Colorado Commission on Higher Education
Committee on ADP Planning and Account-
ability

ADP plan for higher education, 1973-74

UNIVERSITY OF COLORADO
BOULDER, COLORADO 80302

Office of the Director

COMPUTING CENTER

30 January 1973

Dr. Frank C. Abbott
Executive Director
Colorado Commission on Higher Education
State Services Building
Denver, Colorado 80203

Dear Dr. Abbott:

Attached is the report of the CCHE ADP Committee on Planning and Accountability. This report is the product of long and direct working relationships between representatives of the institutions, your staff and other interested State officers. We are pleased to know that your office supports this report as its 1974 plan for State-wide ADP in higher education.

Members of the Committee are:

Alvin Barnhart	University of Northern Colorado
A. R. Brown	Colorado School of Mines
John Chaney	University of Colorado - Boulder
Don Gage	University of Colorado - Colorado Springs
Jim Greer	Executive Budget Office
E. R. Krueger (Chr.)	University of Colorado - Boulder
B. W. Marschner	Colorado State University
Jim McLaughlin	SBCCOE
J. R. Pitsker	Denver Regional Computer Center
W. Richardson	Southern Colorado State College
Dave Satterley	CCHE
Owen Smith	Community College of Denver

In addition, Mr. Paul Shafer, Senior ADP Consultant of the Department of Administration, provided valuable information during the course of the plan's development.

Their participation and cooperation has enabled much progress to be made in the difficult area of establishing mechanisms for predicting and identifying needs for ADP resources. The Committee is convinced of the necessity of this effort because of the vital and integral part ADP plays in support of programs of instruction, research/development, administration and public service within the State institutions of higher education.

On behalf of the Committee, I also express great appreciation to yourself and other members of your staff including Mr. D. Satterley, Associate Coordinator of ADP. His direct involvement and dedication to this project have been invaluable.

Sincerely,

E. R. Krueger

ERK:gd
Attach.

1973-74 ADP PLAN

FOR

HIGHER EDUCATION

A Report Prepared by the CCHE
Committee on ADP Planning and Accountability

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ABSTRACT

This document reviews in summary fashion the current status of ADP centers, facilities and organizations in the State higher education system. The manner in which these service facilities support the institutions' programs for instruction, research and development, administration, and public service is presented. Particular attention is directed to mechanisms for determination of funding levels as well as controlling and coordinating utilization in expenditure of allocated resources.

An operational 1974 plan, commensurate with the 1968 five-year plan for higher education, is presented which is consistent with evolving State-wide ADP plans. Included is a rationale for recommended ADP funding levels for instruction, research and administration for fiscal 1973-74 including adequate mechanisms for control and measurement. This rationale is based on an empirical analysis of State-wide ADP funding with program support for all State institutions of higher education in Colorado. It is based on the number of students using computer resources and on institutions' instructional program budgets.

The 1974 higher education ADP plan has been defined to meet institutional program needs. Its modular facets supporting the programs of instruction, research, administration and public service include a recovery of program support curtailed in fiscal year 1973 and provides for State-wide expansion of service based on program needs to meet system goals and objectives. The key objectives of the plan covering the period 1974 through 1976 are:

- Increase student access from 15% to 40% of the total enrollment.

- Increase the number of student tasks processed by 200%.

- Increase administrative ADP support for improved response, better information management.

The total cost to General Fund of the plan in fiscal year 1974 from the 1973 base of $4,066,701 is $6,227,274. Of the $2,160,573 increase, $403,992 is identified as recovery from fund shortages in fiscal 1973. Estimated annual increments beyond fiscal 1974 to complete the plan through 1976 are $500,000.

The composite annual increase in service of 40% (in terms of numbers of jobs processed) across each of three years is based on an average annual increase in General Fund support of 15% across the

same period. The increase in service, with the requested increase in General Fund support, results in a decrease in unit task costs of over 18%. The projected dollar savings are a consequence of the existing hardware and personnel expertise base and a State-wide resource sharing plan. This plan, initiated in 1968, is now providing cost benefits.

General Fund support identified for 1973-74 with actual levels of support for 1971-72 and estimated support for 1972-73 (including the pending supplemental request) are shown in Table 1 and Figure 1 by program areas supported. Tables 2 and 3 are provided to show the source distribution of income to the system and expenditure distribution by the system respectively.

TABLE 1

GENERAL FUND SUPPORT BY FISCAL YEAR

	FY 72 (Actual)	FY 73 (Estimated)	FY 74 (Recommended)
Instruction	1,186,281	1,350,043	1,915,410
Research/Development	81,812	109,943	237,318
Administration	2,822,530	3,010,707	3,926,732
Security	--	--	147,814
TOTAL	4,090,623	4,470,693[1]	6,227,274

[1] Includes supplemental request (403,992) and 108,772 directly appropriated to C.U.

FIGURE 1

PERCENT OF GENERAL FUND SUPPORT TO PROGRAMS BASED ON COST ALLOCATION

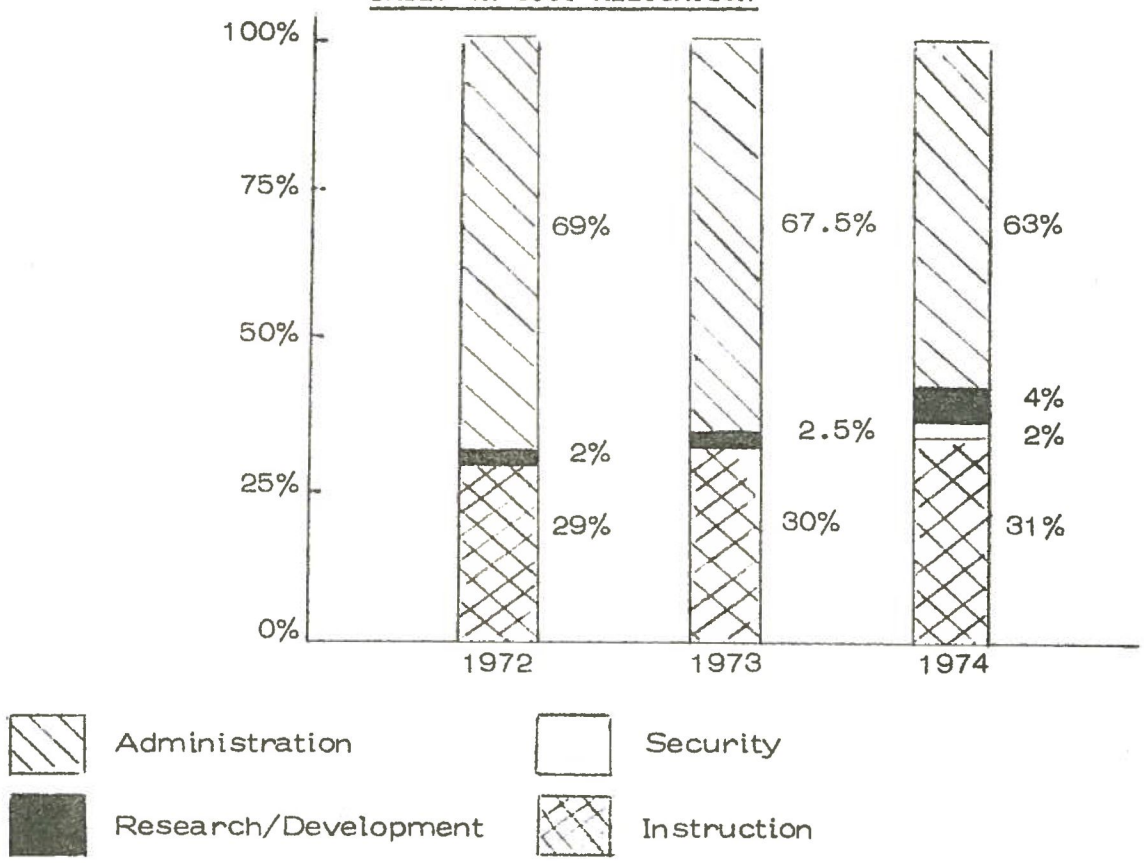


TABLE 2

FISCAL 1974 INCOME BY SOURCE

General Fund	6,227,274
Grant, Contract, etc.	2,170,391
Public Service	847,642
Gross Income	9,245,307
Less Inter-institutional Allocations	(828,392)
Net Income	8,416,915

TABLE 3

FISCAL 1974 EXPENSE BY CATEGORY

Personal Services	4,030,311
Equipment Expense	2,002,243
Other Operating	1,212,588
Capital Outlay	2,000,165
Gross Expense	9,245,307
Less Inter-institutional Allocations	828,392
Net Expense	8,416,915

INTRODUCTION

Institutions of higher education are established and maintained for the preservation, creation and dissemination of knowledge. In achieving these goals, computers have been introduced as a service entity to support the programs of instruction, research, and administration. The institutions have also provided computer service to the public.

The computing resources serve as tools of instruction, both in applications and as an object of study. They are utilized in undergraduate and graduate instruction. Thesis work, a facet of graduate instruction, is carried out on and about computers. Research, performed by faculty utilizing computers, creates new knowledge, much of which is of direct benefit to the public. Day to day institutional operations as well as long range planning require the use of computers as an aid to administration.

This document has been prepared to present the State-wide goals, objectives and plans for computing facilities in institutions of higher education for fiscal year 1974. The development of this material involves a review of current policies and procedures of computing resource allocation and control. The contents of this document include:

I. Background

   A. General

   B. Program Impact

   C. Management Control

II. Program Based Funding Analysis By Program

III. State-Wide Goals and Objectives

IV. State-Wide ADP Plans

I. BACKGROUND

A. General

- Computers have been utilized to meet the program goals in institutions of higher education in Colorado since 1962.

- Currently, eighteen (18) computers with various capabilities are operating to provide centralized services to the institutions.

- CHESS (Colorado Higher Education System Sharing) was instituted in 1968 as a concept to promote sharing of computing system resources among the institutions.

- Twenty three (23) remote batch terminals (card input, printer output) are now in use in the State higher education network system. The existing hardware resource network is shown in Fig. 2.

- Numerous hardware upgrades have been accomplished in line with the CHESS concept.

- Network system has developed in a manner compatible with national planning for higher education (NSF, EDUCOM).

- Interactive computing services are currently provided by three (3) institutions.

- Purchase value of installed hardware, as of 1 July 1972, was over $12,000,000.

- PROBLEM 1:

  Concerns about security of facilities, including system backup, has resulted in a security review and special request for fiscal 1974.

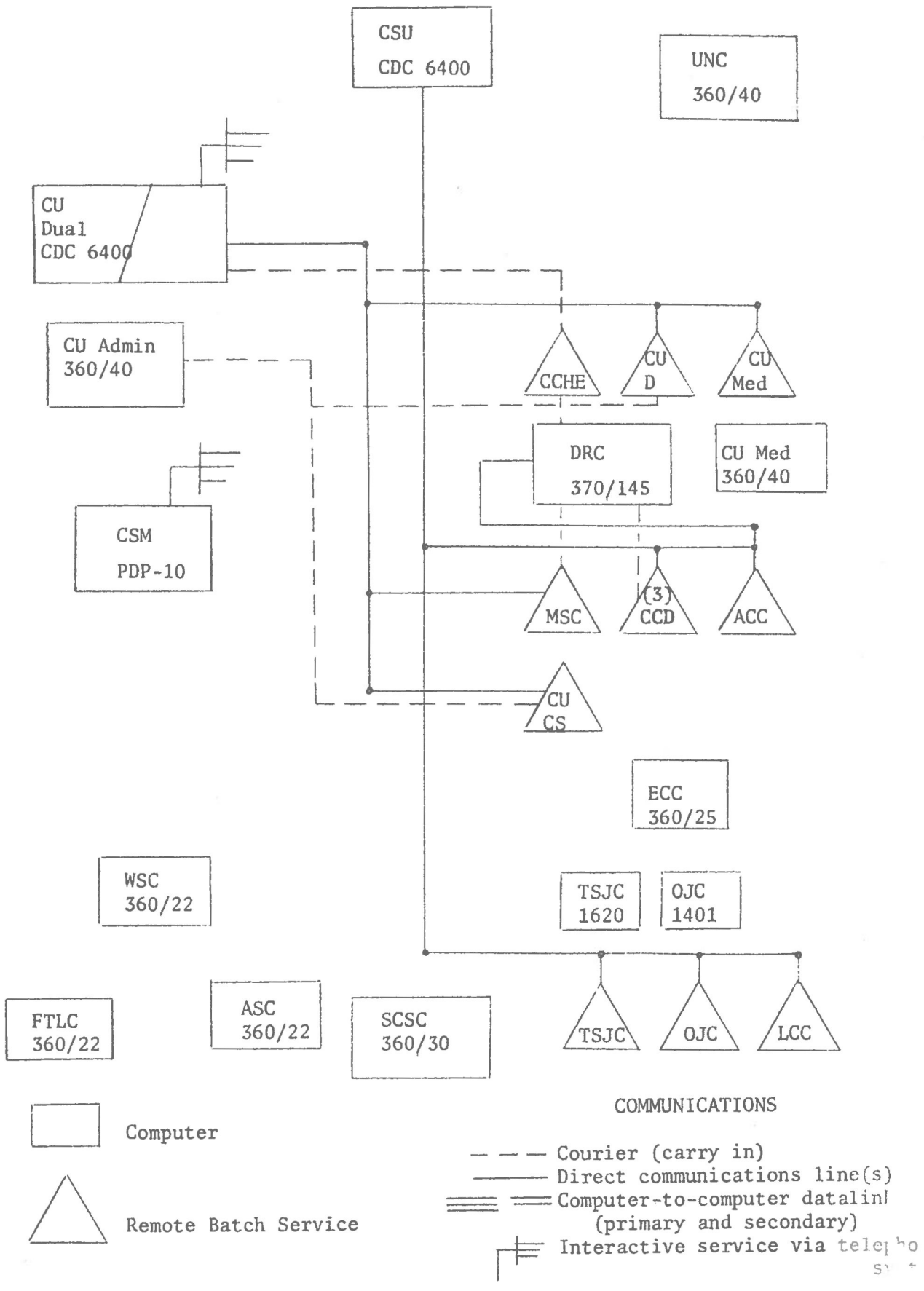
- Total ADP FTE personnel rostered through fiscal 1972 was 303.3.

- General Fund support reached $4,090,623 in fiscal 1972. Fiscal 1973 support is $4,066,701 (includes $108,772 directly appropriated to C.U.).

- Non-General Fund support has grown from $757,000 in 1968 to $1,860,000 in fiscal 1972. Growth has been due to the efforts of the institutions demonstrating their ability to attract financial support, primarily from Federal agencies.

FIGURE 2

STATEWIDE HIGHER EDUCATION ADP NETWORK 1972-73



- Effective fiscal 1973, General Fund appropriations to the institutions for State supported programs (instruction, administration) could not be expended for ADP services supporting these programs, contrary to policy in preceding years.

- PROBLEM 2:

  Fiscal 1973 funding level, and change in generated cash policy, has resulted in income levels less than anticipated by the CCHE and the Department of Administration. A supplemental request for General Fund support of $403,992 is necessary to meet this year's program obligation.

- PROBLEM 3:

  Justification of requested General Fund support has historically been resource oriented based heavily on equipment requirements without measuring the program needs or impact.

B. Program Impact

1. Instruction

- Student tasks processing by computer grow in number, based on program demand, by 30% to 40% annually.

- Expenditure/student user enrolled in a class varies by discipline and institution from $10 to $300.

- Colorado high school students who have accessed computers have almost totally utilized interactive (time sharing) systems. Students in higher education have almost totally been dependent on batch computer processing.

- Emphasis in the use of computers in instruction is shifting from teaching computer programming technology to teaching computer applications design, implementation and use. This direction is commensurate with industrial and governmental interests in seeking college educated personnel.

- Actual class headcount of students using computer resources in fiscal 1972 was 48,714. (One student user = one student enrolled in one class using the computer.) This measurement directly reflects the computer resources

required to serve instruction. For comparison, the number of individual students using computer resources was approximately 15% of the total higher education enrollment in fiscal 1972.

- PROBLEM 4:

  Planning for fiscal year 1973, based on instructional program justification, called for a student user class headcount of 66,015. These programs are not being met because of General Fund shortages. Computer support of some instructional programs will be terminated or curtailed in the Spring of 1973 due to these shortages.

- Resource sharing of hardware and library software for instruction has been initiated and is continuing among institutions.

2. Research/Development

- Numerous computer applications developed through research are increasingly being utilized in instruction as well as being applied beneficially by State agencies. The time between development of computer applications in research and their incorporation in undergraduate instruction is steadily decreasing and now is typically on the order of two to three years.

- Less than 10% of General Fund ADP support for instruction is expended for research/development computer usage. The majority of this activity is directly supported by the Federal government.

3. Administration

- Administrative tasks processed by computer grow in number each year, based on program demands, from internal and external sources.

- Fiscal 1972 expenditures, based on student headcount, vary by institution from $13 to $62 per student.

- Approximately two (2) cents of every institution instructional program dollar (line 105 CCHE Budget Schedule 600) is expended for administrative data processing.

- Resource sharing of software and hardware for administration is taking place among institutions.

- Administrative data processing is essential for the internal management of institutions of higher education and for the accurate and timely reporting to State and Federal agencies.

- The administration of higher educational institutions is concerned with financing, personnel and facilities. The computer can provide assistance in the management of each.

- PROBLEM 5:

  Appropriation of funds identified exclusively for ADP resources stifles administration flexibility to increase efficiency and effectiveness of its program. It separates from the institution administration proper control over one of its most vital management tools.

- Emphasis is shifting from uses of only a purely operational nature to analytically oriented systems and associated data bases to support planning and management, e.g., Comprehensive Analytical Methods for Planning in University Systems (CAMPUS), Resource Requirement Predicting Model (RRPM), student flow models and Statewide planning and management systems. This is also the case with business and government.

- Analytic tools for better planning and management in higher education are of such size and complexity that they usually must be computerized.

- Analytic tools for planning and management systems, such as those being developed by NCHEMS-WICHE, depend on an operational data base -- data developed from day to day operation of a college or university.

4. Public Service

- Institutional ADP resources have been used increasingly in support of other State agency programs. Prime examples include the Division of Highways and Department of Natural Resources.

- Minor commercial use of ADP resources has been made commensurate with the service mission of educational institutions without unfair competition to commercial ADP service bureaus.

C. Management and Control

- Coordination and control of ADP in higher education in Colorado is vested in the Colorado Commission on Higher Education and the Department of Administration (Chapter 3, Article 26, and Chapter 124, Articles 122-126, of the Colorado Revised Statutes as amended).

- Department of Administration is responsible for control of all State ADP.

- Commission on Higher Education is responsible to coordinate activities of the institutions of higher education.

- Fiscal 1973 funds were appropriated to CCHE, but approval authority for spending is vested with the Department of Administration.

- PROBLEM 6:

Division of authority from responsibility between the Department of Administration and CCHE impedes application of support to approved and recognized programs.

- PROBLEM 7:

Lack of definition of the extent and limitations of ADP and its terms, components and role allows for different interpretations by each agency at the expense of programs.

- PROBLEM 8:

The State government objective of program planning and budgeting systems and the resource oriented objective of management control result from interpretation of legislation. Separating the responsibility for program planning from resource oriented control places the two objectives in direct conflict with one another.

II. PROGRAM BASED FUNDING ANALYSIS BY PROGRAM

To interpret the relationship between resource and program based budgeting, an analysis has been performed of program support in 1971-72. This is the first year for which the appropriate and necessary data is available. The analysis by program leads to the program oriented budget recommendations of Section IV.

A. Instruction

- Based on data first available in 1971-72, student computing costs across the State system depend amost totally on the class headcount of student users. The fiscal 1972 performance showing dollar cost per student, as dependent on the number of students using the computer in each institution (composites are used for Adams, Western, and Fort Lewis and for the Community Colleges), is shown in Figure 3. Supporting data for the figure is given in Table 4.

TABLE 4
Fiscal 1972

Institution or Composite of Institutions	Student User Headcount[1]	Cost/Student User ($)
Adams/Western/Ft. Lewis Composite	564	140
Community College Composite (6)	3438	57+
Southern Colorado State College	1382	32+
University of Northern Colorado	2,054	35+
Metropolitan State College	2,500	31
Colorado School of Mines	6,965	25
Colorado State University	10,240	22+
University of Colorado	21,671	17+

[1] One student user = one student enrolled in one class.

COMPUTING COST PER STUDENT
FISCAL YEAR 1972

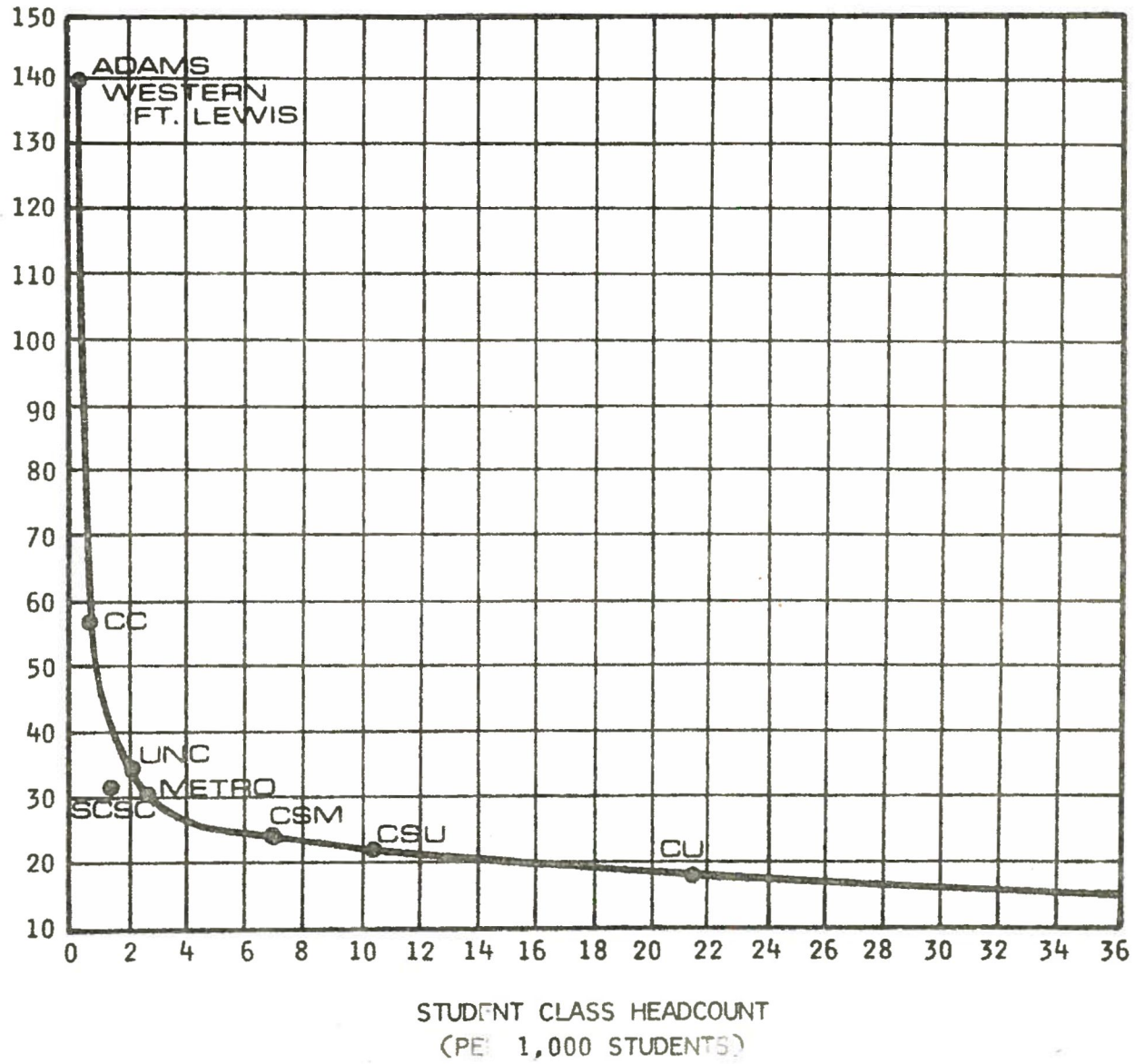


FIGURE 3

- The curve shown in Figure 3 is mathematically derived and therefore can easily be updated on an annual basis to take into account cost of living increases and quality work-load increases (a student user in 1975 will generally use more computer resources in his course work than a student user did in 1972).

- This initial model is limited in that it does not provide a mechanism to measure costs of quality work-load increases. These costs depend on hardware, software and personnel as well as the magnitude and complexity of student use.

- Batch and interactive (time sharing) use are integrated in the cost/student figures. Although interactive usage results in a higher cost/job, based on existing data, the cost/student user is comparable with batch service cost/student user.

- The curve demonstrates economy of scale and the impact of start-up costs to initiate student computer access in the institutions (the Adams/Western/Fort Lewis composite is projected to have costs approaching $50/student in fiscal 1974).

- Using the curve updated for cost of living increases at 3% annually, and CCHE Budget Schedule 124 (student user class headcount data), recommended levels of computer support for instruction can be predicted.

- Data Comparison with institutions outside of Colorado shows excellent agreement. Included have been University of Washington, University of Iowa, Iowa State University and University of Texas.

- Funding of student computer usage, based on this model, provides direct motivation for the computing centers to meet program needs.

B. Research/Development

- Since computer applications from research/development directly improve computer usage in instruction, the level of support for research/development should be continued as a percentage of instructional computer support in the same manner as General Funded research faculty are supported.

C. Administration

- On the average, approximately 2% of every institutional instructional program dollar was applied for administrative

ADP support in fiscal 1972. This correlation is shown in Figure 4 with supportive data in Table 5.

- Use of 2% of the institutional instructional program dollars for base support of administrative ADP establishes a direct and predictable cost relationship.

- Institutional planning and management is defined as "the emphasis an institution gives to planning, management, resource allocation decisions and the utilization of resources" (National Center for Higher Education Management Systems, Program Classification Structure). Support by the institutions and State of improved management is logically related to institution budgets. Support for administrative ADP is support for better management.

- Acceptance of the relationship with institutional budgets and use of CCHE Schedule 125 (Administrative Usage of Data Processing Services) provides a mechanism for appropriation of administrative ADP support with direct total funding control and places application system funding, e.g., an equipment inventory system, in the user's office.

- Funding of user applications would be based on cost/benefit relationships. The decision of whether a given system should be computerized or whether it should be operated in a clerical mode, or perhaps not operated at all, is highly dependent upon a determination of the relative costs and benefits associated with each mode of operation. This issue would be resolved by cost/benefit analysis.

- A study of each major request for a new user application system would be made by the institution in order to provide management sign-off capability and cost/benefit justification. By use of criteria established by the CCHE ADP Advisory Board, levels of cooperative development and sharing of systems would be carried out via the CHESS concept.

- Base level funding would include current system costs with new acquisitions or up-grades, to support user applications, based on the total load requirements of all user departments with appropriate review by State agencies commensurate with State planning.

- Measure of productivity and cost effectiveness is not well defined by this process, but it does allow improved resource

utilization based on management's analysis of program needs, criteria for such measurement to be established by the CCHE ADP Advisory Board.

- Flexibility of the system is dependent upon the accepted definition of ADP and its scope. This should permit reduction of clerical functions to establish savings or permit reallocation to other functions, including administrative ADP where cost effective. Such a model provides direct motivation to be efficient.

D. Summary

The above analysis provides justifiable stability and bounds to funding support levels for the institutions' programs. For example, if 100,000 students enrolled in institutions of higher education utilized computing resources in their course work and if the average cost/student was $25, the total direct general fund requirement would be $2,500,000 to meet ADP support needs.

The fiscal 1974 general fund recommendations in this plan are based on student class headcount request data (CCHE Budget Schedule 124) to specify ADP support for instruction (research/development is based on a percentage of this recommendation) and CCHE recommended institutional instructional program support levels for administrative ADP services. The ADP recommendations are given in Table 6.

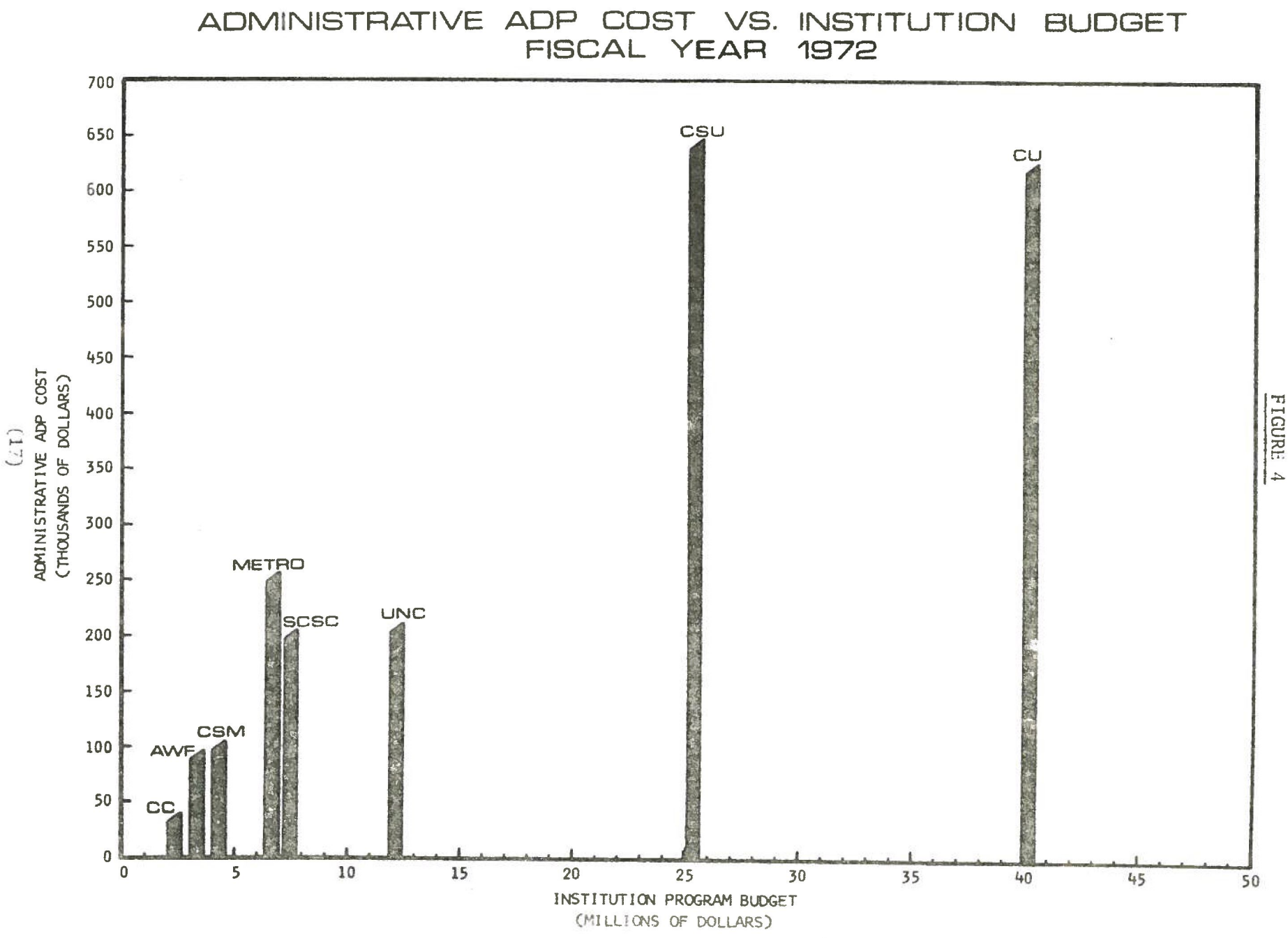

ADMINISTRATIVE ADP COST VS. INSTITUTION BUDGET
FISCAL YEAR 1972
ADMINISTRATIVE ADP COST
(THOUSANDS OF DOLLARS)
INSTITUTION PROGRAM BUDGET
(MILLIONS OF DOLLARS)
CC
AWF
CSM
METRO
SCSC
UNC
CSU
CU
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
0
5
10
15
20
25
30
35
40
45
50

FIGURE 4

TABLE 5

Fiscal Year 1972

Institution or Composite of Institutions	Instructional Program Budget ($) [1]	Administrative ADP Budget ($) [2]	Percent
Adams/Western/Ft. Lewis composite average	3,312,959	91,342	2.7
Community Colleges composite average (6)	2,225,180	35,846	1.6
Southern Colorado State College	7,373,715	198,581	2.7
University of Northern Colorado	12,144,639	206,856	1.7
Metropolitan State College	6,655,599	252,221	3.7
Colorado School of Mines	4,389,650	100,209	2.3
Colorado State University	25,356,904	642,017	2.5
University of Colorado (Boulder, Denver, Colorado Springs)	40,095,559	622,522	1.6

(1) From line 105 of CCHE Budget Schedule 600.

(2) From line 55 of CCHE Budget Schedule 454. Includes $75,000 (estimated) for machine time cost at U. of C. Medical Center for services provided to Metropolitan State College.

TABLE 6

Fiscal 1974 ADP Recommendations By Program

	Total Headcount Request	Total Headcount Recommended	General Fund Recommendations ($)	Average Cost Per Student
Instruction	78,271	78,271	1,915,410	$24.47
Research[1]			237,318	

	Total Institutional Instruc. Program Request	Total Institutional[2] Instruc. Program Recommended ($)		Total Recommended Admin. ADP as a % of Total Recommended Instructional Program
Administration	--	166,374,672	3,926,732	2.3%
Security			147,814	
		TOTAL	6,227,274	

[1] General fund support of research based on institutional requests is 12% of recommended instructional support.

[2] CCHE recommended institutional instruction program budget (CCHE Budget Schedule 600, line 105). Includes appropriate C.U. Medical Center program budget of $32,271,585.

III. STATE-WIDE ADP GOALS AND OBJECTIVES

The identified problems and needs associated with the ADP support services have provided the direction for the goals, objectives and plans in the short term. Critical in formulation of this material has been consideration of those problems, solution of which is dependent on legislation and agency control. To address these problems, it is specifically recommended that legislative action be initiated to restore authority to the institutions of higher education who are responsible for executing programs. This action must recognize that institutional ADP services support academic programs and must define a control mechanism compatible with the planning and budgeting concept. The action must include CCHE coordination while allowing institutional flexibility in management of resources to obtain most efficient use of ADP services. Specifically, the institutions should be allowed to expend funds appropriated for administration and resident instruction for ADP services. The legislative action is necessary for the accomplishment of the State-wide institutional ADP goals.

The generalized goal of initiating a program oriented budgeting approach, with the attendant objective of basing the 1974 General Fund support level on the analysis of Section II, meets facility needs and addresses recognized programs. The special problem of security of computer sites with recommended action is identified. Other goals and objectives are identified by program below.

A. Goals - Fiscal 1974 through 1976

1. Instruction

- Each student should have the opportunity to obtain a general understanding of computers, their organization, applications, limitation and impact on society.

- Each student should have the opportunity to study the computer and apply the computer in a manner and to the extent pertinent to his course of study.

- Adequate batch and interactive computer resources (hardware, software, personnel and instructional programs) should be made available both to meet the above two goals and to maintain the level of education commensurate with the standards existing nationally, utilizing networks to achieve this goal as necessary.

- The student and faculty member should have access to computer resources appropriate to his course of study and discipline regardless of his institutional affiliation.

2. Research/Development

- Use of the computer as a research tool to create new knowledge is a necessary function of higher education. Faculty should have access to computer resources appropriate to their research areas.

3. Administration

Through coordinated instituional activity, administrative data processing should meet State-wide needs as follows:

- Continue and improve support of operations and management functions.

- Administrative computing which will serve the reporting needs of the institution and State in the most cost effective manner.

- Continue and expand development of data base oriented planning models, e.g., CAMPUS, to provide improved planning capability.

- Increase emphasis on State-wide planning and management systems.

- Continue to evaluate and implement existing applications both within the State and available from other sources, including College and University Systems Exchange (CAUSE) and the National Center for Higher Education Management Systems (NCHEMS) at the Western Interstate Commission for Higher Education (WICHE).

- Continue to study and define specific coordinating activities to serve the needs of the institution and objectives of the State.

- Reduce the mounting costs of clerical processing to achieve net savings.

- Continue development of required standard data elements to increase the effectiveness of institutional reporting to State agencies.

4. Public Service

- Cooperative efforts in ADP with Federal, State and local agencies should be encouraged so as to supplement each

institution's educational activities and be of direct benefit to the citizens of the State.

- Cooperative efforts in ADP with industry should be encouraged when oriented toward benefiting the institutional goals in instruction, research and administration.

B. Objectives

1. Instruction

- Increase student access to 78,271 student users (one student enrolled in one class using the computer = one student user) in fiscal 1974.

- Plan for 40% of the student enrollment to be accessing computers in meeting course requirements in fiscal 1976.

- Continue facilities sharing via the CHESS concept -- in particular extending of existing hardware systems, specifically interactive capabilities for instruction oriented usage.

2. Research/Development

- Increase percentage of research/development ADP support based on the instruction ADP level of support to 13% so as to encourage development of new material applicable to the programs of instruction.

3. Administration

- Continue facilities sharing (hardware, software, personnel) via the CHESS concept.

- Review consolidation of resources both inter- and intra-institutional.

- Study cost effectiveness of administrative ADP resources specifically seeking measurement of impact on administrative programs.

- Increase the emphasis on administrative computing as a management tool as well as support to operations.

- Increase support of the concept that given the necessary technological, operational, financial, procedural and political parameters, economies of scale can be achieved

in levels of hardware and staff sharing and software coordination through in-depth knowledge of each institution's requirements.

- Study of a spectrum of cooperative ventures in relation to specific evaluation criteria, e.g., increased user productivity, increased reliance of data, increased ability to response to change, and cost which are more effective than those now incurred.

- Expansion of the benefits of management information and administrative ADP services where cost effective.

4. Public Service

- Establish uniform procedures for serving State and local agencies across the State-wide higher education ADP systems.

IV. STATE-WIDE ADP PLANS

A. General

Based on a funding level depending on program needs, the general plans for ADP in institutions of higher education include:

i) Expanded resource sharing involving hardware networking utilizing "front end" computers. Both batch and interactive services to be increased in support of all programs.

ii) Assign to the CCHE ADP Advisory Board the responsibility of further study and enhancement of the program planned budgeting approach defined in this document. In addition, the Board will study implications and make policy recommendations to the Commission for improving the efficiency and effectiveness of State-wide institutional ADP resources. Topics for consideration include charging, administrative library applications/dictionary standards, hardware utilization criteria, resource sharing policy and procedures, definition of measures of productivity and cost effectiveness and criteria for levels of cooperative developmental activities. Working subcommittees will be established to carry out necessary tasks. The current Planning and Accountability Committee is considered as a standing subcommittee to the Board.

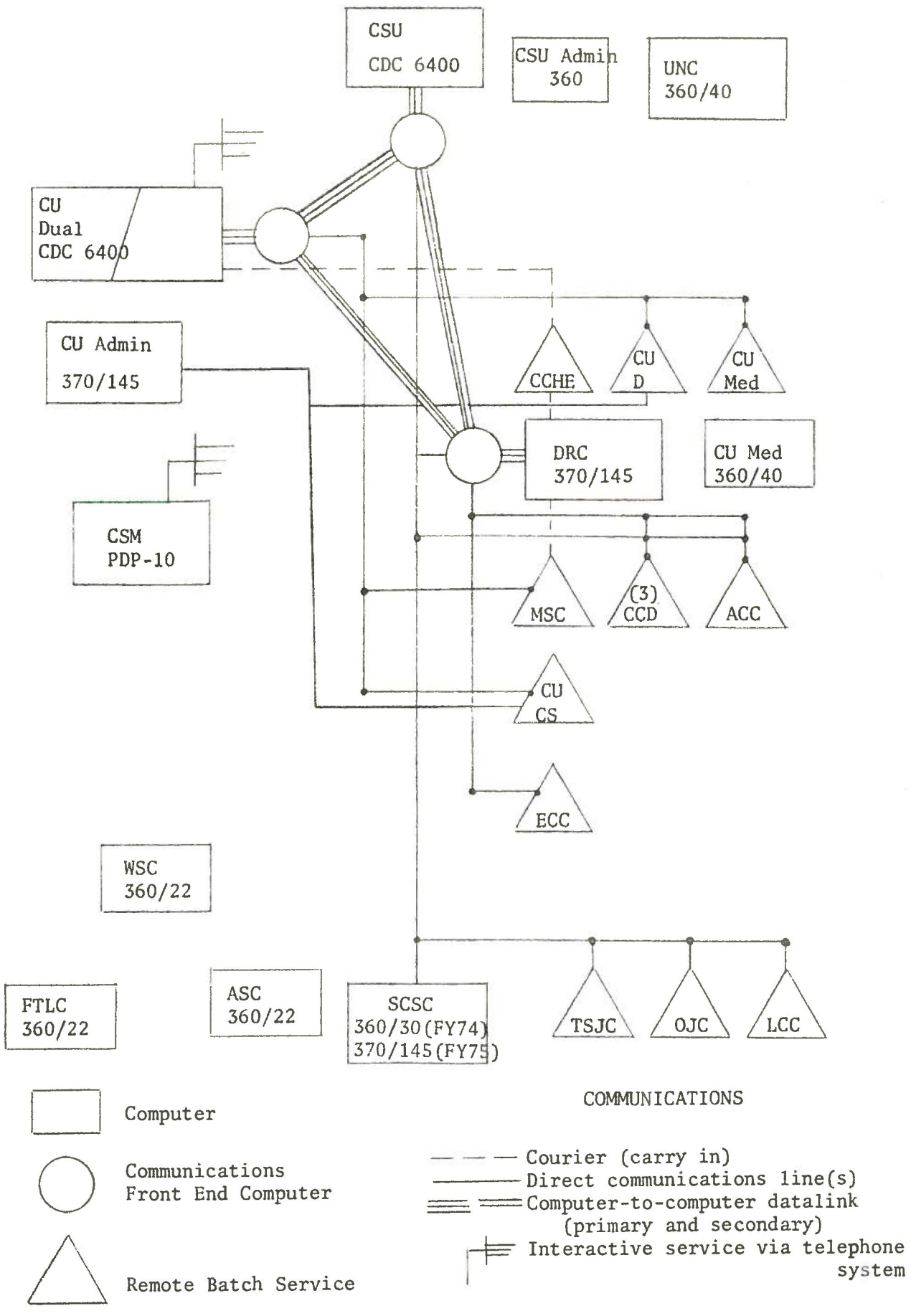
The term "ADP (Automated Data Processing) Services is interpreted in this plan to mean:

"Those institutionally centralized computing/data processing services provided to departments and institutes on an institution-wide basis. Resources identified in providing these services are hardware and personnel (centrally housed and administered) associated with processing, operating, maintaining operating systems, designing, developing and maintaining institutionally generalized applications systems. All currently recognized institutional ADP facilities are included in this interpretation. Although special purpose capabilities - personnel, software and/or hardware - are developed or acquired and maintained by individual departments to provide efficient and effective service to their programs, these facilities are not included in the interpretation." (Coordination of these activities on an institution and State-wide basis (through the CCHE) is recognized, however, as necessary of a program basis for overall system efficiency.)

The fiscal year 1973-74 plan provides for the addition of the following resources:

FIGURE 5

STATEWIDE HIGHER EDUCATION ADP NETWORK 1973-75



i) Addition of two (2) "front end" computers to control network communications. Continue utilization of a front end computer at the Denver Regional Center. Figure 5 shows the planned 1973-75 network system. Long range network planning is included in Appendix D.

ii) Addition of one (1) medium scale computer system in support of administrative programs. This system will increase processing power (8%) and improve the technological capability available to the State institutions of higher education. As an ancillary benefit, the proposed system will serve as a backup system to the Denver Regional Center.

iii) Addition of 55.2 FTE in the ADP services groups as operators, programmers/analysts and support personnel.

Plans, by program, for fiscal 1973-74 follow.

1. Instruction ($1,915,410 General Fund to support batch and interactive instructional services)

   - Installation of fifty-two (52) interactive terminals and five (5) batch terminals in support of the programs of instruction as requested by institutions, compatible with program budgeting.

   - Expand use of CAI (Computer Aided Instruction) to institutions both within the institutions currently utilizing this capability as well as to institutions interested in utilizing this capability.

   - Support library applications development coordinated through inter-institutional working committees and the ADP Advisory Board.

   - Install limited hardware additions (central memory, disk, communications equipment) as required in support of the programs of instruction so as to provide relatively continuous upgraded capabilities.

2. Administration ($3,926,732 General Fund to support administrative programs)

   - Install hardware to enable network access for all campuses of the University of Colorado and to broaden uniformity of systems to include Colorado State University. This component of the plan includes

installation of a medium scale computer system at the University of Colorado with attendant hardware upgrades at other sites through shifts in existing hardware. The hardware shifts will be a major factor in achieving greater system uniformity.

- Intra-campus terminal access at the University of Colorado, University of Northern Colorado and Southern Colorado State College will be achieved by installation of communications equipment in support of program needs.

- Continue support of ADP Advisory Board activities in the administrative areas including library applications and dictionary standards development.

3. Research ($237,318 General Fund, $2,170,391 Federal and other to support research programs)

- Catalog institutional computing oriented research projects so as to maximize benefits to the institutions, agencies and public at large. Coordinate this activity through the ADP Advisory Board.

4. Public Service ($847,642generated cash in support of public programs)

- Encourage utilization of higher education ADP resources to serve the State high schools through the proposed HITIE networking project.

- Continue to serve Federal, State and local agencies and industry commensurate with institutional goals.

5. Security ($147,814 General Fund)

- Improve physical security of computer sites in line with legislative intent and institution requests. System backup is also provided through program planning for two sites not currently protected in this manner.

B. Plans by Institution

COMMUNITY COLLEGE OF DENVER

The Community College of Denver has requested an FTE increase of 8.5. These are to enhance the capability of the programming staff and operations. The three campuses of CCD present a problem for the operation of the COTIE program and require operators at each site in order to offer maximum student utilization. A systems analyst is requested to provide guidance in systems development as the institution seeks to take advantage of the capabilities of the Denver Regional Center.

Terminal capability has been recommended to accommodate the development of administrative systems.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	11.0	19.5	8.5
GENERAL FUND	289,534	463,874	174,340
OTHER	-	-	-
TOTAL FUNDS	289,534	463,874	174,340

COMMUNITY COLLEGE DENVER

Rec. Type		Rec. Type	1 Actual 1971-72		2 Estimated 1972-73		3 Requested 1973-74		4 Recommended 1973-74	
			FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.	Salaries, Administrative	1.	1.0	15,600	1.0	17,000	1.0	18,700		
2.	Salaries, Systems Analysts	2.					1.0	11,000		
3.	Salaries, Programmers	3.	1.0	13,970	4.0	48,255	6.0	74,681		
4.	Salaries, Operations Personnel	4.	2.6	12,011	3.0	15,000	5.0	29,500		
5.	Salaries, Cler./Technical	5.					1.0	6,000		
6.	Hourly Wages	6.	2.2	11,618	3.0	16,800	5.5	34,428		
7.	Overtime Payments	7.								
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	6.8	53,199	11.0	97,055	19.5	172,309		
10.	Benefits, Administrative	10.		1,647		1,921		2,139		
11.	Benefits, Systems Analysts	11.						1,354		
12.	Benefits, Programmers	12.		1,475		5,645		9,012		
13.	Benefits, Operations Personnel	13.		1,346		1,635		3,108		
14.	Benefits, Cler./Technical	14.						630		
15.	Sub Total, Benefits	15.		4,468		9,201		16,243		
16.	Sub Total, Personal Services	16.	6.8	57,667	11.0	106,256	19.5	188,552	19.5	176,811
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.								
19.	Electronic Data Processing Equip.	19.		43,347				41,000		41,000
20.	Data Transmission Equipment	20.								
21.	Data Creation Equipment	21.		6,603		1,776		18,384		18,384
22.	Auxiliary Storage Equipment	22.								
23.	Equipment Overtime & Maintenance	23.		2,109		1,152		5,877		5,877
24.	Lease Time	24.				4,500		18,000		18,000
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		52,059		7,428		83,261		83,261
27.	Other Operating Expenses:	27.				360		6,300		6,300
28.	Denver Regional Computer Ctr.	28.		19,020		77,778		93,236		
29.	Other Contracts	29.								
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		467		1,000		4,960		1,000
33.	Supplies and Expenses	33.		2,729		3,381		11,730		8,367
34.	Sub Total, Other Operating Expenses	34.		22,216		82,519		116,226		108,903
35.	TOTAL DATA PROCESSING EXPENSES	35.	6.8	131,942	11.0	196,203	19.5	388,039	19.5	368,975

COMMUNITY COLLEGE DENVER

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.	89,727	93,331	94,899	94,899
44.	Sub Total Data Processing Cap. Outlay	44.				
45.	TOTAL DATA PROCESSING COST	45.	221,669	289,534	482,938	463,874
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				169,896
49.	Research/Development	49.				
50.	Administration	50.				293.978
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				463,874
58.	Other(1)	58.				
59.						
60.	TOTAL FUNDS		221,669	289,534	482,938	463,874

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

EL PASO COMMUNITY COLLEGE

El Paso Community College has requested the addition of 1 programmer and 1 operations person. In the past, El Paso has had its programming done by the ADP director and others. Administrative demands and control lead to the recommendation that the programmer position be filled. Increased data input require an additional person in the operations area.

El Paso has had a computer that, in the past, has been funded jointly by the State and by a Federal program. Early this year, the Federal program was terminated and, as a consequence, the present computer will be replaced by a smaller device that will be serviced by the Denver Regional Computer Center. The CCHE recommendation is to continue the present computer 3 months into FY 1973-74 while, at the same time, the replacement device is being debugged. This will allow the institution to have continuous, uninterupted service during the transition. At this time, the exact device has not been selected, so some reallocation within the institution's expense categories may be necessary at a later date.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	4.0	6.0	2.0
GENERAL FUND	104,027	99,817	(4,210)
OTHER	14,650	21,468	6,818
TOTAL FUNDS	118,677	121,285	2,608

EL PASO COMMUNITY COLLEGE

R... Type		Rec. Type	1	
			Actual 1971-72	
			FTE	Amount
1.	Salaries, Administrative	1.	1.0	13,548
2.	Salaries, Systems Analysts	2.		
3.	Salaries, Programmers	3.		
4.	Salaries, Operations Personnel	4.	3.0	16,762
5.	Salaries, Cler./Technical	5.		
6.	Hourly Wages	6.		
7.	Overtime Payments	7.		
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.	4.0	30,310
10.	Benefits, Administrative	10.		1,490
11.	Benefits, Systems Analysts	11.		
12.	Benefits, Programmers	12.		
13.	Benefits, Operations Personnel	13.		1,668
14.	Benefits, Cler./Technical	14.		
15.	Sub Total, Benefits	15.		3,158
16.	S... Total, Personal Services	16.	4.0	33,468
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		5,983
19.	Electronic Data Processing Equip.	19.		67,960
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		5,446
22.	Auxiliary Storage Equipment	22.		
23.	Equipment Overtime & Maintenance	23.		
24.	Lease Time	24.		
25.	Equipment Amortization	25.		
26.	Sub Total Equipment Expense	26.		79,389
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		
32.	Travel	32.		500
33.	Supplies and Expenses	33.		4,125
34.	S... Total, Other Operating Expenses	34.		4,625
35.	... DATA PROCESSING EXPENSES	35.	4.0	117,482

2		3		4	
Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
FTE	Amount	FTE	Amount	FTE	Amount
1.0	14,400	1.0	15,552		
		1.0	9,624		
3.0	17,627	4.0	25,348		
4.0	32,027	6.0	50,524		
	1,656		1,789		
			938		
	1,858		2,635		
	3,514		5,362		
4.0	35,541	6.0	55,886	6.0	55,431
	594		594		
	26,394		19,908		
	5,446		8,006		
	32,434		28,508		28,508
	500		750		750
	4,500		5,000		4,949
	5,000		5,750		5,709
4.0	72,975	6.0	90,144	6.0	89,648

EL PASO

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center(2)	43.				
44.	Sub Total Data Processing Cap. Outlay	44.		45,702	31,637	31,637
45.	TOTAL DATA PROCESSING COST	45.	117,482	118,677	121,781	121,285
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				43,313
49.	Research/Development	49.				
50.	Administration	50.				56,504
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				21,468
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.		104,027	99,817	99,817
58.	Other(1)	58.		14,650	21,468	21,468
59.						
60.	TOTAL FUNDS		117,482	118,677	121,781	121,285

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

(2) DRCC funds will be reallocated to enable usage when terminal access is accomplished.

OTERO JUNIOR COLLEGE

Otero Junior College has requested 3.3 FTE for FY 1973-74. This is a continuation of present staffing and is supported by the CCHE. Current equipment and other operating expense has increased primarily due to anticipated use of the Denver Regional Computer Center.

The Capital Outlay increase for Otero Junior College consists of recommended expenditure for support of the COTIE program and the Denver Regional Center Capital Outlay allocation.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	3.3	3.3	-
GENERAL FUND	53,108	69,869	16,761
OTHER	—	1,000	1,000
TOTAL FUNDS	53,108	70,869	17,761

OTERO JUNIOR COLLEGE

Rec. Type		Rec. Type	1 Actual 1971-72		2 Estimated 1972-73		3 Requested 1973-74		4 Recommended 1973-74	
			FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.	Salaries, Administrative	1.	.5	6,512	.5	6,825	.5	7,046		
2.	Salaries, Systems Analysts	2.	.8	8,389	.8	8,882	.8	9,248		
3.	Salaries, Programmers	3.								
4.	Salaries, Operations Personnel	4.	.8	5,174	1.0	6,705	1.0	7,036		
5.	Salaries, Cler./Technical	5.	1.0	6,179	1.0	6,490	1.0	6,813		
6.	Hourly Wages	6.	.1	896						
7.	Overtime Payments	7.		9		25		25		
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	3.2	27,159	3.3	28,927	3.3	30,168		
10.	Benefits, Administrative	10.		704		790		811		
11.	Benefits, Systems Analysts	11.		942		1,075		1,110		
12.	Benefits, Programmers	12.								
13.	Benefits, Operations Personnel	13.		500		690		718		
14.	Benefits, Cler./Technical	14.		526		552		699		
15.	Sub Total, Benefits	15.		2,672		3,107		3,338		
16.	Sub Total, Personal Services	16.	3.2	29,831	3.3	32,034	3.3	33,506	3.3	33,273
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.		1,315		557		1,257		1,257
19.	Electronic Data Processing Equip.	19.		4,641		4,641		4,641		4,641
20.	Data Transmission Equipment	20.						416		416
21.	Data Creation Equipment	21.		4,161		4,946		4,946		4,946
22.	Auxiliary Storage Equipment	22.								
23.	Equipment Overtime & Maintenance	23.						831		831
24.	Lease Time	24.				3,000		3,000		3,000
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		10,117		13,144		15,091		15,091
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.				1,111		7,436		7,436
29.	Other Contracts	29.								
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		685		700		700		700
33.	Supplies and Expenses	33.		2,172		2,359		3,000		2,979
34.	Sub Total, Other Operating Expenses	34.		2,857		4,170		11,136		11,115
35.	TOTAL DATA PROCESSING EXPENSES	35.	3.2	42,805	3.3	49,348	3.3	59,733	3.3	59,479

OTERO

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.			2,280	2,280
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.			3,045	3,045
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.			500	500
43.	Denver Regional Computer Center	43.			5,564	5,564
44.	Sub Total Data Processing Cap. Outlay	44.	18,249	3,760	11,389	11,389
45.	TOTAL DATA PROCESSING COST	45.	61,054	53,108	71,122	70,868
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				11,261
49.	Research/Development	49.				570
50.	Administration	50.				58,038
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				1,000
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				69,869
58.	Other(1)	58.				1,000
59.						
60.	TOTAL FUNDS		61,054	53,108	71,122	70,869

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

TRINIDAD STATE JUNIOR COLLEGE

Trinidad State College has requested 3.2 FTE for FY 1973-74. This is a net reduction of .8 FTE and results from a reduction of 1.0 FTE in operations personnel and the addition of .2 FTE in hourly wages. Other operating expenses have been increased by an assignment of the Denver Regional Center operating expenses based upon the anticipated use of that facility by Trinidad.

The Trinidad Capital Outlay figure consists of support money for the COTIE program and the Denver Regional Center.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	4.0	3.2	(.8)
GENERAL FUND	53,653	92,473	38,820
OTHER	-	-	-
TOTAL FUNDS	53,653	92,473	38,820

TRINIDAD JUNIOR COLLEGE

Rec. Type		Rec. Type
1.	Salaries, Administrative	1.
2.	Salaries, Systems Analysts	2.
3.	Salaries, Programmers	3.
4.	Salaries, Operations Personnel	4.
5.	Salaries, Cler./Technical	5.
6.	Hourly Wages	6.
7.	Overtime Payments	7.
8.	Night Differential	8.
9.	Sub Total, Salaries and Wages	9.
10.	Benefits, Administrative	10.
11.	Benefits, Systems Analysts	11.
12.	Benefits, Programmers	12.
13.	Benefits, Operations Personnel	13.
14.	Benefits, Cler./Technical	14.
15.	Sub Total, Benefits	15.
16.	Sub Total, Personal Services	16.
17.	Equipment Expense:	17.
18.	Electric Accounting Machines	18.
19.	Electronic Data Processing Equip.	19.
20.	Data Transmission Equipment	20.
21.	Data Creation Equipment	21.
22.	Auxiliary Storage Equipment	22.
23.	Equipment Overtime & Maintenance	23.
24.	Lease Time	24.
25.	Equipment Amortization	25.
26.	Sub Total Equipment Expense	26.
27.	Other Operating Expenses:	27.
28.	Denver Regional Computer Ctr.	28.
29.	Other Contracts	29.
30.	Building Rental	30.
31.	Adm./Research Overhead(See Instructions)	31.
32.	Travel	32.
33.	Supplies and Expenses	33.
34.	Sub Total, Other Operating Expenses	34.
35.	TOTAL DATA PROCESSING EXPENSES	35.

1		2		3		4	
Actual 1971-72		Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.0	13,872	1.0	14,556	1.0	15,721	1.0	
1.0	7,356	2.0	13,228	1.0	8,110	1.0	
.9	3,000	1.0	3,330	1.2	5,492	1.2	
2.9	24,228	4.0	31,114	3.2	29,323	3.2	
	1,516		1,577		1,744		
	526		657		446		
	2,042		2,234		2,190		
2.9	26,270	4.0	33,348	3.2	31,513	3.2	30,919
	7,842		7,842		7,842		7,842
			2,766		3,326		3,326
					831		831
			1,500		3,000		3,000
	7,842		12,108		14,999		14,999
			1,111		19,448		19,448
	650		520		550		550
	8,080		5,232		9,132		8,960
	8,730		6,863		29,130		28,958
2.9	42,842	4.0	52,319	3.2	75,642	3.2	74,876

TRINIDAD

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.	16,413			
39.	Data Transmission Equipment	39.			3,045	3,045
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.		1,334	14,552	14,552
44.	Sub Total Data Processing Cap. Outlay	44.	16,413	1,334	17,597	17,597
45.	TOTAL DATA PROCESSING COST	45.	59,255	53,653	93,239	92,473
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				41,548
49.	Research/Development	49.				
50.	Administration	50.				50,925
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				92,473
58.	Other(1)	58.				
59.						
60.	TOTAL FUNDS		59,255	53,653	93,239	92,473

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

LAMAR JUNIOR COLLEGE

The ADP operating budget request for Lamar Junior College is generally the same as for the previous year. The 1.7 FTE requested and recommended for FY 1973-74 shows no increase over the FY 1972-73 staffing.

The Capital Outlay portion shows the institution's costs to support the COTIE program in which it participates. Also, a portion of the Denver Regional Center Capital Outlay Expense has been allocated on an anticipated use of that facility by Lamar.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	1.7	1.7	-
GENERAL FUND	24,085	37,717	13,632
OTHER	-	-	-
TOTAL FUNDS	24,085	37,717	13,632

LAMAR JUNIOR COLLEGE

Rec. Type		Rec. Type	1 Actual 1971-72 FTE	1 Actual 1971-72 Amount
1.	Salaries, Administrative	1.	.3	5,180
2.	Salaries, Systems Analysts	2.		
3.	Salaries, Programmers	3.	.5	3,625
4.	Salaries, Operations Personnel	4.	.5	3,625
5.	Salaries, Cler./Technical	5.		
6.	Hourly Wages	6.	.2	759
7.	Overtime Payments	7.		
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.	1.5	13,189
10.	Benefits, Administrative	10.		539
11.	Benefits, Systems Analysts	11.		
12.	Benefits, Programmers	12.		
13.	Benefits, Operations Personnel	13.		423
14.	Benefits, Cler./Technical	14.		423
15.	Sub Total, Benefits	15.		1,385
16.	Sub Total, Personal Services	16.	1.5	14,574
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		
19.	Electronic Data Processing Equip.	19.		
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		
22.	Auxiliary Storage Equipment	22.		
23.	Equipment Overtime & Maintenance	23.		1,485
24.	Lease Time	24.		2,417
25.	Equipment Amortization	25.		
26.	Sub Total Equipment Expense	26.		3.902
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		
32.	Travel	32.		4,310
33.	Supplies and Expenses	33.		1,055
34.	Sub Total, Other Operating Expenses	34.		5,365
35.	TOTAL DATA PROCESSING EXPENSES	35.	1.5	23,841

2		3		4	
Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
FTE	Amount	FTE	Amount	FTE	Amount
.5	6,011	.5	7,150		
.5	3,900	.5	4,050		
.5	3,900	.5	4,050		
.2	2,000	.2	2,000		
1.7	15,811	1.7	17,250		
	655		793		
	480		519		
	480		519		
	1,615		1,831		
1.7	17,426	1.7	19,081	1.7	17,290
	1,500		1,800		1,800
			3,000		3,000
	1,874		2,734		2,734
	3,374		7,534		7,534
	1,111		4,862		4,862
	300		300		300
	400		1,000		906
	1,811		6,162		6,068
1.7	22,611	1.7	32,777	1.7	30,892

LAMAR

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				3,045
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				2,734
44.	Sub Total Data Processing Cap. Outlay	44.	16,653	1,474	6,825	6,825
45.	TOTAL DATA PROCESSING COST	45.	40,494	24,085	39,602	37,717
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				15,000
49.	Research/Development	49.				
50.	Administration	50.				22,717
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				37,717
58.	Other(1)	58.				
59.						
60.	TOTAL FUNDS		40,494	24,085	39,602	37,717

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

ARAPAHOE COMMUNITY COLLEGE

Arapahoe Community College has requested 1 additional FTE for operations and the reduction of .2 FTE in hourly wages. This is based upon an increased demand for usage of the COTIE terminals.

The Capital Outlay and supplies and expenses totals include an allocation for the Denver Regional Center.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	3.2	4.0	.8
GENERAL FUND	84,339	97,982	13,643
OTHER	-	-	-
TOTAL FUNDS	84,339	97,982	13,643

ARAPAHOE

Rec. Type		Rec. Type	1 Actual 1971-72 FTE	1 Actual 1971-72 Amount	2 Estimated 1972-73 FTE	2 Estimated 1972-73 Amount	3 Requested 1973-74 FTE	3 Requested 1973-74 Amount	4 Recommended 1973-74 FTE	4 Recommended 1973-74 Amount
1.	Salaries, Administrative	1.	1.0	11,828	1.0	12,479	1.0	14,447		
2.	Salaries, Systems Analysts	2.								
3.	Salaries, Programmers	3.								
4.	Salaries, Operations Personnel	4.	1.9	11,128	2.0	13,008	3.0	18,672		
5.	Salaries, Cler./Technical	5.								
6.	Hourly Wages	6.	.1	370	.2	1,119				
7.	Overtime Payments	7.								
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	3.0	23,326	3.2	26,606	4.0	33,119		
10.	Benefits, Administrative	10.		1,287		1,472		1,764		
11.	Benefits, Systems Analysts	11.								
12.	Benefits, Programmers	12.								
13.	Benefits, Operations Personnel	13.		946		1,225		1,493		
14.	Benefits, Cler./Technical	14.								
15.	Sub Total, Benefits	15.		2,233		2,697		3,257		
16.	Sub Total, Personal Services	16.	3.0	25,559	3.2	29,303	4.0	36,376	4.0	34,918
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.								
19.	Electronic Data Processing Equip.	19.		24,982						
20.	Data Transmission Equipment	20.						2,493		2,493
21.	Data Creation Equipment	21.		3,147		3,147		3,147		3,147
22.	Auxiliary Storage Equipment	22.								
23.	Equipment Overtime & Maintenance	23.						831		831
24.	Lease Time	24.				1,500		6,000		6,000
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		28,129		4,647		12,471		12,471
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.								
29.	Other Contracts	29.		3,657		22,222		26,312		26,312
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		349		500		300		300
33.	Supplies and Expenses	33.		630		1,000		1,300		1,248
34.	Sub Total, Other Operating Expenses	34.		4,636		23,722		27,912		27,860
35.	TOTAL DATA PROCESSING EXPENSES	35.	3.0	58,324	3.2	57,672	4.0	76,759	4.0	75,249

ARAPAHOE

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	24,196	26,667	22,733	22,733
45.	TOTAL DATA PROCESSING COST	45.	82,520	84,339	99,492	97,982
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				28,127
49.	Research/Development	49.				
50.	Administration	50.				69,855
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				97,982
58.	Other(1)	58.				
59.						
60.	TOTAL FUNDS		82,520	84,339	99,492	97,982

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

METRO STATE COLLEGE

Metro State's request for increased FTE reflects the need to develop the administrative systems possible through the use of the computer at the Denver Regional Computer Center. The FTE for FY 1972-73 was 10.8. An increase of 7.2 FTE will bring the recommended total to 18.0 FTE.

Increased lease time at CU-Boulder and the Denver Regional Computing Center has noteable impact upon the operating budgets and Capital Outlay. Again, this institution is now in a growth mode and wants to gain access to broader applications and instructional programs.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	10.8	18.0	7.2
GENERAL FUND	333,334	463,218	129,884
OTHER	-	-	-
TOTAL FUNDS	333,334	463,218	129,884

METRO STATE COLLEGE

Rec. No.		Rec. Type	1 Actual 1971-72 FTE	1 Actual 1971-72 Amount
1.	Salaries, Administrative	1.		
2.	Salaries, Systems Analysts	2.		
3.	Salaries, Programmers	3.	2.0	22,084
4.	Salaries, Operations Personnel	4.	4.3	30,015
5.	Salaries, Cler./Technical	5.	1.0	7,356
6.	Hourly Wages	6.	5.9	25,454
7.	Overtime Payments	7.		
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.	13.2	84,939
10.	Benefits, Administrative	10.		
11.	Benefits, Systems Analysts	11.		
12.	Benefits, Programmers	12.		1,877
13.	Benefits, Operations Personnel	13.		2,554
14.	Benefits, Cler./Technical	14.		625
15.	Sub Total, Benefits	15.		5,056
16.	Sub Total, Personal Services	16.	13.2	89,995
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		4,622
19.	Electronic Data Processing Equip.	19.		
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		14,358
22.	Auxiliary Storage Equipment	22.		
23.	Equipment Overtime & Maintenance	23.		1,122
24.	Lease Time	24.		46,900
25.	Equipment Amortization	25.		
26.	Sub Total Equipment Expense	26.		67,002
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		24,874
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		
32.	Travel	32.		1,469
33.	Supplies and Expenses	33.		18,434
34.	Sub Total, Other Operating Expenses	34.		44,777
35.	TOTAL OBJECT EXPENSES	35.	13.2	201,774

	2		3		4	
	Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
	FTE	Amount	FTE	Amount	FTE	Amount
	1.0	15,333	1.0	17,600		
			2.0	21,216		
	2.0	20,605	5.0	50,507		
	3.5	19,463	5.0	27,726		
	1.0	7,536	2.0	13,817		
	3.3	13,832	5.0	24,232		
	10.8	76,769	20.0	155,098		
		1,573		1,796		
				2,043		
		1,991		4,893		
		2,074		2,957		
		761		1,415		
		6,399		13,104		
	10.8	83,168	20.0	168,202	18.0	149,495
		4,622		4,622		4,622
		6,724		16,375		16,375
		1,122		1,122		1,122
		50,000		80,000		89,500
		62,468		102,119		111,619
		83,334		104,867		104,867
				6,000		6,000
				2,000		1,500
		4,364		8,179		7,270
		87,698		121,046		119,637
	10.8	233,334	20.0	391,367	18.0	380,751

METROPOLITAN STATE

	State Funded Capital Outlay	
36.	Data Processing:	36.
37.	Electric Accounting Machines	37.
38.	Electronic Data Processing Equip.	38.
39.	Data Transmission Equipment	39.
40.	Data Creation Equipment	40.
41.	Auxiliary Storage Equipment	41.
42.	Computer Accessories	42.
43.	Denver Regional Computer Center	43.
44.	Sub Total Data Processing Cap. Outlay	44.
45.	TOTAL DATA PROCESSING COST	45.
46.	Usage Analysis	46.
47.	General Fund Supported Usage:	47.
48.	Resident Instruction	48.
49.	Research/Development	49.
50.	Administration	50.
51.	Security	51.
52.	Other Usage:	52.
53.	Grant, Contract, etc.	53.
54.	Public Service	54.
55.		55.
56.	Source of Funds:	56.
57.	ADP Appropriated General Fund	57.
58.	Other(1)	58.
59.		
60.	TOTAL FUNDS	

(1) Includes the Salary Act funding not administered

1	2	3	4
Actual 1971-72	Estimated 1972-73	Requested 1973-74	Recommended 1973-74
52,947	100,000	82,467	82,467
52,947	100,000	82,467	82,467
254,721	333,334	473,834	463,218
			97,024
			9,500
			356,694
			463,218
254,721	333,334	473,834	463,218

through the Commission office and other miscellaneous funds reported.

ADAMS STATE COLLEGE

ADP support at Adams State College will continue at the same FTE level in FY 1973-74. Current ADP hardware will also be continued. Reduced total ADP cost for FY 1973-74 is due to the reduced payment for equipment being purchased.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	6.0	6.0	-
GENERAL FUND	98,937	79,895	(19,042)
OTHER	17,000	10,930	(6,070)
TOTAL FUNDS	115,937	90,825	(25,112)

ADAMS STATE COLLEGE

Rec. Type		Rec. Type	1 Actual 1971-72		2 Estimated 1972-73		3 Requested 1973-74		4 Recommended 1973-74	
			FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.	Salaries, Administrative	1.	1.0	11,604	1.0	12,612	1.0	13,495		
2.	Salaries, Systems Analysts	2.								
3.	Salaries, Programmers	3.	1.0	9,396	1.0	9,756	1.0	10,439		
4.	Salaries, Operations Personnel	4.	2.5	14,356	3.0	17,450	3.0	18,328		
5.	Salaries, Cler./Technical	5.								
6.	Hourly Wages	6.	1.5	5,862	1.0	4,200	1.0	5,250		
7.	Overtime Payments	7.								
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	6.0	41,218	6.0	44,018	6.0	47,512		
10.	Benefits, Administrative	10.		1,251		1,408		1,507		
11.	Benefits, Systems Analysts	11.								
12.	Benefits, Programmers	12.		1,035		1,117		1,195		
13.	Benefits, Operations Personnel	13.		1,220		1,484		1,558		
14.	Benefits, Cler./Technical	14.								
15.	Sub Total, Benefits	15.		3,506		4,009		4,260		
16.	Sub Total, Personal Services	16.	6.0	44,724	6.0	48,027	6.0	51,772	6.0	50,686
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.		4,658		4,873		4,873		
19.	Electronic Data Processing Equip.	19.						8,100		
20.	Data Transmission Equipment	20.								
21.	Data Creation Equipment	21.		3,247		3,542		3,542		
22.	Auxiliary Storage Equipment	22.								
23.	Equipment Overtime & Maintenance	23.		3,039		11,000		6,078		
24.	Lease Time	24.								
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		10,944		19,415		22,593		23,190
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.								
29.	Other Contracts	29.								
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		381		250		250		250
33.	Supplies and Expenses	33.		6,851		6,245		7,110		7,081
34.	Sub Total, Other Operating Expenses	34.		7,232		6,495		7,360		7,331
35.	TOTAL IA PROCESSING EXPENSES	35.	6.0	62,900	6.0	73,937	6.0	81,725	6.0	81,207

(SO)

ADAMS STATE COLLEGE

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.	71,459	42,000	12,309	9,618
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	71,459	42,000	12,309	9,618
45.	TOTAL DATA PROCESSING COST	45.	134,359	115,937	94,034	90,825
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				9,028
49.	Research/Development	49.				4,261
50.	Administration	50.				66,606
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				10,930
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				79,895
58.	Other(1)	58.				10,930
59.						
60.	TOTAL FUNDS		134,359	115,937	94,034	90,825

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

WESTERN STATE COLLEGE

Western State College will continue to be supported by its present computer configuration for FY 1973-74. The budget request for an additional hourly FTE is supported by the CCHE. Net decrease in ADP costs for FY 1973-74 is due to the reduced payment for equipment being purchased.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	6.6	7.6	1.0
GENERAL FUND	98,000	97,233	(767)
OTHER	20,000	19,768	(232)
TOTAL FUNDS	118,000	117,001	(999)

WESTERN STATE COLLEGE

Rec. Ty		Rec. Type	1 Actual 1971-72 FTE	Amount
1.	Salaries, Administrative	1.	1.0	14,448
2.	Salaries, Systems Analysts	2.		
3.	Salaries, Programmers	3.	1.6	16,831
4.	Salaries, Operations Personnel	4.	3.0	18,816
5.	Salaries, Cler./Technical	5.		
6.	Hourly Wages	6.	.9	3,754
7.	Overtime Payments	7.		
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.	6.5	53,849
10.	Benefits, Administrative	10.		1,485
11.	Benefits, Systems Analysts	11.		
12.	Benefits, Programmers	12.		1,470
13.	Benefits, Operations Personnel	13.		1,739
14.	Benefits, Cler./Technical	14.		
15.	Sub Total, Benefits	15.		4,694
16.	Sub Total, Personal Services	16.	6.5	58,543
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		
19.	Electronic Data Processing Equip.	19.		
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		2,495
22.	Auxiliary Storage Equipment	22.		
23.	Equipment Overtime & Maintenance	23.		8,499
24.	Lease Time	24.		
25.	Equipment Amortization	25.		
26.	Sub Total Equipment Expense	26.		10,994
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		
32.	Travel	32.		
33.	Supplies and Expenses	33.		3,502
34.	Sub Total, Other Operating Expenses	34.		3,502
35.	TOTAL DATA PROCESSING EXPENSES	35.	6.5	73,039

	2		3		4	
	Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
	FTE	Amount	FTE	Amount	FTE	Amount
	1.0	14,448	1.0	15,456		
	2.0	20,636	2.0	21,662		
	3.0	19,066	3.0	19,595		
	.6	2,643	1.6	7,323		
	6.6	56,793	7.6	64,036		
		1,529		1,692		
		1,994		2,081		
		1,981		2,296		
		5,504		6,069		
	6.6	62,297	7.6	70,105	7.6	69,046
		8,100		8,100		8,100
		2,495		2,495		2,495
		11,208		11,856		11,856
		21,803		22,451		22,451
				4,065		4,003
				4,065		4,003
	6.6	84,100	7.6	96,621	7.6	95,500

WESTERN _____

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.	71,459	33,900	21,501	21,501
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	71,459	33,900	21,501	21,501
45.	TOTAL DATA PROCESSING COST	45.	144,498	118,000	118,122	117,001
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				16,065
49.	Research/Development	49.				
50.	Administration	50.				81,168
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				19,768
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				97,233
58.	Other(1)	58.				19,768
59.						
60.	TOTAL FUNDS		144,498	118,000	118,122	117,001

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

FORT LEWIS STATE COLLEGE

Fort Lewis State College has requested an increase in FTE of 1.5. The request asks for .5 FTE for programmer support and 1 additional FTE in the operations area. The CCHE supports this personnel increase. The computer hardware configuration presently at Fort Lewis will continue during FY 1973-74. Net decrease in ADP cost for FY 1973-74 is due to the reduced payment for equipment being purchased.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	5.0	6.5	1.5
GENERAL FUND	98,605	97,868	(737)
OTHER	10,770	10,500	(270)
TOTAL FUNDS	109,375	108,368	(1007)

FORT LEWIS STATE COLLEGE

Rec. Type		Rec. Type	1 Actual 1971-72 FTE	1 Actual 1971-72 Amount	2 Estimated 1972-73 FTE	2 Estimated 1972-73 Amount	3 Requested 1973-74 FTE	3 Requested 1973-74 Amount	4 Recommended 1973-74 FTE	4 Recommended 1973-74 Amount
1.	Salaries, Administrative	1.	1.0	12,100	1.0	12,700	1.0	13,500		
2.	Salaries, Systems Analysts	2.								
3.	Salaries, Programmers	3.	1.0	9,500	1.5	14,900	2.0	22,400		
4.	Salaries, Operations Personnel	4.	2.0	11,335	2.0	10,340	3.0	16,360		
5.	Salaries, Cler./Technical	5.								
6.	Hourly Wages	6.	.5	3,870	.5	3,000	.5	4,160		
7.	Overtime Payments	7.		82				200		
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	4.5	36,887	5.0	40,940	6.5	56,620		
10.	Benefits, Administrative	10.		1,029		1,330		1,448		
11.	Benefits, Systems Analysts	11.								
12.	Benefits, Programmers	12.		807		1,641		2,504		
13.	Benefits, Operations Personnel	13.		971		1,119		1,750		
14.	Benefits, Cler./Technical	14.								
15.	Sub Total, Benefits	15.		2,807		4,090		5,702		
16.	Sub Total, Personal Services	16.	4.5	39,694	5.0	45,030	6.5	62,322	6.5	58,277
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.		1,517		1,517		1,517		
19.	Electronic Data Processing Equip.	19.		8,100		8,100		8,100		
20.	Data Transmission Equipment	20.								
21.	Data Creation Equipment	21.		2,908		3,249		4,688		
22.	Auxiliary Storage Equipment	22.								
23.	Equipment Overtime & Maintenance	23.		3,039		11,000		12,000		
24.	Lease Time	24.								
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		15,564		23,866		26,305		22,354
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.								
29.	Other Contracts	29.								
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		535		1,250		1,500		1,500
33.	Supplies and Expenses	33.		5,403		5,329		5,000		4,991
34.	Sub Total, Other Operating Expenses	34.		5,93		6,579		6,500		6,491
35.	TOTAL DATA PROCESSING EXPENSES	35.	4.5	61,19	5.0	75,475	6.5	95,127	6.5	87,122

FORT LEWIS

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.	63,359	33,900	21,286	21,246
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	63,359	33,900	21,286	21,246
45.	TOTAL DATA PROCESSING COST	45.	124,555	100,375	116,413	108,368
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				63,212
49.	Research/Development	49.				7,462
50.	Administration	50.				27,194
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				10,500
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				97,868
58.	Other(1)	58.				10,500
59.						
60.	TOTAL FUNDS					108,368

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

UNIVERSITY OF NORTHERN COLORADO

The University of Northern Colorado has requested an increase of 3.0 FTE over the previous year. New applications development require 1 additional systems analyst and 1 additional programmer. 1 additional clerical/technical FTE is also requested. This increase is recommended.

A terminal capability has been recommended as part of the development of a library system. The terminal will be used for both instruction and administration. The total decrease in the UNC ADP budget is due to a decrease in Capital Outlay.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	21.0	24.0	3.0
GENERAL FUND	309,000	307,213	(1,787)
OTHER	74,248	60,000	(14,248)
TOTAL FUNDS	383,248	367,213	(16,035)

UNIVERSITY OF NORTHERN COLORADO

Rec. Type		Rec. Type
1.	Salaries, Administrative	1.
2.	Salaries, Systems Analysts	2.
3.	Salaries, Programmers	3.
4.	Salaries, Operations Personnel	4.
5.	Salaries, Cler./Technical	5.
6.	Hourly Wages	6.
7.	Overtime Payments	7.
8.	Night Differential	8.
9.	Sub Total, Salaries and Wages	9.
10.	Benefits, Administrative	10.
11.	Benefits, Systems Analysts	11.
12.	Benefits, Programmers	12.
13.	Benefits, Operations Personnel	13.
14.	Benefits, Cler./Technical	14.
15.	Sub Total, Benefits	15.
16.	Sub Total, Personal Services	16.
17.	Equipment Expense:	17.
18.	Electric Accounting Machines	18.
19.	Electronic Data Processing Equip.	19.
20.	Data Transmission Equipment	20.
21.	Data Creation Equipment	21.
22.	Auxiliary Storage Equipment	22.
23.	Equipment Overtime & Maintenance	23.
24.	Lease Time	24.
25.	Equipment Amortization	25.
26.	Sub Total Equipment Expense	26.
27.	Other Operating Expenses:	27.
28.	Denver Regional Computer Ctr.	28.
29.	Other Contracts	29.
30.	Building Rental	30.
31.	Adm./Research Overhead(See Instructions)	31.
32.	Travel	32.
33.	Supplies and Expenses	33.
34.	Sub Total, Other Operating Expenses	34.
35.	TOTAL DATA PROCESSING EXPENSES	35.

1		2		3		4	
Actual 1971-72		Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.0	16,268	1.0	17,081	1.0	19,130		
2.0	24,944	2.0	26,437	3.0	43,609		
3.0	30,428	3.0	32,499	4.0	43.449		
10.0	62,182	9.0	66,636	9.0	71,634		
1.0	5,540	1.0	5,674	2.0	11,014		
5.0	20,738	5.0	20,000	5.0	21,200		
22.0	160,100	21.0	168,327	24.0	210,036		
	1,708		1,878		2,056		
	2,619		2,907		4,688		
	2,547		2,864		4,779		
	6,078		6,537		7,870		
	552		616		1,212		
	13,504		14,802		20,605		
22.0	173,604	21.0	183,129	24.0	230,641	24.0	227,189
	7,880		6,152		6,152		6,152
	21,415						
			12,500		18,000		18,000
	12,809		13,188		16,051		16,051
	733		1,656		1,656		1,656
	13,003		16,671		23,571		23,571
							20,000
	55,840		50,167		65,430		85,430
	16,006		18,480		21,000		20,686
	16,006		18,480		21,000		20,686
22.0	245,450	21.0	251,776	24.0	317,071	24.0	333,305

UNIVERSITY OF NORTHERN COLORADO

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.			121,856	33,908
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	84,492	131,472	121,856	33,908
45.	TOTAL DATA PROCESSING COST	45.	329,942	383,248	438,927	367,213
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				124,992
49.	Research/Development	49.				10,000
50.	Administration	50.				172,221
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				60,000
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				307,213
58.	Other(1)	58.				60,000
59.						
60.	TOTAL FUNDS		329,942	383,248	438,927	367,213

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

SOUTHERN COLORADO STATE COLLEGE

Southern Colorado State College has requested an increase of 1.5 FTE for fiscal 1973-74. Two additional FTE have been requested in the programming and clerical/technical areas respectively. A reduction of .5 FTE in hourly wages personnel leaves a net of 1.5 FTE.

Southern Colorado,in order to begin terminal oriented processing at that instituion, has requested and the CCHE has recommended the acquisition of two inexpensive terminals. These will be used locally to develop administrative systems for Admissions and Records, Personnel, and others.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	15.0	16.5	1.5
GENERAL FUND	238,000	274,522	36,522
OTHER	9,000	10,000	1,000
TOTAL FUNDS	247,000	284,522	37,522

Southern Colorado State College

Rec. Type		Rec. Type	Actual 1971-72 FTE	Actual 1971-72 Amount
1.	Salaries, Administrative	1.	2.0	37,044
2.	Salaries, Systems Analysts	2.	1.0	13,083
3.	Salaries, Programmers	3.	3.0	32,940
4.	Salaries, Operations Personnel	4.	6.0	42,308
5.	Salaries, Cler./Technical	5.		
6.	Hourly Wages	6.	1.9	8,363
7.	Overtime Payments	7.		
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.	13.9	133,738
10.	Benefits, Administrative	10.		
11.	Benefits, Systems Analysts	11.		
12.	Benefits, Programmers	12.		
13.	Benefits, Operations Personnel	13.		
14.	Benefits, Cler./Technical	14.		
15.	Sub Total, Benefits	15.		
16.	Sub Total, Personal Services	16.	13.9	133,738
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		
19.	Electronic Data Processing Equip.	19.		
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		
22.	Auxiliary Storage Equipment	22.		
23.	Equipment Overtime & Maintenance	23.		
24.	Lease Time	24.		
25.	Equipment Amortization	25.		
26.	Sub Total Equipment Expense	26.		23,979
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		
32.	Travel	32.		1,659
33.	Supplies and Expenses	33.		12,707
34.	Sub Total, Other Operating Expenses	34.		14,366
35.	Total Expenditures (Sub Totals 16, 26 & 34)	35.	13.9	172,083

	2		3		4	
	Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
	FTE	Amount	FTE	Amount	FTE	Amount
	2.0	38,932	2.0	40,842		
	1.0	13,344	1.0	13,995		
	3.0	33,460	4.0	44,464		
	7.0	52,284	7.0	54,968		
			1.0	8,294		
	2.0	8,400	1.5	6,300		
		146,420		168,863		
	15.0	146,420	16.5	168,863	16.5	169,761
						10,000
		31,280		34,186		44,186
		1,500		1,500		1,500
		2,543		13,500		13,573
		14,500		15,000		15,073
	15.0	181,743	16.5	218,049	16.5	229,020

SOUTHERN COLORADO STATE COLLEGE

	State Funded Capital Outlay		Actual 1971-72
36.	Data Processing:	36.	
37.	Electric Accounting Machines	37.	
38.	Electronic Data Processing Equip.	38.	74,393
39.	Data Transmission Equipment	39.	
40.	Data Creation Equipment	40.	
41.	Auxiliary Storage Equipment	41.	
42.	Computer Accessories	42.	2,874
43.	Denver Regional Computer Center	43.	
44.	Sub Total Data Processing Cap. Outlay	44.	77,267
45.	TOTAL DATA PROCESSING COST	45.	251,219
46.	Usage Analysis	46.	
47.	General Fund Supported Usage:	47.	
48.	Resident Instruction	48.	
49.	Research/Development	49.	
50.	Administration	50.	
51.	Security	51.	
52.	Other Usage:	52.	
53.	Grant, Contract, etc.	53.	
54.	Public Service	54.	
55.		55.	
56.	Source of Funds:	56.	
57.	ADP Appropriated General Fund	57.	
58.	Other(1)	58.	
59.			
60.	TOTAL FUNDS		251,219

(1) Includes the Salary Act funding not administered through the Commission

2	3	4
Estimated 1972-73	Requested 1973-74	Recommended 1973-74
64,382	19,776	
	17,334	
875	875	
65,257	114,985	55,502
247,000	333,034	284,522
		63,300
		10,000
		201,222
		10,000
		274,522
		10,000
247,000	333,034	284,522

office and other miscellaneous funds reported.

COLORADO SCHOOL OF MINES

The Colorado School of Mines continues to base its ADP support on its present PDP-10 computer. The major items of increase are 1.8 FTE additional full-time employees, 1.4 FTE additional student help, expansion of the PDP-10, and improvements in physical security.

The additional personnel are to handle increasing instruction and administrative workload and to provide improved consulting services to instructional and research users. Expansion of the PDP-10 is primarily to relieve the pressures on a saturated system so as to improve service for instruction and administration, and secondarily to provide a modest increase in the interactive capability for both on-campus and off-campus use. The proposed expenditures for security are in response to legislative and Department of Administration suggestions.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	14.1	17.3	3.2
GENERAL FUND	233,150	374,018	140,868
OTHER	95,850	95,850	-
TOTAL FUNDS	329,000	469,868	140,868

COLORADO SCHOOL OF MINES

Rec. Type		Rec. Type	1 Actual 1971-72		2 Estimated 1972-73		3 Requested 1973-74		4 Recommended 1973-74	
			FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.	Salaries, Administrative	1.	1.0	17,833	2.0	28,534	2.8	43,615		
2.	Salaries, Systems Analysts	2.	1.0	15,424	1.0	15,672	1.0	15,672		
3.	Salaries, Programmers	3.	2.4	22,768	3.0	29,176	3.0	30,080		
4.	Salaries, Operations Personnel	4.	5.0	32,242	5.0	33,054	6.0	38,456		
5.	Salaries, Cler./Technical	5.	1.0	6,438	1.0	6,759	1.0	6,840		
6.	Hourly Wages	6.	2.2	11,477	2.1	10,500	3.5	18,096		
7.	Overtime Payments	7.								
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	12.6	106,182	14.1	123,695	17.3	152,759		
10.	Benefits, Administrative	10.		1,849		3,081		4,636		
11.	Benefits, Systems Analysts	11.		1,401		1,452		1,452		
12.	Benefits, Programmers	12.		2,096		2,840		2,917		
13.	Benefits, Operations Personnel	13.		5,036		3,049		3,869		
14.	Benefits, Cler./Technical	14.		562		695		701		
15.	Sub Total, Benefits	15.		8,944		11,117		13,575		
16.	Sub Total, Personal Services	16.	12.6	115,126	14.1	134,812	17.3	166,334	17.3	163,318
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.		5,009		5,860		5,454		5,454
19.	Electronic Data Processing Equip.	19.		114,000		114,000		151,000		151,000
20.	Data Transmission Equipment	20.		3,310		2,825		8,474		8,474
21.	Data Creation Equipment	21.		3,525		3,525		3,700		3,700
22.	Auxiliary Storage Equipment	22.		38,002		42,290		51,438		51,438
23.	Equipment Overtime & Maintenance	23.								
24.	Lease Time	24.								
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		163,846		168,500		220,066		220,066
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.								
29.	Other Contracts	29.								
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.				1,300		1,700		1,700
33.	Supplies and Expenses	33.		13,148		21,763		18,840		18,499
34.	Sub Total, Other Operating Expenses	34.		13,148		23,063		20,540		20,199
35.	TOTAL DATA PROCESSING EXPENSES	35.	12.6	292,120	14.1	326,375	17.3	406,940	17.3	403,583

COLORADO SCHOOL OF MINES

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.	2,350	2,350	4,700	4,700
39.	Data Transmission Equipment	39.			14,000	14,000
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories /Security	42.	502	275	47,585	47,585
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	2,852	2,625	66,285	66,285
45.	TOTAL DATA PROCESSING COST	45.	294,972	329,000	473,225	469,868
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				221,182
49.	Research/Development	49.				10,000
50.	Administration	50.				96,636
51.	Security	51.				46,200
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				95,850
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.			374,018	374,018
58.	Other(1)	58.			0	95,850
59.						
60.	TOTAL FUNDS		294,972	329,000	473,225	469,868

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

COLORADO STATE UNIVERSITY

Continued expansion of the administrative data processing capability as well as supporting programs of instruction are recommended for Fiscal 1974. Personnel increases (5.2 FTE) in support of both program design and development and operations are recommended. A 250K word unit of extended core storage, enabling a higher throughput of the system, is also recommended. Addition of this module will enable CSU to serve as backup for the University of Colorado Computing Center in the event such is necessary. This security move is imperative, as currently there is no site in Colorado which can provide backup to the C.U. system.

Increasing involvement in State networking activities, with CSU as the primary COTIE source, results in a recommendation for a "front-end computer" to ease the data communications load on the main system.

Increasing load on the CSU CDC 6400 and the need to encourage uniformity in many administrative application systems has resulted in a continuing review of hardware requirements in support of the University Information System Office. Requested, therefore, for FY 1974 is additional disk storage and a high speed chain printer and controller. The magnitude of the total request ($146,704) logically results in comparing costs to a State owned IBM 360/40 displaced by the IBM 370/145 requested at the University of

Colorado. Greater State-wide system uniformity and personnel economy may be achieved by installation of this system at CSU. To accomplish the desired goal, the funds requested by CSU are recommended, but final review of the alternative should be given consideration.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	77.8	83.0	5.2
GENERAL FUND	825,000	1,319,805	494,805
OTHER	655,000	500,625	(154,375)
TOTAL FUNDS	1,480,000	1,820,430	340,430

COLO. STATE UNIVERSITY - COMBINED

Rec. Type		Rec. Type	1 Actual 1971-72 FTE	Amount
1.	Salaries, Administrative	1.	4.8	83,857
2.	Salaries, Systems Analysts	2.	11.8	167,158
3.	Salaries, Programmers	3.	14.2	162,367
4.	Salaries, Operations Personnel	4.	30.4	201,963
5.	Salaries, Cler./Technical	5.	2.8	13,940
6.	Hourly Wages	6.	7.6	41,058
7.	Overtime Payments	7.		7,638
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.	71.6	677,981
10.	Benefits, Administrative	10.		8,229
11.	Benefits, Systems Analysts	11.		14,209
12.	Benefits, Programmers	12.		13,800
13.	Benefits, Operations Personnel	13.		17,166
14.	Benefits, Cler./Technical	14.		1,184
15.	Sub Total, Benefits	15.		54,588
16.	Sub Total, Personal Services	16.	71.6	732,569
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		
19.	Electronic Data Processing Equip.	19.		
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		223,973
22.	Auxiliary Storage Equipment	22.		
23.	Equipment Overtime & Maintenance	23.		122,945
24.	Lease Time	24.		
25.	Equipment Amortization	25.		96,273
26.	Sub Total Equipment Expense	26.		443,191
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		49,363
32.	Travel	32.		7,664
33.	Supplies and Expenses	33.		119,591
34.	Sub Total, Other Operating Expenses	34.		176,618
35.	TOTAL DATA PROCESSING EXPENSES	35.	71.6	1,352,378

2		3		4	
Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
FTE	Amount	FTE	Amount	FTE	Amount
4.8	89,169	5.0	102,872		
12.5	192,174	13.5	217,615		
16.5	197,897	18.5	237,435		
35.0	233,919	36.0	257,749		
3.0	16,004	3.0	17,361		
6.0	30,000	7.0	36,200		
	8,200		9,500		
77.8	767,363	83.0	878,732		
	8,271		9,500		
	16,335		18,496		
	16,821		20,002		
	19,883		21,908		
	1,360		1,475		
	62,670		71,381		
77.8	830,033	83.0	950,113	83.0	926,911
	50,476		43,700		43,700
	225,365		223,390		223,390
	129,000		147,000		147,000
			97,229		97,229
	404,841		511,319		511,319
	30,000		30,000		
	50,829		56,418		
	10,000		10,000		9,250
	154,297		149,642		145,988
	245,126		246,060		235,496
77.8	1,480,000	83.0	1,707,492		1,673,726

COLO. STATE UNIVERSITY - COMBINED

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	56,000		146,704	146,704
45.	TOTAL DATA PROCESSING COST	45.	1,408,378	1,480,000	1,854,196	1,820,430
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				309,369
49.	Research/Development	49.				152,000
50.	Administration	50.				819,642
51.	Security	51.				38,794
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				461,625
54.	Public Service	54.				39,000
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				1,319,805
58.	Other(1)	58.				500,625
59.						
60.	TOTAL FUNDS		1,408,378	1,480,000	1,854,196	1,820,430

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

UNIVERSITY OF COLORADO - BOULDER

The University of Colorado at Boulder has both an administrative and academic computer organization. The administrative group is presently served by an IBM 360/40 computer. The academic center is served by 2 CDC 6400s.

In the administrative area, the request for FY 1973-74 is for more personnel strength. An increase of 12.5 FTE over the previous year is made up of additional systems, programming and operations staff. The administrative center in Boulder is embarked on a broad program of management information systems and data base management of significance for the entire University. Consequently, the administrative computer center in Boulder is requesting the installation of an IBM 370/145 computer. This machine will provide the necessary computing power to allow this center to serve the Denver and Colorado Springs campuses by means of terminal access as well as meet the needs of the Boulder campus. This machine will provide the necessary backup for the Denver Regional Center and, as both centers develop, will allow the exchange of data and sharing of program and systems resources. The plan will be for the Boulder administrative computer to offer network services to other campuses, which is in accord with previously developed ADP plans.

The academic computer center operates as an auxiliary enterprise, charging for all services. Its grant and contract usage ensures low unit costs. Growth of instructional computing usage at the University has consistently been at about a 40% annual rate (in terms of numbers of jobs). In order to assure access to the greatest number of students

from many locations, a front end computer is requested and recommended for FY 1973-74. This, along with similar gear at CSU and the Denver Regional Center, will make possible greater and more varied computer usage for students in remote areas. Students who, because of geography, could not expect to use large scale computers will now have such capability available to them.

Sharing of program libraries and resources will now be possible between the Boulder campus and Colorado State University. Redundancy of resources will assure strong backup for each machine and allow greater assurance of reliable systems. Again, this type of shared resource is compatible and supportive of previous higher education ADP plans.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	96.7	109.2	12.5
GENERAL FUND	809,140	1,340,045	530,905
OTHER	1,756,458	1,607,704	(148,754)
TOTAL FUNDS	2,565,598	2,947,749	382,151

UNIVERSITY OF COLORADO - COMBINED (Boulder)

Rec. Type		Rec. Type	1 Actual 1971-72		2 Estimated 1972-73		3 Requested 1973-74		4 Recommended 1973-74	
			FTE	Amount	FTE	Amount	FTE	Amount	FTE	Amount
1.	Salaries, Administrative	1.	5.0	94,843	8.0	127,976	8.0	134,662		
2.	Salaries, Systems Analysts	2.	15.0	177,382	16.0	235,460	18.0	272,975		
3.	Salaries, Programmers	3.	14.5	153,988	18.0	186,910	23.0	258,440		
4.	Salaries, Operations Personnel	4.	41.0	278,595	41.0	286,848	47.0	341,227		
5.	Salaries, Cler./Technical	5.	7.5	40,488	8.5	55,980	8.5	58,623		
6.	Hourly Wages	6.	6.8	41,835	5.2	24,208	4.7	22,444		
7.	Overtime Payments	7.		11,695		4,720		4,920		
8.	Night Differential	8.		4,483		4,662		4,859		
9.	Sub Total, Salaries and Wages	9.	89.8	803,309	96.7	926,764	109.2	1,098,150		
10.	Benefits, Administrative	10.		7,896		13,201		13,885		
11.	Benefits, Systems Analysts	11.		13,995		22,624		25,807		
12.	Benefits, Programmers	12.		13,324		18,283		24,685		
13.	Benefits, Operations Personnel	13.		25,324		28,425		33,075		
14.	Benefits, Cler./Technical	14.		3,458		5,637		5,899		
15.	Sub Total, Benefits	15.		65,997		88,170		103,351		
16.	Sub Total, Personal Services	16.	89.8	867,306	96.7	1,014,934	109.2	1,201,501	109.2	1,163,748
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.		21,870		17,255		17,255		17,255
19.	Electronic Data Processing Equip.	19.		326,527		386,087		444,640		444,640
20.	Data Transmission Equipment	20.		17,761		27,749		21,624		21,624
21.	Data Creation Equipment	21.		31,372		39,822		42,233		42,233
22.	Auxiliary Storage Equipment	22.		393		612		700		700
23.	Equipment Overtime & Maintenance	23.		17,730		23,500		35,409		35,409
24.	Lease Time	24.						19,700		19,700
25.	Equipment Amortization	25.		67,565						
26.	Sub Total Equipment Expense	26.		483,218		495,025		581,561		581,561
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.								
29.	Other Contracts	29.		20,433		20,241		20,241		20,241
30.	Building Rental	30.		73,280		73,280		86,920		86,920
31.	Adm./Research Overhead(See Instructions)	31.		45,928		52,580		62,470		62,470
32.	Travel	32.		7,112		10,500		14,200		14,200
33.	Supplies and Expenses	33.		181,067		190,608		204,590		116,571
34.	Sub Total, Other Operating Expenses	34.		327,820		347,209		388,421		300,402
35.	TOTAL DATA PROCESSING EXPENSES	35.	89.8	1,678,344	96.7	1,857,168	109.2	2,171,483	109.2	[illegible]

UNIVERSITY OF COLORADO - COMBINED (Boulder)

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	620,426	708,430	955,483	902,038
45.	TOTAL DATA PROCESSING COST	45.	2,298,770	2,565,598	3,126,966	2,947,749
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				497,174
49.	Research/Development	49.				33,525
50.	Administration	50.				746,526
51.	Security	51.				62,820
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				909,886
55.		55.				697,818
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				1,340,045
58.	Other(1)	58.				1,607,704
59.						
60.	TOTAL FUNDS		2,298,770	2,565,598	3,126,966	2,947,749

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

UNIVERSITY OF COLORADO - DENVER

As the demand for instructional computing increases, more operations personnel are requested. Systems analysts have also been requested for administrative systems development. A recommendation of 5.2 FTE is 1.0 FTE less than requested.

Interactive terminals have been recommended for instruction to access the CDC 6400 computer in Boulder.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	1.5	5.2	3.7
GENERAL FUND	81,446	191,190	109,744
OTHER	-	-	-
TOTAL FUNDS	81,446	191,190	109,744

CU DENVER CENTER COMBINED

Rec. Type		Rec. Type	1	
			Actual 1971-72	
			FTE	Amount
1.	Salaries, Administrative	1.		
2.	Salaries, Systems Analysts	2.		
3.	Salaries, Programmers	3.		
4.	Salaries, Operations Personnel	4.	1.0	7,020
5.	Salaries, Cler./Technical	5.		
6.	Hourly Wages	6.	.5	2,400
7.	Overtime Payments	7.		
8.	Night Differential	8.		
9.	Sub Total, Salaries and Wages	9.		9,420
10.	Benefits, Administrative	10.		
11.	Benefits, Systems Analysts	11.		
12.	Benefits, Programmers	12.		
13.	Benefits, Operations Personnel	13.		680
14.	Benefits, Cler./Technical	14.		
15.	Sub Total, Benefits	15.		680
16.	Sub Total, Personal Services	16.	1.5	10,100
17.	Equipment Expense:	17.		
18.	Electric Accounting Machines	18.		
19.	Electronic Data Processing Equip.	19.		
20.	Data Transmission Equipment	20.		
21.	Data Creation Equipment	21.		9,523
22.	Auxiliary Storage Equipment	22.		100
23.	Equipment Overtime & Maintenance	23.		
24.	Lease Time	24.		
25.	Equipment Amortization	25.		
26.	Sub Total Equipment Expense	26.		9,623
27.	Other Operating Expenses:	27.		
28.	Denver Regional Computer Ctr.	28.		52,924
29.	Other Contracts	29.		
30.	Building Rental	30.		
31.	Adm./Research Overhead(See Instructions)	31.		
32.	Travel	32.		1,350
33.	Supplies and Expenses	33.		2,075
34.	Sub Total, Other Operating Expenses	34.		56,349
35.	TOTAL DATA PROCESSING EXPENSES	35.		76,072

	2		3		4	
	Estimated 1972-73		Requested 1973-74		Recommended 1973-74	
	FTE	Amount	FTE	Amount	FTE	Amount
			.5	9,000		
			2.0	18,780		
	1.0	7,970	1.0	8,290		
			.5	2,600		
	.5	2,400	2.2	13,028		
		10,370	6.2	51,698		
				945		
				1,822		
		773		804		
				251		
		753		3,822		
	1.5	11,143	6.2	55,520	5.2	38,552
				9,210		
		10,773		8,220		
		200				
		10,973		17,430		20,009
		53,205		114,400		78,835
		1,850		1,900		800
		4,275		6,500		3,894
		59,330		122,800		83,529
		81,446		195,750	5.2	142,090

CU DENVER CENTER COMBINED

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.			62,760	49,100(2)
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.			62,760	49,100
45.	TOTAL DATA PROCESSING COST	45.	76,072	81,446	258,510	191,190
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				129,987
49.	Research/Development	49.				
50.	Administration	50.				61,203
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.				191,190
58.	Other(1)	58.				
59.						
60.	TOTAL FUNDS		76,072	81,446	258,510	191,190

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

(2) Extended purchase program (3 years) for requested interactive terminals (instruction) is recommended.

UNIVERSITY OF COLORADO - COLORADO SPRINGS

The University of Colorado - Colorado Springs has requested an increase of 2.9 FTE for FY 1973-74. This includes .2 FTE in administration, 1.0 in systems analysis and 1.7 in hourly wages. The rapid growth of this campus has led to increased demands for ADP support in both the administrative and instructional areas. It is recommended that the requested FTE be funded.

In Capital Outlay, Colorado Springs has requested funds for the payment on a terminal that has been funded from other sources within the institution. In an attempt to identify and properly fund such items of data processing expense, it is recommended that funding for this terminal be supported.

	FY 1972-73 (Estimated)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	1.2	4.1	2.9
GENERAL FUND	39,121	129,167	90,046
OTHER	-	-	-
TOTAL FUNDS	39,121	129,167	90,046

UNIVERSITY OF COLORADO - COLORADO SPRINGS

Rec. Type		Rec. Type	1 Actual 1971-72 FTE	1 Actual 1971-72 Amount	2 Estimated 1972-73 FTE	2 Estimated 1972-73 Amount	3 Requested 1973-74 FTE	3 Requested 1973-74 Amount	4 Recommended 1973-74 FTE	4 Recommended 1973-74 Amount
1.	Salaries, Administrative	1.	.1	1,800	.1	2,600	.3	5,066		
2.	Salaries, Systems Analysts	2.					1.0	11,000		
3.	Salaries, Programmers	3.								
4.	Salaries, Operations Personnel	4.								
5.	Salaries, Cler./Technical	5.								
6.	Hourly Wages	6.	2.2	10,563.	1.1	5,614	2.8	12,550		
7.	Overtime Payments	7.								
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	2.3	12,363	1.2	8,214	4.1	28,616		
10.	Benefits, Administrative	10.								
11.	Benefits, Systems Analysts	11.						1,055		
12.	Benefits, Programmers	12.								
13.	Benefits, Operations Personnel	13.								
14.	Benefits, Cler./Technical	14.								
15.	Sub Total, Benefits	15.		--		--		1,055		
16.	Sub Total, Personal Services	16.	2.3	12,363	1.2	8,214	4.1	29,671	4.1	29,720
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.								
19.	Electronic Data Processing Equip.	19.						2,700		2,700
20.	Data Transmission Equipment	20.								22,781
21.	Data Creation Equipment	21.		3,845		3,964		4,845		4,845
22.	Auxiliary Storage Equipment	22.		83		83		83		83
23.	Equipment Overtime & Maintenance	23.		193		330		1,400		1,400
24.	Lease Time	24.								
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		4,121		4,377		9,028		31,809
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr. - Boulder	28.		28,061		24,534		52,238		52,238
29.	Other Contracts	29.		12		75		125		125
30.	Building Rental	30.								
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		669		350		975		650
33.	Supplies and Expenses	33.		9,661		1,571		2,620		2,624
34.	Sub Total, Other Operating Expenses	34.		38,403		26,530		55,958		55,637
35.	TOTAL DATA PROCESSING EXPENSES	35.	2.3	54,887	1.2	39,121	4.1	94,657	4.1	117,166

UNIV. OF COLORADO - COLORADO SPRINGS

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.			12,000	12,000
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.			12,000	12,000
45.	TOTAL DATA PROCESSING COST	45.	54,887	39,121	106,657	129,166
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				74,932
49.	Research/Development	49.				
50.	Administration	50.				54,235
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ADP Appropriated General Fund	57.			106,657	129,167
58.	Other(1)	58.				
59.						
60.	TOTAL FUNDS		54,887	39,121	106,657	129,167

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

UNIVERSITY OF COLORADO MEDICAL CENTER

Detailed information on the Medical Center is not available at this time as the Medical Center budget was not included in the CCHE budget document. The following funding, however, is recommended.

GENERAL FUND	523,940
OTHER	135,103
TOTAL FUNDS	659,043

COLORADO COMMISSION ON HIGHER EDUCATION (CCHE)

The figures in the CCHE budget documents represent the request of both the CCHE staff and the Denver Regional Computer Center. The request for the staff ADP funding is for "real" funds, while the funds for the Denver Regional Center have been folded back into the budgets of the using agencies. The CCHE ADP staff budgets are based on the addition of 3.0 FTE to perform the systems analysis and programming necessary to develop and maintain the systems for the CCHE staff. Also included in the figures is the CCHE share of the Denver Regional Center budget request.

	FY 1972-73 (Estimate)	FY 1973-74 (Recommended)	Increase (Decrease)
TOTAL FTE	4.0	7.0	3.0
GENERAL FUND	90,326	142,428	(52,102)
OTHER			
TOTAL FUNDS	90,326	142,428	(52,102)

The Denver Regional Computer Center was established to provide ADP service for institutions of higher education in the immediate Denver areas, as well as for others, such as El Paso, who need computing power. During the past year, the Denver institutions have carried their work to the Center for processing. Currently, communications with one institution is being debugged so that remote processing can be made available. There

have been some delays in this implementation because of funding cut-backs at the Center during FY 1972-73. The budget request for FY 1973-74 is to restore the Denver Regional Center to the level of support originally planned for FY 1972-73. This includes the addition of core storage and disk needed to support the requirements of serving remote institutions such as El Paso.

There are 15 FTE in the estimated year, FY 1972-73, and it is recommended that this staffing continue through FY 1973-74.

	FY 1972-73 (Orig. Estimate)	FY 1972-73 (Current Estimate)	FY 1973-74 (Recommended)
TOTAL FTE	15.0	15.0	15.0
GENERAL FUND	428,346	476,810	48,464
OTHER	60,550	68,275	7,725
TOTAL FUNDS	488,896	545,085	56,189

COLORADO COMMISSION ON HIGHER EDUCATION

Rec. Type		Rec. Type	1 Actual 1971-72 FTE	1 Actual 1971-72 Amount	2 Estimated 1972-73 FTE	2 Estimated 1972-73 Amount	3 Requested 1973-74 FTE	3 Requested 1973-74 Amount	4 Recommended 1973-74 FTE	4 Recommended 1973-74 Amount
1.	Salaries, Administrative	1.	1.0	17,500	3.0	54,500	3.0	57,645		
2.	Salaries, Systems Analysts	2.	1.0	16,700	1.0	16,500	1.0	17,655		
3.	Salaries, Programmers	3.	1.5	14,509	4.0	52,100	7.0	85,415		
4.	Salaries, Operations Personnel	4.			6.0	40,200	6.0	42,210		
5.	Salaries, Cler./Technical	5.	1.9	9,791	5.0	29,285	5.0	30,885		
6.	Hourly Wages	6.	1.3	11,899	1.4	13,000	1.4	13,000		
7.	Overtime Payments	7.		1,254		5,000		5,000		
8.	Night Differential	8.								
9.	Sub Total, Salaries and Wages	9.	6.7	71,633	20.4	210,000	23.4	251,810	23.4	251,810
10.	Benefits, Administrative	10.		1,875		6,001		6,294		
11.	Benefits, Systems Analysts	11.		1,781		1,903		2,001		
12.	Benefits, Programmers	12.		1,114		5,781		9,813		
13.	Benefits, Operations Personnel	13.		645		4,340		4,620		
14.	Benefits, Cler./Technical	14.		403		2,833		2,915		
15.	Sub Total, Benefits	15.		5,818		20,858		25,643		
16.	Sub Total, Personal Services	16.	6.7	77,451	20.4	231,443	23.4	277,453	23.4	277,453
17.	Equipment Expense:	17.								
18.	Electric Accounting Machines	18.								
19.	Electronic Data Processing Equip.	19.		1,560		51,120		63,920		63,920
20.	Data Transmission Equipment	20.								
21.	Data Creation Equipment	21.				6,000		6,000		6,000
22.	Auxiliary Storage Equipment	22.				3,500		4,000		4,000
23.	Equipment Overtime & Maintenance	23.								
24.	Lease Time	24.								
25.	Equipment Amortization	25.								
26.	Sub Total Equipment Expense	26.		1,560		60,620		73,920		73,920
27.	Other Operating Expenses:	27.								
28.	Denver Regional Computer Ctr.	28.		4,521		17,679		24,310		24,310
29.	Other Contracts	29.		3,942		12,000		12,000		12,000
30.	Building Rental	30.				20,000		20,000		20,000
31.	Adm./Research Overhead(See Instructions)	31.								
32.	Travel	32.		700		2,800		3,100		3,100
33.	Supplies and Expenses	33.		25,545		35,800		35,650		35,650
34.	Sub Total, Other Operating Expenses	34.		34,708		88,279		95,060		95,060
35.	TOTAL DATA PROCESSING EXPENSES	35.	6.7	113,719	20.4	380,342	23.4	446,433	23.4	446,433

COLORADO COMMISSION ON HIGHER EDUCATION

	State Funded Capital Outlay		1 Actual 1971-72	2 Estimated 1972-73	3 Requested 1973-74	4 Recommended 1973-74
36.	Data Processing:	36.				
37.	Electric Accounting Machines	37.				
38.	Electronic Data Processing Equip.	38.				
39.	Data Transmission Equipment	39.				
40.	Data Creation Equipment	40.				
41.	Auxiliary Storage Equipment	41.				
42.	Computer Accessories	42.				
43.	Denver Regional Computer Center	43.				
44.	Sub Total Data Processing Cap. Outlay	44.	109,000	198,680	241,080	241,080
45.	TOTAL DATA PROCESSING COST	45.	222,719	579,222	687,513	687,513
46.	Usage Analysis	46.				
47.	General Fund Supported Usage:	47.				
48.	Resident Instruction	48.				
49.	Research/Development	49.				
50.	Administration	50.				
51.	Security	51.				
52.	Other Usage:	52.				
53.	Grant, Contract, etc.	53.				
54.	Public Service	54.				
55.		55.				
56.	Source of Funds:	56.				
57.	ALP Appropriated General Fund	57.				142,428
58.	Other(1)	58.				545,085
59.						
60.	TOTAL FUNDS		222,719	579,222	687,513	687,513

(1) Includes the Salary Act funding not administered through the Commission office and other miscellaneous funds reported.

AURARIA

The administration of the Auraria Center for Higher Education has requested $25,000 of General Funds to be spent for data processing services. These funds will be used to purchase computer time to run management analysis programs.

APPENDIX A

SUBCOMMITTEE REPORT

ON THE

USE OF ADP IN INSTRUCTION

1. Goals and Objectives.

There are two primary goals for the use of computers in higher education programs. These are first, understanding of the role and functioning of the computer as it affects the social, economic, and technological aspects of our society; and second, application of the computer to the solution of specific problems in technological and social fields of our society.

In support of these goals, higher education has established four objectives.

(1) Every student should have the opportunity to obtain a general understanding of computers, their organization, applications, limitations, and impact on society.

(2) Every student should have the opportunity to study the computer and to apply the computer in the manner and to the extent pertinent to his course of study.

(3) Adequate batch and interactive computer resources (hardware, software, personnel, and programs of instruction) should be made available both to meet the above two objectives and to maintain the level of education commensurate with the standards existing nationally, utilizing networks to achieve this goal as necessary.

(4) The student and faculty member should have access to computer resources appropriate to his course of study and discipline regardless of his institutional affiliation.

The achievement of these goals and objectives in a variety of academic majors throughout the state in a multiplicity of educational institutions presents a very complex problem. However, technological changes in progress and progressing at an accelerated pace make it possible for these goals to be achieved to that degree of uniformity required among the programs, throughout all the institutions of the state of Colorado. The different means of offering services by local computers and by remote computing through telecommunications are being tested in various locations in the state.

By a carefully devised plan involving the appropriate mix of resident computing capability coupled with an adequate tele-communication system connected to regional computer centers, the objective of uniformity and availability of computing powers to all students can be achieved over the next several years.

2. Present Programs.

Every state institution of higher education in Colorado makes some instructional use of computers. The number of students using the computer varies among the institutions as shown in Figure 1 and Table 1.

At every school it is possible for a student to learn elementary data processing principles and computer programming. All of the universities and four year institutions offer at least one course of study in which a student can progress to a level of competence in some field of application of data processing. Several of the community colleges offer subprofessional or technician level terminal programs leading to careers in data processing. A number of unique computer-oriented programs in instruction are offered in state institutions, such as the program in numerical control at Southern Colorado State College. As might be expected, the larger state colleges, the Colorado School of Mines, and the universities offer more courses of study making use of the computer beyond the elementary level. However, in no institution is every department making use of the computer in instruction on the level of the best similar departments in the country. Support for these statements and descriptions of the instructional data processing programs in the individual institutions are to be found in their ADP plans.

On-campus computers used for instruction range from small, obsolete, second generation computers to large, versatile, modern systems. CU and CSU furnish remote batch service to several community colleges and Metropolitan State College. The Colorado School of Mines furnishes a small amount of remote interactive computing service to other schools in the Denver metropolitan area.

3. Proposed programs and emerging issues.

Each institution has its own plans for the use of computers in instruction. These plans are unique to the institutions, depending as they do on the curriculum, size and present state of development of the institution. However, some common threads run through most of the plans.

First is the element of change and growth. Once computer use has passed the threshold of strictly elementary use, it will grow about 40% per year unless artificially constrained. This growth is due to more students in more courses in more departments using the computer to solve more and larger problems. In a school with an increasing enrollment, the demand will grow even faster. Some of the growth is, of course, self-propagating by the availability of a fascinating tool. Most, however, is a result of the information explosion and the demands of society for better and faster solutions to increasingly complex problems.

COMPUTING COST PER STUDENT
FISCAL YEAR 1972

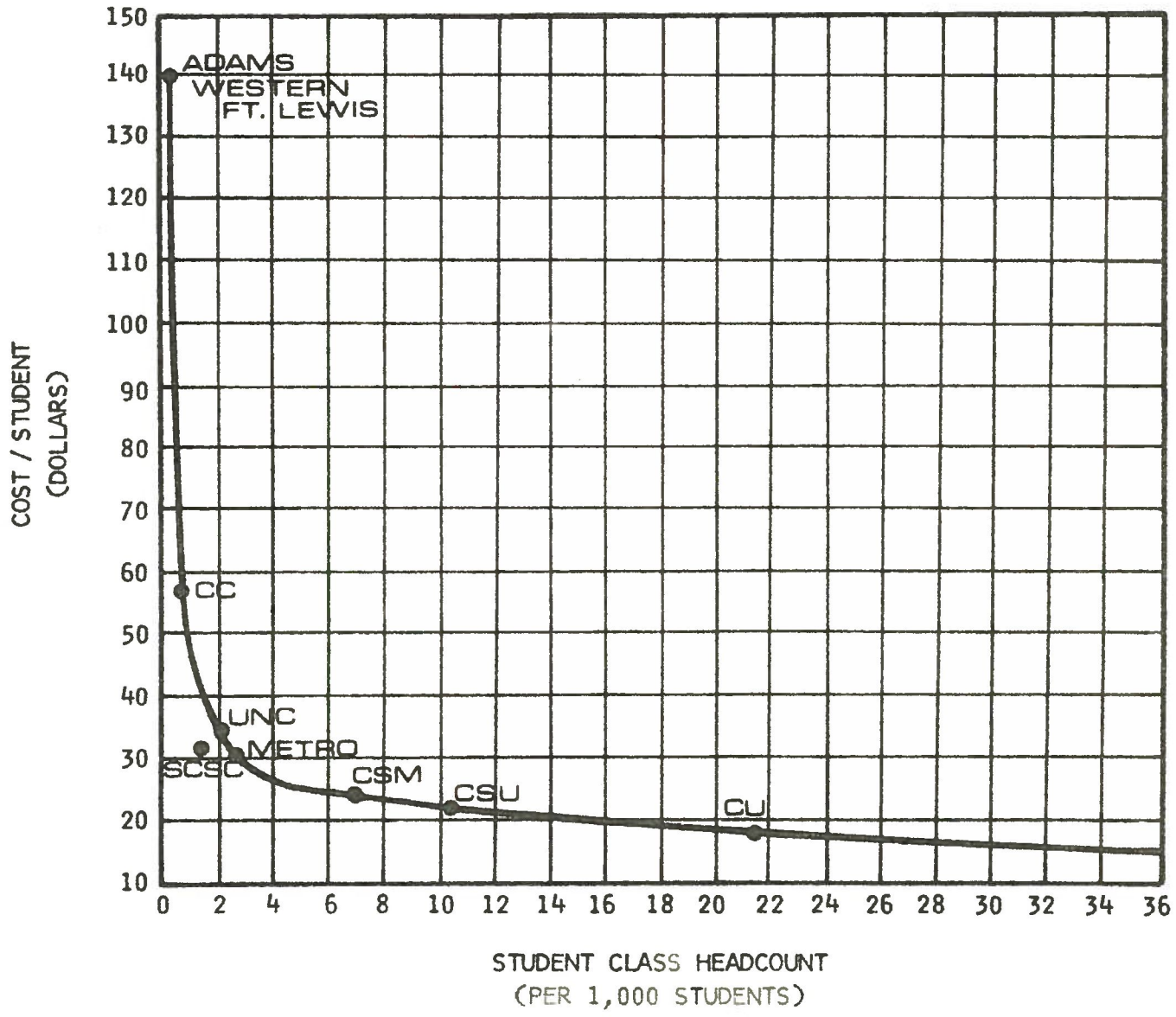


TABLE 1

COMPUTING COST PER STUDENT

FISCAL YEAR 1971-72

Institution or Composite of Institutions	Student User Headcount[1]	Cost/Student User ($)
Adams/Western/Ft. Lewis Composite	564	140
Comm. Coll. Composite (6)	3438	57+
S.C.S.C.	1382	32+
University of Northern Colorado	2,054	35+
Metropolitan State College	2,500	31
Colorado School of Mines	6,965	25
Colorado State University	10,240	22+
University of Colorado	21,671	17+

(1) one student user is one student enrolled in one class using the computer.

The pressure of increasing demand for services leads to requests for more personnel, more supplies, and either expansion of on-campus computers or access to more computer services off-campus.

Second is the need for interactive computing in instruction. Interactive computing has proven itself as a useful tool in many fields of instruction in educational institutions throughout the country. Many high school students in Colorado have learned computer programming in interactive mode and are acutely conscious of a step backward to a more primitive mode when they encounter the computing services offered in most of our colleges. Employers in a number of fields, including engineering and the teaching of high school science and mathematics, expect a college graduate to be competent in the interactive use of computers. For these and other reasons, most schools see an immediate need for interactive computing capability for their students.

However, among state supported institutions in Colorado, only the University of Colorado, Colorado State University, and the Colorado School of Mines have interactive computing capability. The Colorado School of Mines and the University of Colorado have used interactive computing as a regular part of support of instruction for the past several years. Many schools are asking for interactive capability for 1973-74. The pressure and needs are real; the question is how to meet them. Some schools are requesting that their on-campus computers be expanded to provide interactive capability for themselves and perhaps others. Some feel their needs can be met by services from CU, CSU, or CSM. Another alternative for some types of applications may be a dedicated timesharing system based on a minicomputer. For the long range, the alternatives will be weighed to find the mix which will give the best service at reasonable cost with provision for expansion as the load increases.

Third is the desire for computer-assisted instruction. This overlaps with interactive computing but is not the same. Although research in CAI has gone on for some time, CAI is not yet generally considered to be economically effective for widespread use. No Colorado school has much present experience or investment in CAI. There are more questions than answers for implementing CAI now in Colorado. What school(s) should make CAI pilot studies? Who will develop course materials? At what stage of cost and demonstrated effectiveness should the capability for widespread CAI be provided to the schools? In the meantime, experimenting must continue at CU, CSU, and CSM, and be extended into UNC and SCSC.

Fourth is the emerging area of data base management. Several schools now have or plan to have large data bases in the social sciences, natural resources, etc. They need the hardware and software capability to store, access, modify, and manipulate the data bases to use them in solving problems in appropriate fields. Questions of local capability versus storing a given data base only at one site to be accessed remotely arise, as do questions of file maintenance, interactive versus non-interactive use, appropriate general data management software, etc.

APPENDIX B

SUBCOMMITTEE REPORT

ON

RESEARCH

The research function, an essential part of the educational institution's role of creating knowledge and passing that knowledge on to others, is today making an increasingly greater use of computers. Research use of the institution's computing equipment includes both that which is funded directly through Federal, State or other contracts and that which is supported by the institution.

Faculty interested in research activities are strongly encouraged to apply for funds directly from outside sources. The level of success of these applications is dependent on the reputation of the researchers and the interest of the sponsoring agency in the proposed effort. Projects for which outside funding is not available, or which need an allocation initiated, seek support of the institution. Generally, these latter projects require levels of support which are small, but because they use the computer, some allocation of the institution's computer resource is necessary. The associated cost for this academic activity is included in the State appropriation.

Based on the institutional goals, the objective of computer supported research is:

> Use of the computer as a research tool to create new knowledge is a necessary function in higher education. Faculty should have access to computer resources appropriate to his research area.

Research which involves use of computers is predominately at the University of Colorado, Colorado State University, University of Northern Colorado and Colorado School of Mines although other institutions are realizing increasingly greater demands. Examples of research activity demonstrating the concepts described are:

1) University of Colorado

a) Atmospheric and Space Physics Research

LASP (Laboratory for Atmospheric and Space Physics) has engaged in extensive computer usage for its satellite and space probe contracts. Some of the computation work carried out by LASP scientists has involved the reduction of data from space experiments on Mariner planetary probes, orbiting geophysical observatories and sounding rockets. Calculations have been made for trajectory parameters for experiments being conducted on spacecraft. The processing of ultraviolet spectra from space and laboratory experiments determine the properties of their sources and other such projects. Work involving ionization processes, heat conduction and auroral geometry of the upper atmosphere have also been carried on by the LASP scientists. These projects are totally Federal funded, have performed satisfactorily to the sponsoring agency and have produced results which are considered as new knowledge to both industry and education in the State. Many of these results are included in University courses, both at the undergraduate and graduate levels.

b) Psychological Research

A major hypothesis of research performed at the Institute of Behavioral Science at the University of Colorado was that language is an inadequate means for communication of policies as well as for reduction of conflict and the accomplishment of compromise. Research on the question had generated findings which strongly suggested that rational men cannot achieve agreement even when it is desired. The researchers at IBS sought causes for this inability to reduce conflict. They looked toward computer technology as an aid to change.

A technological aid called COGNOGRAPH makes policy and characteristics explicit and clears away operational and linguistic confusion by eliminating false differences in pinpointing real differences. COGNOGRAPH is an interactive computer graphics program based on a probabilistic theory of cognition. It accepts policy judgment as input and supplies a graphics description of a person's cognitive system with regard to the policy in question.

Policy makers interact with COGNOGRAPH on the quantitative/pictorial display with a "light pen" and connection with the interactive graphics terminal. The policy maker indicates with the light pen the changes he is willing to make in his policy. Further interaction with the display allows him to see the consequences of the changes he makes.

COGNOGRAPH has been used as an aid in training medical students to make diagnoses on the basis of cues presented to them on the graphics screen. It has also been used experimentally for the resolution of labor relations disputes. This project was initially supported both by sources outside and inside the University of Colorado. Recently, it has received total NSF support.

c) Civil Engineering

As a result of strong faculty support from the Department of Civil Engineering at the University of Colorado and the University Computing Center, numerous applications programming systems have been developed at the University across the past several years. Supported initially by the Computing Center and the Department of Civil Engineering as research projects, these applications capabilities have now developed so as to be basic material for a variety of courses. For example, interactive computer graphics has been used in a Civil Engineering course in soil mechanics: C.E. 595 (Mechanics of Multi-Phase Media). The graphics system RING (Rate INteractive Graphics) was designed in a problem oriented mode. The system is so designed that a user does not need to know anything about computer programming. The student uses the system in a command structure mode where the commands are in soil mechanics jargon. The system solves a general class of consolidation problems so there are an infinite number of cases that can be treated.

Applications capability similar to this is now being accessed by the Colorado Division of Highways in their day to day engineering design activities.

2) Colorado School of Mines

Geophysics (seismic exploration) at CSM. Before computers, data reduction and interpretation absorbed 10% - 20% of each dollar spent on geophysical exploration in the U.S. Present estimates raise this to 40% - 50% of a total annual expenditure of $800 million in the critical search for new sources of oil and minerals. A large portion of the rise in cost is due to the use of computers to process and interpret the data obtained in the field as the search becomes more complex and difficult and hence previous methods inadequate. The salient feature of geophysical data is its volume. A typical processed section contains 4,000 computed values on each of 100 traces, or on the order of 400,000 values. With this volume of data, the critical need is to have many pictures - a new one for each processing scheme tried. Each new picture may involve the recalculation of each value present in the picture.

A Ph.D. thesis project has been produced on the problems of using a graphics display terminal to process seismic data which relieves the mundane engineering chores of transcription of data and calculation of static and dynamic corrections.

A modest investment by the school in research funds and computer time has enabled the Colorado School of Mines to develop a tool with immediate use in graduate instruction and substantial research potential. Without this development, instruction in seismic exploration would lag behind the practices of industry.

APPENDIX C

SUBCOMMITTEE REPORT

ON

ADMINISTRATIVE DATA PROCESSING

1. The Nature of Administrative ADP

Academic institutions have traditionally differed in their objectives, mission, methods and funding sources. The variance has resulted in the creation of separate governing boards which have set policies designed to achieve the unique purposes of the respective institutions, and which have established equally unique reporting requirements in order to measure their performance. In many cases these institutions are publically supported and must account to various external agencies concerning their use of funds and their educational and administrative activities.

The administrative use of computers represents an interesting dichotomy. On one hand, administrative data processing is closely tied to the unique mission, organization, and makeup of its host institution and must reflect this uniqueness in the design and nature of its applications. Some typical examples of institutional differences which are reflected in administrative data systems include:

(1) Institution's academic calendar - the difference between semester and quarter systems has a direct impact on the institution's administrative data processing requirements.

(2) The method by which the institution determines its faculty, student and course loads. Some institutions use hours, others credits and still other, units.

(3) The method by which the institution calculates its student and faculty FTE. Such calculations may be determined by the academic calendar, the educational objectives and the internal budgetary requirements of the specific institution.

On the other hand, administrative ADP must also reflect the need to provide information for state and federal reporting purposes at minimal cost. This reporting function, while not constituting the major part of administrative computing, has often required considerable investments of time, personnel and funds on the part of the institutions.

Each administrative ADP installation in higher education must continually balance the need to serve the institution while at the same time respond to the diverse reporting requirements of external agencies. The performance of both of these functions as economically and effectively as possible has been an ongoing concern and problem for administrative ADP in higher education.

a. Specific Characteristics

Administrative ADP in higher education differs considerably from the two other major computing activities, instruction and research.

(1) Unlike most instructional and research computing, administrative work tends to have large volumes of input and output data and to be file-oriented in concept.

(2) Administrative ADP provides services to all parts of the institution. Close coordination with users, many of whom may be using the same files for different purposes, is a major task not found either in instruction or research activities. Every data file created or modified must take into consideration all of the users of that file, whereas each research and instruction activity tends to be independent of other areas.

(3) The majority of administrative data systems have tended to be sequential and batch oriented. However, recent advances in hardware and software technology have made teleprocessing applications technically and economically feasible.

(4) Administrative ADP systems are characterized by high development and maintenance costs. The user typically does not write his own programs as is the case in the areas of instruction and research. Furthermore, administrative data systems are generally of an evolutionary nature which require continual review and modification to accommodate changing requirements.

(5) Often the administrative ADP unit will perform the function of data collection and transmittal as well as delivering a verified report to the user.

(6) The administrative ADP organization will also typically provide uniform standards for systems analysis and design, programming and documentation which greatly facilitates the development and maintenance of the institution's administrative data systems.

(7) The ability to provide timely information when and where needed is a continuing concern of administrative ADP installations. Examples of this difference in operation can be discerned in the higher costs recorded for analyst and programmer staff.

(8) In most cases, administrative ADP installations are responsible not only for designing applications, but also for maintaining data files and for making modifications to them. A payroll system at a large institution might typically involve a considerable number of programs concerned directly with paying, posting, accounting and a large number of related programs concerned with budgeting, institutional data and other systems.

The importance of accuracy, timeliness, security and consistency required of the administrative ADP installation cannot be overemphasized. Their support of the operation and management of the institutions can quite literally determine the success or failure of the institution.

Due to the size of enrollments, increasing diversity in subject matter, growing sophistication among clerical departments and the complexities

caused by multiple accountability to various funding agencies, the total cost of institutional administration is seen to be increasing at a rapid rate. Institutions are, therefore, looking to administrative ADP to stem the rising cost trend of administrative procedures.

2. Administrative ADP Applications

The computer is an effective information processing machine. Its success as a tool in editing, storage, retrieval, manipulation and display of the vast quantities of data associated with most administrative tasks (accounting, payroll, financial planning, etc.) is undisputed. Computers have proved themselves cost effective and indispensable in performing the clerical tasks associated with the administrative function.

Higher education has applied the computer to the full spectrum of its administrative record keeping, i.e., finance, personnel, and facilities.

a. Finance

In its financial operations, the administration of higher education resembles the administration of other enterprises. General accounting, payroll, inventory record-keeping, budget preparation, cost analysis, and investment management are tasks that have many aspects in common with industry, business, and government. Just as computers have proven themselves useful, and sometimes indispensible, in the clerical tasks of business, they have demonstrated their value in the related tasks of educational institutions. Those responsible for financial officers elsewhere and, in some cases, have used the same computers and programs through the facilities of service bureaus. Despite this relation,however, many institutions have been slow to follow industrial leadership in computer applications beyond the simplest accounting and payroll applications.[1]

b. Student Records

The most important original applications to be programmed on the campus will usually have to do with personnel, especially student personnel. Registration, grade reporting, and grade recording compose a great portion of the use of computers in the administrative area. The reasons are not hard to find; these tasks involve a large amount of clerical work; they need to be accomplished quickly and accurately; the load is heavier at certain times of the year than at others. They are, thus, natural areas for consideration for computer assistance. From this base, many institutions expand their student-centered activities to cover the years before and after attendance at the institution.

Before the student attends the school, his records are processed by programs that assist in handling student admissions. Many such programs do

nothing more than perform clerical tasks in helping organize applicant information for the use of the admissions staff. However, there are now a number of admissions programs that apply concrete decision rules to data such as test scores and high school grades in order to select applicants who obviously do or do not warrant admission. The more difficult cases which remain are presented to the admissions officers for consideration. Besides providing statistical information and formatting the data in convenient forms, such programs will print mailing labels and letters to applicants and sponsors, analyze geographical distribution of students so far selected, compare the characteristics of the group selected with those of last year's freshmen, and so on.

After the student has left the school, his records are processed by programs that help with alumni affairs. Mailings, fund appeals and other alumni contacts can be carefully organized and analyzed with the help of computer-based alumni record systems. Such programs run the gamut from simple clerical routines that maintain mailing lists to complex management information systems that assist with the organization of major fund-raising campaigns.[2]

c. Facilities

The fourth area of computer use focuses on the campus' facilities: its buildings, grounds, and equipment. With the aid of the computer, many large, sprawling institutions have been able to take complete stock of their space availability and space utilization. With such data in hand, administrators can obtain more accurate data on costs of building and maintaining classrooms and offices. Similar, though less dramatic, utilization advantages can be gained with respect to the wide range of furnishings and equipment needed to stock the campus.[3]

d. The Range of Applications

(1) Day to day clerical information processing. (Student Records, Payroll, Admissions)
(2) The control and audit of institutional activities. (Purchase orders, obligation accounting)
(3) Improvement of management decision-making capabilities through the development of integrated information systems within and among academic institutions. (Payroll/Student Records data may support many institutional cost studies)
(4) The improvement of the institution's planning capability through the development of models and simulation systems. (Campus, et al)
(5) The improvement of techniques for making effective resource allocation and utilization decisions. (Job scheduling and Financial Aid algorithms)
(6) The expansion of administrative computer services to all departments and academic units which have a need and can cost justify the service. (On-line Retrieval System and Administrative Terminal System)

(7) The continuing commitment to institute more efficient and economical ways to utilize administrative computing services. (e.g., Microfilm)

3. Effectiveness

The current literature suggests that most institutions have not gone far beyond the stage of applying straightforward clerical applications to the computer. Higher education generally has not kept pace with private industry in developing sophisticated, integrated systems.[4] Yet the demand for a higher level of sophistication is very real as many state, federal and institutional administrators express the need for more and faster access to administrative information.

One important point to emphasize is the wide range of systems design pertaining to individual applications. For example, surveys of public senior institutions have found that a payroll application may, on one hand, be performed in a "tab shop" and on the other, be a by-product of a faculty information system. Varying degrees of sophistication exist between these two extremes.

The development of administrative applications (and the related technical development staffs) has been pluralistic in nature. With the coming of the computer on campus and the realization of its power as applied to administrative applications, each institution has developed its own. The end result has been proliferation of some similar types of systems. There is an awareness of this situation, and arguments have been heard on both sides as to the justification for these seemingly duplicated efforts. Too often the conclusion is that this has been a misuse of scarce resources and that this could be eliminated via some type of scheme resulting in a joint development of these applications. On the other hand, many administrators assert that because of their local pecularities, such joint systems development would not provide service, information, etc., which is needed to conduct their business day-to-day. They assert that, while the names of the systems may be the same, it is the administrative practices which are unique. Common system development would require common practices and policies. Arguments on both sides of the question have merit and need consideration.

The development of administrative ADP has been a natural evolutionary activity by higher education in attempting to provide for both local administration needs and the information needs of its many publics. There is belief that this function, especially within public institutions, has a higher priority than in private institutions because of the reporting requirements of state agencies. The following points, as discussed in a 1968 study of General Learning Corporation entitled "A Feasibility Study of a Central Computer Facility for an Educational System," call attention to pluralistic developments:

(1) There has been an existence of genuine local differences. This is expressed in the operating policies of the institutions, e.g., how could uniform admission systems be developed when admission policies at each institution differ significantly?

(2) Machine configurations differ. A uniform system cannot be designed to "fit" all of the various machine configurations and operating systems that exist. To do this implies both the development of a central facility and imposing standards on institutions regarding configurations.

(3) Sharing of system and program development is more ideal than practical. Even industry traditionally has not seen fit to do this.

Beyond the reasons discussed above, the Rand Study described other reasons why innovation has been made difficult in this area. This study claims that administrative data processing usually has its own separate computing facility divorced from all other usuers along with their own development programming staffs and seem not to be infected with the spirit of innovation which characterizes academic uses.[5]

This concept does not seem to hold true for the majority of Colorado institutions. Most of them are presently running virtually all administrative, research, and instruction applications on one computer facility. However, it has been observed that as institutions develop certain characteristics, such as orientation toward heavy graduate programs, or as they grow larger, the need to separate computer applications by machine becomes natural. This has held true, for example, at all Big 10 institutions.

4. Needs and Growth

During the last number of years progress has been made toward acquiring equipment and staff to automate administrative systems. While this job is far from complete, many systems have been automated to some extent at most institutions. The result of this automation has been that campus administrators have had more capability to assess information for use in analyzing their institution's operations. In working with computerized systems, administrators find that once the system meets some level of service needs, they begin to recognize the capability of faster and better systems to satisfy other needs. The result of this administrative need is that the emphasis for computerizing the system changes from completely <u>developing</u> new systems to <u>maintenance</u>, i.e., making system changes to accommodate new needs.

An example of an evolving system would be an admissions procedure operating under a batch reporting system which gives the daily status of admissions and produces a wide variety of summaries for different management levels. While the system is responsible for providing up-to-date information for making admission decisions, it does not provide quick answers to a wide variety of student and parent inquiries. This function could be achieved by

providing "on line" capabilities whereby a clerk in the admissions office could have instant access to the admissions data base for answering these inquiries.

Another need is that of developing management information systems Better over-all planning and management can take place by taking the many separate systems and integrating them into a single system.

> "Viable information systems, utilizing computer technology, enable a complex institution to be viewed as a coherent unit. As information systems provide an increasing number of parts to the whole structure, decision makers will be able to take into account an increasingly larger portion of the whole university."[6]

> "Two very important concepts underlie the interrelating of data systems to support institutional planning and management: (1) Institutional analysis files are based on operating data systems; and, (2) Operating data bases are linked into a network by a predetermined set of uniformly coded data elements."[6]

The trend toward management information systems is desirable. The major thrust of this development is concerned with (1) the refinement and integration of present systems including development of data bases for long range projects such as Management Information Systems and Program, Planning, and Budget Control and, (2) the development of financial planning and forecasting systems using a variety of models wherever possible. The magnitude of these developments, as typified by the National Center for Higher Education Systems (NCHEMS at WICHE) with their Resource Requirements Prediction Model (RRPM), Student Flow Model, etc., and Systems Research Group with their Comprehensive Analytical Methods for Planning University Systems (CAMPUS), is so great that its accomplishment will likely require a multiple phased project extending over a number of fiscal years.

All indications for providing for administrative computing needs point toward more effective use of computer resources through cooperative efforts by individual institutions. Most certainly, the need for good management and planning in this area is emphasized within a framework of ever increasing societal needs for scarce funds.

5. Characteristics and Effect on Higher Education

In the majority of cases, users are taking advantage of the computer's superlative clerical abilities to perform faster and more efficiently the separate tasks that were previously done manually. As these uses spread and mature, however, they begin to make easily available kinds and quantities of information that had been inaccessible before. Analyses of the cost of various aspects of the institution's operations can be produced.

Trends in student interests, space uses, budgets, and faculty teaching loads can be computed. Studies of admissions, dropouts, faculty grading performance, and alumni-fund response become part of the administrator's regular management information. As a consequence, the administrator can manage the day-to-day affairs of the university better. He begins to gain the capacity to observe the interactions among the separate components of the institution; to sense the interaction between increases in student enrollment in one department (say, engineering) and increases in student load, faculty load, and space utilization in another (say, physics or mathematics); to see the tight linkage among personnel, financial, program, and facility decisions. And he begins to do a better job not only of day-to-day management, but of longer range planning as well.

Although possible, these potentialities have been little realized in practice. Most institutions have not gone far beyond straightforward clerical applications. This seems to be less a function of the size of the institution than of the ability of key personnel to understand the potential role of computers in managerial affairs, the ability of local computer and analysis staffs to develop complex systems, and the institution's willingness to experiment with expensive and extensive changes.[7]

Several special characteristics of computer use in administration have made innovation difficult:

a. Lack of Cooperation

Until recently, there have been few cooperative efforts that might reduce the cost of developing innovative computer applications. Administrative practices differ so much among colleges that cooperation seems to require changes and adoption of common policies. Most administrations are unwilling to undertake such changes. A promising move toward cooperation has been taken by the NCHEMS at WICHE (Western Interstate Commission on Higher Education) project on management information systems. It is developing administrative programs in cooperation with a number of universities.[8]

b. Scarcity of Development Funds

Development of an advanced administrative data-processing system is expensive and demanding, yet only recently has there been interest by governmental or private funding agencies in supporting the improvement of administrative practice in education. Three notable exceptions are the sponsorship of development of computer-based admissions systems by the College Entrance Examination Board, the support of the NCHEMS at WICHE project by the U.S. Office of Education, and the funding of a number of university programs of institutional systems analysis by the Ford Foundation.

The development of advanced computer uses in the administration of higher education, although slow for the reasons noted, has achieved some

success. At a number of institutions, computer simulations of colleges and universities are being developed in order to test the consequences of changes in admissions policy, student course preferences, budget allocations, and so on. The University of Toronto has pioneered in this regard. Programs to assist in long range cost projections and program budgeting are being written. Techniques to project student needs and space requirements are being studied. And, as an integral part of these developments, the various constituents of the institution--its people, dollars, students, and physical goods; its many departments--are being treated as part of an integral whole, the institution is being viewed as a system. This more coherent view of the university or college, this ability to administer the whole instead of its individual, competing pieces, promises to be the most important contribution of the computer to higher educational administration.[9]

6. Cost/Benefit Analysis of Administrative ADP

A central issue in the resource allocation problem is a determination of the net advantages to be gained through the expenditure of resources. Specifically, the decision of whether a given system should be computerized or whether it should be operated in a clerical mode, or perhaps not operated at all, is highly dependent upon a determination of the relative costs and benefits associated with each mode of operation. A study of all requests for new major system developments should be made in order to provide an economic justification prior to system development. Such a study usually involves the preparation of a proposal which should include such elements as:

(1) Overall systems design with emphasis on interfaces between the proposed system and existing manual or computerized systems.

(2) A plan for system development which includes an analysis of user requirements, system description and specifications, development and production costs, project schedules, testing and implementation, hardware implications and the associated reporting systems.

(3) A cost/benefit analysis which identifies the resources to be expended in connection with the system as well as the benfits accrued from the implementation of the proposed system.

It is recognized that proposal preparation can itself be an expensive undertaking. Administrative ADP management must screen requests and determine the extent to which a proposal is required. Certain small scale or "one-shot" developments can be phased into the priority scheme without an extensive cost/benefit analysis. Requests which potentially require the expenditure of more than $500, for example, would undergo a more detailed analysis. The extent of the proposal and analysis would be closely related to the magnitude of the development and would rely upon the judgment of administrative ADP management.

Proposals cannot be viewed independently since decisions in connection with a given new system proposal are related to other system proposals and undoubtedly other operations of the institution. The fact that a decision is justified from a cost/benefit standpoint does not necessarily justify its development as related

to other systems proposed; especially in the case of limited resources. Each systems proposal should be viewed as a planning element and integrated with other proposals and developmental efforts for purposes of providing a long range plan which can be utilized in the establishment of priorities.

a. Analysis of Comparative Cost

It is necessary to prepare a comparative analysis of the costs associated with the computerized system being proposed and the comparable system, if any, as it currently exists. Certain costs will likely be incurred under both systems. It is unlikely that the computerized system would eliminate all clerical costs incurred under the conventional system.

Two other types of costs must be analyzed in more detail. Conversion costs are defined as those costs which would be incurred once during the development of the computerized system and would include such components as system design and development, programming, testing and debugging, change of forms, and computer time and data creation for development.

All other costs associated with the system are defined to be operating costs. This cost includes such components as data collection, computer time, clerical, materials, data creation, distribution, and system maintenance.

These costs must be estimated for the computerized system and also for the comparable conventional system, if such exists, normally on a per year basis.

b. Analysis of Benefits

The most difficult area of cost/benefit analysis is a measurement of the benefits or returns associated with the new computerized system, because of the subjectivity involved in estimating the differences in the quality of decisions and the value of more readily available information which normally results. The concern is with the relative return associated with the new system versus that of the old system; if, in fact, a conventional system currently exists. An analysis of benefits would include the estimation of such components as:

(1) Eliminated clerical efforts
(2) The value of additional information obtained
(3) The value of shorter lead times associated with obtaining information
(4) Research significance of the system
(5) Value of interfacing with other systems.

In this sort of analysis consideration would be given to information requirements and the capacity and flexibility of the system to satisfy such requirements. Further, an evaluation must be accomplished relative to the availability of information and its effect on decision-making. For example,

there is little value attached to having information six days earlier through a computerized system unless an improvement in decision-making results from more readily available information. Likewise, if the information available through one system as compared to the other system would improve the quality, and perhaps the quantity of decisions, such measures should be included in the benefit analysis. It is also useful to measure the benefits of a new system by measuring the penalty costs avoided by the new system. The avoidance of penalty costs should be included as benefits.

Cost/benefit analysis is often criticized because the relative returns are difficult to measure quantitatively. While the subjective nature of benefits is recognized, such criticism is unjustified. A cost/benefit analysis is, in fact, performed whenever a proposed system is evaluated; whether this is done on a systematic basis or as a global, intuitive judgment. It is claimed that a systematic approach is much more likely to yield effective decisions in connection with new system developments. Certain costs and benefits can be readily quantified, others must be estimated, to obtain as accurate a measure of the costs and benefit components detailed above as is possible.

REFERENCES

1. R.E. Levien, etal, The Emerging Technology, Instructional Uses of the Computer in Higher Education (Draft), September 1970, p. 37.

2. Ibid, p. 38.

3. Ibid, p. 39.

4. Ibid, p. 37.

5. Ibid, p. 41.

6. John Minter, Ben Lawrence, ed., John F. Chaney, "Data Management and Interrelated Data Systems for Higher Education", Management Information Systems; Their Development and Use in the Administration of Higher Education, p. 17.

7. R.E. Levien, etal, The Emerging Technology, Instructional Uses of the Computer in Higher Education (Draft), September 1970, p. 40.

8. Ibid, p. 41.

9. Ibid, p. 42.

APPENDIX D

SUBCOMMITTEE REPORT

ON

NETWORKING HIGHER EDUCATION ADP

Networking has been presented as an emerging issue in planning for data processing services in higher education, both for instruction and administration. Networking is usually discussed from the standpoint of making use of excess capacity at certain computer installations or of tightening central control. These points are pertinent in planning whether or how to network, but they are not the central point. Networking is a means to an end, not an end in itself.

The central question in considering networking or any other approach to meeting the expanding needs of instructional and administrative data processing is how to provide the best service to meet the many different needs at reasonable costs. The programs of instruction, number of students, location of students, present investment in applications software, present services, and total cost of providing service must all be considered, in addition to computer hardware and administrative control.

Three terminal networks are already in existence in the State of Colorado centered around the University of Colorado, Colorado State University, and Colorado School of Mines. The first two of these networks provide batch service for research and instruction oriented applications. The network utilizing the CSU computing facility also supports administrative applications. The CU and CSM networks provide access from interactive terminals via the public telephone system. All networks are coordinated through the Colorado Commission on Higher Education, but otherwise are autonomous. The network supported by Colorado State University has received State and NSF funding to provide support for community college instructional computer usage (COTIE). Approximately 70,000 students enrolled in Colorado institutions of higher education can be exposed to instructional applications through these networks. (Figure 1)

The addition of another large facility in the State system, the Denver Regional Computing Center, was based on a discussion to reduce capital expenditures and share resources through networking. Implementation of its network is under way. (Figure 1)

Continuing concern about ADP networking between institutions of higher education has resulted in several networking studies initiated by the institutions which are currently operating networks. In addition to consideration of organizational and policy oriented questions which are discussed in this report, hardware and communications requirements have been reviewed. Basic

in these considerations has been the evaluation of the front-end computer concept as utilized in numerous existing computer networks, e.g. ARPA and MERIT. In these networks, multiple front-end computers and multiple data communications routes provide the required high level of reliability of service. The Colorado higher education network plan relies on this operational experience (Ref. The Hardware Network, a Colorado Report, by E. R. Krueger; Preliminary Description and Requirements: Regional Network and University of Colorado Communications, by C. J. Brauch and R. R. Gilman; HITIE proposal to NSF - project director L. Maxwell). (Figs. 2 and 3)

In developing networking plans and evaluating alternatives, criteria for effective networking must be established and applied. Criteria being considered for Colorado higher education are as follows.

a. The network must offer to all campuses of all institutions the capabilities for batch processing, interactive computing, and the accessing of magnetic tape and on-line files, as the need for those services is demonstrated.
b. No existing on-campus service at any institution should be transferred off the local computer to a network computer without study and justification to prove that the service can be furnished at least as well and at equal or lower cost. Before a service is transferred, personnel resources must be provided by the State for program conversion.
c. New services needed on a campus should be provided by a network computer already furnishing such service unless it is demonstrated that such service can be furnished more economically locally than via the remote computer.
d. When a new service, not presently offered anywhere on the network, is needed at a school, the total potential system-wide demand for continuing service will be studied to determine how and from which computer(s) the service should be supplied.
e. Expansion of computer capacity at any school will be coordinated with total network needs.
f. Network node computing centers must be so managed that all users from all campuses will receive comparable priorities and services.
g. Network node computing centers must be provided additional support staff to furnish training and consulting services to the schools they serve, as well as to maintain additional software and hardware which may be needed to serve the network.

With these criteria, detailed evaluation of the role of present computers can be carried out, and decisions made when to provide additional resources, and what services should be furnished to whom by which computer.

STATEWIDE HIGHER EDUCATION ADP NETWORK 1972-73

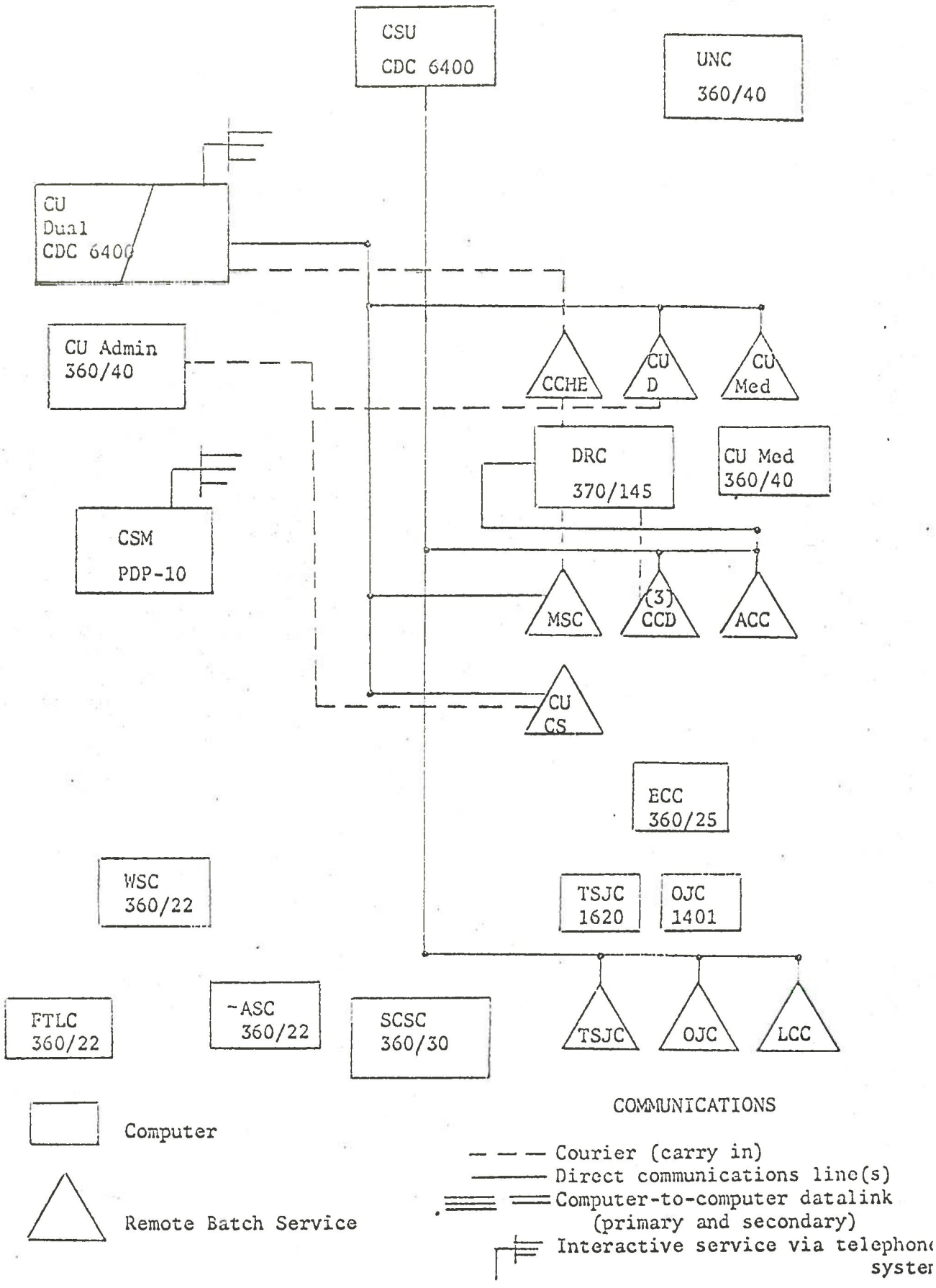


FIGURE 2

STATEWIDE HIGHER EDUCATION ADP NETWORK 1973-75

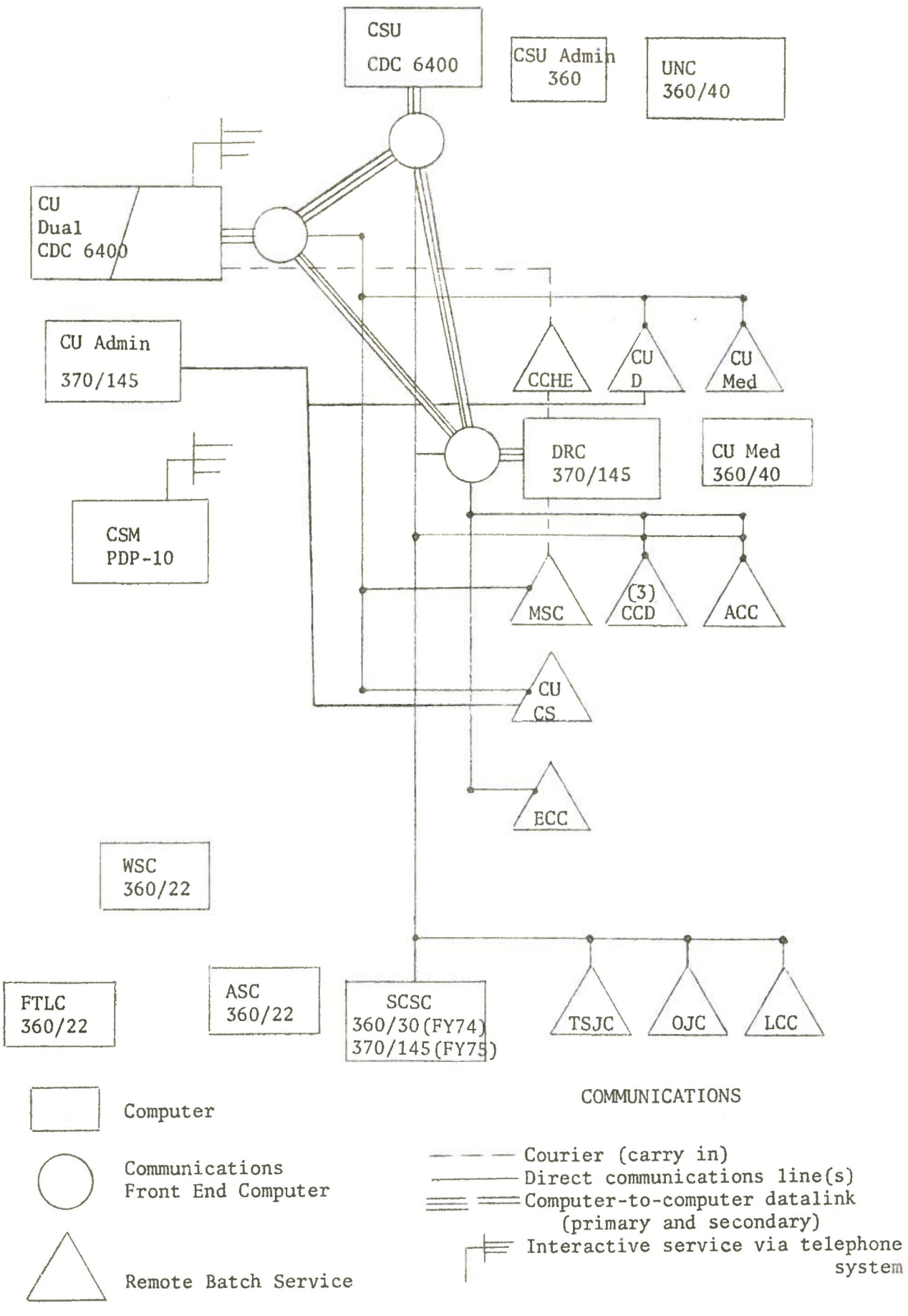


FIGURE 3

STATEWIDE HIGHER EDUCATION ADP NETWORK 1975 - LONG RANGE