.

2. METHODOLOGY

In our view, the challenges to successful systems development are best met by following a systems development methodology which includes an analysis of data processing needs, as well as:

- Consideration of costs and benefits of computerization;

- Division of development into logical phases, and approval by managers and technical staff before proceeding from one phase to the next;

- Project budgets and timetables which provide tools for management to measure progress; and

- Completion of appropriate documentation during each phase of development.

Many organizations use a formal systems development methodology so that development can proceed in an orderly manner. For many years, the Department of Administration's Information Services Bureau has used the PRIDE (Profitable Information by Design) methodology for systems development by state agencies.

In 1979, the Legislature mandated the use of PRIDE by state agencies, although in 1980 the requirement to use a specific methodology was removed. Instead, the Commissioner of Administration was directed to adopt a procedure for evaluating proposed computerization projects and to adopt a methodology for developing approved projects. The law provides that "A state agency shall not develop, improve or modify a data processing system using any methodology other than that established by the commissioner of administration."[1]

By law, the authority of the Commissioner of Administration to regulate state agencies' use of data processing services extends to the Department of Education and to SDE-IS.[2] Therefore, SDE should be using an approved computer development methodology in developing and improving SDE-IS.

Instead, we found:

- SDE has not used PRIDE or any formal development methodology in a consistent manner.

In the past, SDE developed or improved computer systems by starting with program design. Only the briefest attention was given to needs analysis and general systems design, activities that are crucial to successful systems development. The department has not divided development into phases, has not required signoffs, and has done very little to budget or schedule projects.

- Because SDE ignored essential design tasks, maintenance costs will be unusually high and will consume most of EDSS's resources in future years.

EDSS published a standards manual in 1981 which describes its approach to systems development. While we believe that a standards manual is a useful step, the EDSS manual is deficient in this area. Although the manual draws heavily on PRIDE, in the manual systems development begins with program design. No mention is made of needs analysis or overall systems design.

---

[1]Minn. Stat. §16.955.

[2]Minn. Stat. §16.931.

3. DATA PROCESSING COSTS

State agencies should carefully account for the costs of developing and operating computer systems so department management can measure progress in development and costs of service, and so the Legislature can know what financial commitments may be required in the future. In our evaluation of SDE-IS, we found:

- SDE paid scant attention to accounting for the costs of developing, improving, and operating SDE-IS.

When we began our study, we wanted to know how much was spent to develop SDE-IS. We soon learned that EDSS has not kept track of project costs in a satisfactory manner. EDSS could not provide complete figures on the costs of hardware, contractors, and EDSS staff. It was unable to provide any useful allocations of those costs to specific applications, or to attribute overall costs to development, improvement, and production activities.

This problem is due in part to SDE's failure to organize its work by projects, and to budget and schedule projects. Since EDSS does not track the costs of its activities, it cannot report these costs to its users.

B. USE OF CONSULTANTS AND CONTRACTORS

Data processing consultants and contractors developed most of the systems that comprise SDE-IS and played an important role in improving and operating the systems.[1] Between 1976 and 1981, more than $529,000 was paid in contractors' fees.[2] An additional $226,000 has been budgeted for contractor support of SDE-IS during the current biennium.

State agencies frequently use data processing contractors to assist in the development and improvement of computer systems. Indeed, the Department of Administration's Information Services Bureau (ISB) often contracts for systems analysis and programming services, in order to augment its own staff. State agencies have usually benefitted from consulting arrangements because they can engage a level of expertise that is not always available through state hiring channels.

---

[1] We used the terms consultant and contractor interchangeably, although EDSS correctly points out the difference between the two terms. Consultants were engaged to assist SDE in making decisions about the design and concept of SDE-IS. Once those decisions were made, contractors--systems analysts and programmers--were engaged to carry out those decisions.

[2] This does not include $65,135 paid to Alexander Grant & Co. for a review of ESV-IS and the regional centers.

In our view, a state agency derives the greatest benefit from the use of data processing consultants if it observes these standards:

- Carefully drafted contracts specify in detail the tasks to be performed, the money and contractor time allocated to performance of each task, and the deliverables to be produced. Useful specification of contract tasks requires study and analysis by the agency before it negotiates the contract.

- Contracts specify standards for performance of the work and for evaluation of the contractor's performance.

- Agency management manages the work of the contractor and does not delegate its authority for making important decisions to the contractor. Management should be capable of understanding technical and managerial choices proposed by the consultant and selecting the option that best serves the agency's needs.

- Unique knowledge is transferred to agency staff through training and documentation, or at least, is reduced to documentation that can be used by a different consultant.

We analyzed the role of consultants in the development and operation of SDE-IS and how SDE managed their work. Except for some work in the first years of the project, SDE contracted with only one firm--Information Systems Support, Inc. (ISSI)--which subcontracted with programmers and analysts and managed the project. SDE and ISSI have entered into two original contracts since 1977.[1] The first was signed in October 1977 and was extended and amended four times after that: in January 1978, January 1979, January 1980, and November 1980. In 1981, SDE used a competitive process for the first time to engage a consultant to work on SDE-IS. Five proposals were received in response to SDE's solicitation, and ISSI was hired for two more years.

We found several problems with EDSS's use and management of consultants. First:

- The department negotiated contracts which do not specify tasks to be performed, deliverables, and performance standards in adequate detail.

The contracts are agreements to buy time and expertise from ISSI, in order to progress toward goals described in very general terms. The contracts do not specify applications to be developed or modified, or how much time and money should be devoted to tasks.

---

[1] Prior to 1977, the consultant did some work at SDE through a contract with MECC.

In the original 1977 contract, ISSI was engaged as a project manager which would help engage programmers and analysts, "coordinate the design and implementation of the SDE-IS," and "coordinate the development of the interim mechanical/manual procedures necessary to operate the SDE-IS until all schools are on the ESV-IS."

The first supplemental agreement called on ISSI to provide the computer programs that would establish data bases, produce reports, and transfer data from ISB computers to the MECC machines. This amendment required documentation of all programs using "standard computer science terminology and PRIDE methodology," but was silent with regard to other documentation which should be created during development.[1]

The next two supplemental agreements only increased the dollar value of the original contract. The last amendment to the contract increased the amount and specified three tasks for the contractor: writing programmer documentation according to state standards, assisting in the development of a training plan and associated manuals, and providing a report describing the status of SDE-IS and what remained to be accomplished.

The contract for the 1981-83 biennium does a better job of describing what tasks ISSI might be called on to perform. It creates a procedure for identifying subprojects and for developing budgets and timetables for completing those subprojects. Nonetheless, ISSI is not required to produce systems level documentation; that is something it may do in conjunction with EDSS staff. Furthermore, no standard is established or referenced for what documentation should be produced.

- EDSS has delegated too much management authority to ISSI, without proper accountability.

The department has relied on ISSI to manage development of SDE-IS since 1977. ISSI planned projects, assigned staff, and made basic decisions about systems design. Until recently, department users routinely contacted the consultant about their systems and did not work through EDSS staff.

We believe that reliance on contractors for project management is undesirable in any case. We think it particularly undesirable here, where the contracts have not specified tasks and have not provided mechanisms or standards for reviewing the contractor's work; and where the department does not possess adequate technical expertise to evaluate the work.

- EDSS relies heavily on ISSI and has no realistic plan for becoming independent.

---

[1] In Chapter III, we reviewed the quality of SDE-IS documentation.

SDE will have to rely on ISSI to support SDE-IS maintenance and development for the foreseeable future. A large amount of unique knowledge about the design and operation of the systems resides in the contractors and has not been transferred to EDSS staff. This is partly because documentation of systems design and programming was not produced in the past. Furthermore, EDSS does not have the needed skills and familiarity to operate and maintain the system without outside help.

In the past two years, EDSS has tried to provide its staff with exposure to the operation of the systems and the work of the contractors. These efforts have not been aggressive enough to have a major impact in a reasonable time period.

C. SDE-IS STAFFING

While the cost of computer hardware decreased in recent years, the cost of data processing personnel increased. Staff and contractor costs now account for more than half of the EDSS annual budget. We wanted to know how many people and what skills will be needed to continue development, operation, and improvement of computer systems in the Department of Education.

We reviewed the staffing of SDE-IS and conducted an inventory of skills and of activities which staff members perform. Six senior systems analysts and four programmer/analysts and programmers work under the EDSS systems supervisor. Their numbers are augmented by five analysts and programmers employed by ISSI (about 1.8 FTE). Most of the ISSI personnel hold other full time jobs and work on SDE-IS during their off hours.

We found several problems with SDE-IS staffing. First,

- EDSS analysts and programmers are not effectively deployed.

EDSS analysts spend much of their time supporting users and production operations, and not in designing new systems or enhancements. They spent relatively little time in project management and supervision of programmers. According to our survey, EDSS analysts spend an average of 20 percent of their time in user "hand-holding," and only 12 percent in project management.

Similarly, the EDSS programmers spend an average of only 49 percent of their time actually writing programs. They spend much of their time setting up operations runs and assisting users. Given the small number of programmers in EDSS and the high demand for their skills, the department could use this scarce resource more effectively.

The contract programmers spend an average of 80 percent of their time on programming tasks. They are far more experienced in both Burroughs systems and data processing in general than the EDSS programmers. As a result, most of the development programming is done by contractors.

In other organizations, the user assistance now provided by staff programmers and analysts is provided by an EDP coordinator in each user area. Typically, this person is a senior clerk or junior manager (without programming experience) who understands how to use the systems and coordinates user requests with the data processing staff. Operations support is usually assigned to a specific systems supervisor and programmer(s). This arrangement frees analysts and programmers to perform their traditional duties of systems design and programming.

Even if EDSS analysts and programmers were spending more time on those duties,

- The ratio of programmers to analysts in EDSS is wrong.

In a data processing environment like EDSS, one systems analyst should be able to keep three to six programmers busy. In EDSS, the analysts outnumber the programmers (including the contractors). This staffing arrangement impedes SDE's ability to get its work done.

Finally, most of the systems analysts are not technically qualified to design systems and to direct programmers in development efforts. Several do not have strong programming backgrounds, so they do not clearly understand the implications of their design decisions, and they may not know what to expect in performance from programmers.

The EDSS systems analysts function primarily as intermediaries between the end users and the programmers. In many cases, however, the contractors feel that the results of the EDSS analysts' work are not useful as programming specifications and redo them. And, as we noted in Chapter II, some users are dissatisfied with this arrangement and would prefer to work directly with the programmers assigned to their systems.

- The present staff complement or more will be required to support the systems in the future.

We do not foresee a reduced need for EDSS staff anytime soon. As we have seen, most of EDSS's current budget is required to maintain, modify, and run the current system. Little new development is underway. As far as development is concerned, without an overall design to work toward, it is not possible to determine when the system is complete. More importantly, the section receives countless requests for increased systems capabilities, ad hoc reports, and modifications to calculations and formulas. We anticipate that these will continue in the future, and at least the present complement will be required to support the systems.

D. RECOMMENDATIONS

1. DEVELOPMENT CONTROLS

- SDE should use an appropriate systems development methodology for all new development and enhancements. Furthermore, needs analysis and general systems design should be part of the development methodology, and EDSS standards should be revised to reflect that requirement.

- EDSS should organize its work around projects, and not around systems. These projects should be based on approved user requests. User request forms should be used for all new development and enhancements to existing systems. The requests should clearly identify the functions of the desired system as well as the benefits that will result.

- Firm and realistic priorities must be assigned to each request, and the priorities must be known to and accepted by the appropriate section heads.

- Projects should, in turn, be controlled at the task level. Task plans need not be elaborate or lengthy, but should reflect the activities needed to complete the work. Each task should identify the staff and computer resources it will consume. In order to allow effective monitoring of progress, no task should take more than four weeks to complete.

- EDSS staff members should be assigned to projects, and not to systems. This will increase accountability for time spent and encourage adherence to deadlines.

However, implementation of these recommendations will probably reduce the satisfaction of users who are accustomed to having an EDSS analyst "on call" and responsive to requests.

2. DATA PROCESSING COSTS

- Once projects have been identified and work has begun, EDSS should track all costs associated with each project, including staff time, computer time, and contractor costs. This will clearly identify the cost of each increment of work and will help project personnel to learn to estimate costs more realistically.

- Besides calculating the costs of developing and improving systems, EDSS should also calculate the costs of operating systems. It should report all data processing costs to users (including the Legislature).[1] Users should see that

---

[1] In January 1982, the department began to report some measures of machine usage to its sections.

information has a cost and should know what costs they are responsible for.

- EDSS should consider billing all users for the costs of data processing services. Users would then have to budget those costs and would be encouraged to review requests and operations more closely. Users might then separate essential support from services that are only nice to have.[1] (A direct appropriation should cover part of the EDSS budget--not all costs should be recovered from users.)

- If a billing system is introduced, EDSS should consider a fee structure that would help it achieve other goals. For example, a higher charge for first shift operations could encourage use during off-peak periods. This might help to even computer utilization patterns and to avoid saturation during peak hours.

3. STAFFING

- EDSS should attempt to staff appropriately to attain self-sufficiency in the maintenance of the existing systems. In order to reach this goal,

- EDSS should achieve an appropriate ratio of analysts to programmers. This is not necessarily a question of job titles, but of how many persons are actively writing programs as opposed to those designing them and dealing with users.

- Systems staff should spend two to four weeks each year in training. This training should be divided between maintaining technical proficiency and preparing for promotion.

- EDSS should cross-train its staff in different systems.

- EDSS should develop at least two persons capable of acting as project managers for ongoing work.

It is unwise to continue to contract for project management. Each EDSS project manager should have budget and deadline responsibility for several projects and should be reviewed primarily on meeting those goals.

- EDSS should plan to continue use of consultants for design and development work.

---

[1] If users were billed for data processing costs, they might reasonably insist that they be able to shop around for data processing support, and not be tied to using EDSS.

Current staff members do not have the experience or technical expertise to design and develop new systems or applications. The best way to improve them is to combine training with supervised work alongside experienced programmers. By operating through formal contracts, the section will find it easier to implement the project management controls that we have recommended above.

V. THE FUTURE OF SDE-IS

In previous chapters, we concluded:

- EDSS and its consultants have developed automated systems which support many of the administrative functions and information needs of the department and other users. Those users are generally satisfied with the data processing support they get and are eager for more.

- Nevertheless, the department is far from achieving some of its basic goals for SDE-IS, namely creating an integrated base of data about education in Minnesota, controlling the collection and use of that data, and reducing the reporting burden on school districts.

- Certain technical aspects of the systems, particularly basic systems documentation and user manuals, are inadequate and need to be strengthened.

- Management of SDE-IS staff, contractors, and money, has been poor in the past. While we noted recent improvements in this area, much work remains.

Many of these problems can be addressed by EDSS. But the top management of the department should become more closely involved in basic decisions about future data processing support in the department.

In this chapter, we consider two key issues:

- What should be the future, long-term direction of SDE-IS?

- Who should be responsible for governance and oversight of SDE-IS?

A. STRATEGIES FOR IMPROVING SDE-IS

In Chapters III and IV, we reviewed problems with managerial and technical aspects of SDE-IS and proposed ways of addressing those problems. While implementation of these recommendations would strengthen SDE-IS, the Department of Education needs to make basic choices about the future course of SDE-IS.

We propose two alternative approaches. The alternatives, and the advantages and disadvantages associated with each, are depicted in Figure 5. The first approach endorses the current system design. It calls for a brief halt to development in order to

FIGURE 5

STRATEGIES FOR IMPROVING SDE-IS

ALTERNATIVE I:

STABILIZE SYSTEMS AND CONTINUE CURRENT DESIGN

Improve documentation before beginning any new development, and improve staff understanding of existing applications.

ADVANTAGES

- Retains investment in past development work.
- Less costly in the short run.
- Less disruptive to current operations and users.
- Perceived as more manageable, since it does not involve a significant change from current practice.

DISADVANTAGES

- Original objectives will not be achieved--an integrated data base, and a link with ESV-IS.
- Long-term costs will be higher because the system will never be stable and will require high maintenance.
- Reliance on current consultants will increase.
- May limit potential use of advanced technologies.

ALTERNATIVE II:

HALT NEW MODIFICATIONS AND DEVELOP A MASTER PLAN

Make only essential modifications and begin no new development. Strengthen documentation and develop a master plan to govern future automation efforts. Plan should identify categories of information needs, establish priorities for future development, and review the staff, hardware, and software needed to implement the plan.

ADVANTAGES

- Information needs would be comprehensively determined.
- Automation capabilities needed to support department's functions would be identified, as well as ways that new technologies could be used.
- Long-term costs of maintenance and modification would be lower.
- A plan for development priorities would be established.

DISADVANTAGES

- May require rewriting many applications, though major modifications would probably take place under Alternative I.
- Short-term costs would be higher because of planning effort.
- New development would be delayed until the master plan and priorities were in place.
- Requires a more disciplined approach to development.

strengthen documentation and staff understanding of the systems. This approach is attractive because it does not disrupt current operations and retains the investment in past development.

However, we feel that adopting the first approach means the department will never achieve some of its basic goals, including an integrated data base and the extensive use of data from ESV-IS applications. We also think that this approach will require costly maintenance in the future for a system that will never be stable.

The second alternative requires an important break with current practice. It calls for a halt to all but essential development and modifications. Documentation would be strengthened, and the department would develop a master plan to govern future automation efforts. For the first time, the department would comprehensively determine its information needs and establish plans and development priorities. Development and modifications after that point would be directed to fit in the new framework.

This approach might require rewriting many applications and would be more costly at first. (Note that under the first alternative, a good deal of rewriting will probably take place, anyway.) Alternative II would also be more disruptive to current operations and users and would delay new development until plans and priorities were in place.

We favor Alternative II. It offers the department the better chance of obtaining useful, stable computer systems at a reasonable cost. Moreover, it establishes a framework of defined data processing objectives that will be understood throughout the department.

B. GOVERNANCE OF SDE-IS

Many of the problems described in this report are partly due to the lack of proper governance and oversight of SDE-IS. EDSS has no official charter describing its department-wide responsibilities. But it is called upon to provide services throughout the department, limited only by how far it can stretch its staff and other resources.

EDSS is also plagued by the absence of department-wide plans for data processing, or department agreement on what computer support is needed. Like many organizations in government and industry, SDE is comprised of divisions that enjoy a measure of autonomy. Each has its own interests, constituencies, and demands for computer systems. These demands are, for all practical purposes, unlimited and far exceed EDSS's ability to respond.

Partly as a result, EDSS is constantly trying to catch up and to respond to the Legislature or to whichever department demand seems most urgent. And because priorities must be established,

EDSS, by default, plays two roles: a provider of service and a regulator of who receives service. We believe that these roles are ultimately incompatible and should not be performed in the same section of an organization. We reached a similar conclusion in our study of ISB, where we found that ISB's attempts to provide and control computer services at the same time created serious problems.

We conclude that governance of SDE-IS should be removed located outside EDSS. In this section we discuss several alternatives and consider the roles of ISB, the department's top management, and the ESV Computer Council.

1. ISB

As we noted in Chapter IV, ISB and the Commissioner of Administration have statutory authority over SDE-IS. They have not exercised that authority in several years. ISB could provide the department with useful expertise, particularly in the areas of hardware planning and procurement, staff development, and operations management.

We do not recommend that ISB play a larger role in regulation of SDE-IS development and operation. ISB has had problems with development projects like SDE-IS in the past. Indeed, ISB is now a less active regulator and shares some of its authority with user agencies.

2. SDE MANAGEMENT

Governance of SDE-IS should remain within the department. We believe that basic decisions about system design and software development should be made by the commissioner's cabinet (the deputy and assistant commissioners). That group should review long-range plans and annual operational plans and should establish priorities among the competing requests of SDE divisions.

Any requests for new software development would be brought to this group for its approval. EDSS could provide technical assistance to the decision makers.

The involvement of top management is crucial. In an era of budget cutbacks, the department faces the possibility that it might not be able to complete all budgeted requests, not to mention all other requests. Decisions on cutbacks must be based on a careful assessment of department-wide priorities. Furthermore, the department will never achieve its goals for SDE-IS unless department management can agree on integrated systems and shared data.

3. ESV COMPUTER COUNCIL

The ESV Computer Council was created in 1980. It is a 12-member board charged with advising and assisting the State Board

of Education in development and operation of ESV-IS and SDE-IS. By law, the council is to advise and assist the state board in the development of applications software for ESV-IS and SDE-IS. The department is required to develop and operate SDE-IS with the advice and assistance of the council. Furthermore, the council is directed by law to develop a systems architecture and long-range plan for ESV-IS and SDE-IS.

For several reasons, the ESV Council has not been closely involved with SDE-IS. The preliminary systems architecture released in November 1981 addressed SDE-IS only briefly. The council has faced a lengthy agenda of tasks for ESV-IS and the development of the systems architecture and long-range plan. The council has also delayed its involvement with SDE-IS pending completion of this study.

The ESV Council could play a useful role in future development and operation of SDE-IS. The council is in a unique position to coordinate future development of and enhancements to SDE-IS and ESV-IS so as to establish or strengthen bridges that would connect the two systems.

Because the council's membership and viewpoint are oriented to school districts and the ESV regions, we do not recommend that it govern the development and operation of SDE-IS. But, by the same token, it can provide a valuable perspective to SDE on the concerns of the regions and districts and on how the department, regions, and districts can cooperate. In the past, SDE has not been sensitive to the concerns of districts, particularly in the area of data collection.

We therefore believe that the ESV Council should begin to review all plans and proposals for SDE-IS development and operation and to provide its perspective to the department and the state board on a regular and continuing basis.

In summary, we recommend:

- The top management of the department should make plans and establish priorities for SDE-IS development and operation;
- The ESV Council should advise and assist in these decisions; and
- SDE should use ISB's expertise in certain areas.

APPENDIX

The following rider appeared in the 1981 Education Appropriations Act. Laws 1981, Chapter 359, Section 1, Subdivision 6(g).

> $40,000 is appropriated to a special contingent account for an evaluation of the development of the state department of education information system (SDE-IS). These funds shall be released to the office of the legislative auditor after submission of a plan to the chairmen of the house appropriations committee and the senate finance committee. The evaluation shall consider:
>
> (1) The extent to which the present system meets all reporting requirements of the department and the cost and effort required to automate those reporting requirements which are presently not computerized;
>
> (2) the impact of legislative mandates and changing complex statutory requirements on the system;
>
> (3) an estimate of the resources and schedule necessary to complete development of the system and to maintain it in the future; specific consideration shall be given to the present arrangement of data processing hardware used for the system and projected hardware requirements in the future;
>
> (4) the role of consultants in the development of the system; and
>
> (5) the adequacy of the documentation of the system as development occurs.

STUDIES OF THE PROGRAM EVALUATION DIVISION

Final reports and staff papers from the following studies can be obtained from the Program Evaluation Division, 122 Veterans Service Building, Saint Paul, Minnesota 55155, 612/296-8315.

1977

1. Regulation and Control of Human Service Facilities
2. Minnesota Housing Finance Agency
3. Federal Aids Coordination

1978

4. Unemployment Compensation
5. State Board of Investment: Investment Performance
6. Department of Revenue: Assessment/Sales Ratio Studies
7. Department of Personnel

1979

8. State-sponsored Chemical Dependency Programs
9. Minnesota's Agricultural Commodities Promotion Councils
10. Liquor Control
11. Department of Public Service
12. Department of Economic Security, Preliminary Report
13. Nursing Home Rates
14. Department of Personnel, Follow-up Study

1980

15. Board of Electricity
16. Twin Cities Metropolitan Transit Commission
17. Information Services Bureau
18. Department of Economic Security
19. Statewide Bicycle Registration Program
20. State Arts Board: Individual Artists Grants Program

1981

21. Department of Human Rights
22. Hospital Regulation
23. Department of Public Welfare's Regulation of Residential Facilities for the Mentally Ill
24. State Designer Selection Board
25. Corporate Income Tax Processing
26. Computer Support for Tax Processing

27. State-sponsored Chemical Dependency Programs, Follow-up Study
28. Construction Cost Overrun at the Minnesota Correctional Facility - Oak Park Heights
29. Individual Income Tax Processing and Auditing
30. State Office Space Management and Leasing

1982

31. Procurement Set-Asides
32. State Timber Sales
33. Department of Education Information System

In Progress

34. Fire Inspections of Residential Facilities for the Disabled
35. State Mineral Leasing
36. State Purchasing
37. Post-Secondary Vocational Education
38. Direct Property Tax Relief Programs