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ABSTRACT

This monograph provides descriptions of the use of computers in seven community colleges. Each includes background information about the institution's history, facilities, programs, and students, while focusing on the computing environment, its background, current status, and future. First, "Computers in Community Colleges," by Judith W. Leslie offers a general discussion of the use of information technologies in community colleges, examining patterns in computing services related to student recruitment, assessment, record-keeping, instructional delivery, and student assistance. Subsequent chapters include essays on the Dallas County Community College District by James Hill; Maricopa County Community College District by Ronald D. Bleed; Mercer County Community College by Joseph P. Balabon; Miami-Dade Community College by H. Phillip Nicely; North Central Technical College by Warren H. Groff; Pima County Community College District by Judith W. Leslie; and Southwestern College by Allan MacDougall. Finally, Judith W. Leslie reviews major patterns reflected in these descriptive essays as they relate to institutional environment, computing background, current computing practices, and plans for the future. (LAL)

CAUSE

MONOGRAPH SERIES

Computers Serving Students:

The Community College Way

Edited by
Judith W. Leslie

The Professional Association for Computing and Information Technology in Higher Education

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About CAUSE

CAUSE, The Professional Association for Computing and Information Technology in Higher Education, is a non-profit professional association, national in structure, membership, and operation. The mission of the association is to promote effective management, use, and development of academic computing, administrative computing, and information technologies in colleges and universities. CAUSE activities provide a framework for communication among professionals with common interests and concerns, a centralized source of quickly accessible information to support the research and decision making of such professionals, a forum for the identification and discussion of problems and issues related to the field, a resource for research and publication in the field, and an opportunity for individual professional development.

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Foreword

Consider twenty-six years ago. There were approximately 678 community colleges serving approximately 500,000 students. None of the seven institutions discussed in this volume were in existence. Community college success and effectiveness were significantly related to their growth and their commitment to access. Little-known except to local communities, community colleges were exciting, innovative, creative educational experiments. They were what the baby boomers needed, what industry needed, what the G.I. Bill needed, what a country in the midst of unprecedented economic growth and prosperity needed.

Consider the present. There are now at least 1200 community colleges for approximately five million students. The institutions we are discussing in this monograph enroll approximately 240,000 students. You will read much in these pages of the student population these institutions serve. If this type of college did not exist there would be no accessible educational opportunity for millions of women, people from minority groups, people older than twenty-five, people needing, in the words of Harlan Cleveland, "recurring education." If the demographers, the futurists, and the thoughtful among us are correct, the future of this nation and many others depends in a dramatic fashion on their success.

Consider the challenges for community colleges. Growth recently has diminished; the commitment to accessibility has been emulated by much of the higher education community and is no longer unique to community colleges. The mature baby boomers are forty years old; the G.I. Bill has expired; and we no longer take economic growth for granted. We are redefining our educational agenda and reformulating our values. In urban areas, the community college is taking on the role of the "city college" of the 1950s and 1960s. Throughout the country, community colleges are formulating responses to the fundamental academic issue of quality. It is no longer adequate to be available; it is essential to be effective as well. We find ourselves responding to forms of change other than growth—new services for contemporary student needs, complete modification of programs rather

than simple program addition and deletion. We are assessing these changes in light of a collegiate culture, a meaningful educational environment, and an awareness that our community colleges make value statements to students simply by their physical existence.

Consider computers. In an electronically accessible, multi-national world in which people seek to control information as they once controlled things, computers have become the equivalent of the internal combustion engine. Without them, space shuttles would not be as readily launched, the IRS would have more difficulty collecting taxes, television, telephones, and transportation would be greatly limited. Our GNP would shrink, our vocabulary would change, and our perception of our environment, greatly affected by the availability of information, would alter considerably. Computers, with their accompanying values and perspective, have become part of the public and private culture we inhabit.

Consider computers in community colleges. Students have come to expect the virtually instantaneous service of admissions and registration available at some of the institutions discussed in this volume. They are comfortable interacting with electronic machines as well as people. They value the ease that accompanies advanced technology systems in our institutions. But students need more. Students need to be confronted with the impact of computer technology as they evaluate the past, consider the present, assess their civic responsibility, and determine the work they may do. Students need to be sensitive to the impact of the advanced technology era on how they think and what they think. Students need to understand the potential power implied by the computer age. Most of all, they need to understand that the societal changes emanating from extensive application of computer technology have created an unavoidable obligation for lifetime education.

If you are not already part of the computer culture which produced the developments described in these pages, you soon will be. And so we present this clear, informative, and important monograph on computers in community colleges. It is meaningful reading; it is worthwhile reading.

Judith Eaton
President
Community College of Philadelphia

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Chapter One

Computing in Community Colleges

Why Community Colleges?

The "business" of all higher education is information: the imparting of information about our historical foundation, the analysis and integration of our current body of knowledge, and the creation of new ideas. One of the most efficient and effective tools used in this business is the computer. It develops, manages, and disseminates information resources with a speed and capacity for complexity unknown in any tool previously available to education.

While the computer is present in all segments of higher education, the literature describing its use focuses on the four-year/university environment. This monograph is offered to describe computer use in another segment of higher education: two-year and community colleges, with their unique history, mission, and programs.

Most community colleges were founded in the sixties.This period was characterized by space exploration with its technological underpinnings; innovation brought on by a population of students who rejected past practices; and access to higher education by a student population with special needs. It was within this era that most community college programs were planned, their facilities constructed, and their faculty hired.They developed in an era ripe for change, and the tool to accomplish it was the computer.

The traditional mission within higher education has been research, instruction, and community service. The community college mission is more limited, including only instruction and community service: to prepare students for direct employment or university transfer, to satisfy general interest, and to respond to the educational, social, and economic needs of the community. While the introduction and expansion of the computer into the university came about to a great extent in support of the mission of research, within community colleges the computer's presence came about primarily in support of the mission of instruction.

Community college programs have always been designed to serve the needs of the local community. As the market began its transformation from an industrial to a technological base, community colleges responded by

establishing two-year programs in computer science and data processing, electronics, engineering, CAD/CAM, and other computer-related fields. Since many of these programs were to prepare students for direct employment, the courses were practitioner-oriented, offering hands-on instruction with the computer. Within the university environment, responsiveness to the marketplace evolves more slowly and its coursework is more theoretically based. Thus the community college typically infused the computer into the curriculum sooner and more extensively than did the university.

To illustrate the above generalizations about the effects of history, mission, and programs on the use of the computer in community colleges, seven institutions are featured in this monograph. These particular schools were selected according to the following criteria:

1. effective use of the computer in serving students,
2. a reputation for innovation in the use of computers,
3. involvement at the national level in the exchange of information, and
4. a balance among institutions on the basis of size, type, and location.

Dallas County Community College District is located in Dallas, Texas, which is one of the largest metropolitan areas in the country. Seven separate comprehensive community colleges comprise the District, with a combined enrollment of approximately 47,000 students.

Maricopa County Community College District, located in Phoenix, Arizona, is the third largest community college system in the United States with an enrollment of 68,000 students. Seven separate colleges comprise the District.

Mercer County Community College is an autonomous institution which operates within New Jersey's higher education system of two-year county colleges, four-year state colleges, and the state university. Located in Mercer County, it enrolls nearly 3,000 full-time and more than 6,500 part-time students.

Miami-Dade Community College District is located in metropolitan Dade County, Florida. Approximately 64,000 students enroll for credit courses annually. The District has grown from a single temporary site to four permanent campuses.

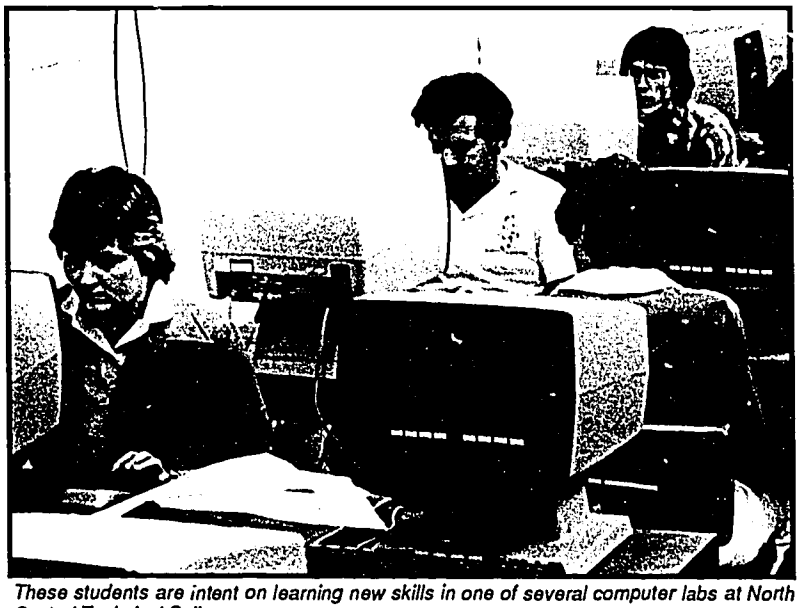
North Central Technical College is located in Mansfield, Ohio, and serves Ashland, Crawford, and Richland Counties. Enrollment at North Central for the fall quarter 1985 was 1,894 students (1,172 FTE). The College shares facilities with the regional campus of the Ohio State University. This is the only featured institution that is not a community college. Unlike the other institutions, which include university-transfer two-year degree programs, North Central's curriculum offers only two-year technical degree programs.

Pima County Community College District is in Tucson, Arizona, a growing urban community of the southwest. The College enrolls approximately 20,000 students on four separate campuses.

Southwestern College is one of seventy publicly-supported California community college districts. It serves the population of California's most southwesterly comer, Chula Vista. The College has an enrollment of 12,000 students.

Each chapter has a unique orientation and emphasis. All include background information about the institution's history, facilities, programs, and students. Each focuses on the computing environment, its background, current status, and future.

Should you read on? If you are interested in the future, yes. Community colleges are expected to play a major role in the future of higher education. Enrollment projections consistently predict that there will be more minority, more female, more part-time, and older students than in the past—populations that community colleges have always served, and will continue to serve, through programs and services which accommodate their particular needs. Furthermore, given the low cost of attending a community college compared to a university, greater access for more students is possible in a community college. This combination of conditions suggests that the greatest number of college students in the future will be served by a community college. In the stories of the seven institutions featured here you will discern the beginnings of an era that has the potential to change the nature of the learning process and the way in which people work. The business of higher education has always been information—and information is the business of the future.



These students are intent on learning new skills in one of several computer labs at North Central Technical College.

Patterns in Computing Services in Community Colleges

Certain patterns in the use of information technology emerge from analyses of community colleges' responses to their student population and its unique needs. This population has more older, more part-time, more minority, and more female students than do those of four-year colleges and universities. The majority of community college students are working adults. Some are academically underprepared, and a good number need financial aid. They are interested in transfer programs and vocational programs; many have personal interests to pursue.

In order to cope with this mixture of needs, abilities, backgrounds, schedules, and commitment levels, community colleges are using computers extensively—to simplify complex administrative demands, to prepare students for changing vocational conditions, and to provide training in valuable intellectual skills. There are five essential categories in which these schools use computers specifically to serve students, categories which we can conveniently term the "five A's":

1. *Attraction*: information systems and other technological applications used to recruit students.

2. *Assessment*: information systems and other technological applications used to assess students in financial, academic, and personal domains.

3. *Administration*: information systems and other technological applications used in student -oriented record keeping.

4. *Academics*: electronic delivery systems and modes of instruction as well as technological innovations in select programs of study.

5. *Assistance*: information systems and other technological applications used to assiststudents in every phase of their relationship with the school, from entry to completion to follow-up.

These categories provide a framework for the following general discussion of the use of the information technologies in community colleges.

Attraction

There are a variety of technological means which community colleges use to recruit or "attract" students to their institutions, from personalized computer mailers to high school students, to on-line career counseling in the high school or workplace, to a registration process that is convenient, accessible, flexible and expeditious.

Computer mailers are being utilized increasingly to attract students to community colleges. This may be through high school listings of students, through previous enrollment, or through promotional activities such as follow-ups to shopping center displays. Current students also are receiving mailers advising them of special sessions, new services, and registration times.

Community colleges are using the computer for career counseling to attract students. Pima Community College, for example, uses a Guidance Information System wherein terminals are placed in local high schools, and plans have also been made to offer them at major employer sites. Interested students can use this system to discover what programs are available on a local, regional, or national basis. The system allows inquiry according to a number of variables including careers, transfer information, course equiv-

alency information, institutional requirements, programs of study, and occupational information.

Most of the community colleges featured have sophisticated student registration processes. Two ways used to make registration convenient and accessible are through non-campus registration sites and through the telephone. Maricopa County Community College District has piloted voice registration at one of its colleges and will shortly implement it throughout the District. A number of these institutions also assure that registration is convenient for students by having on-line terminals available in shopping malls during the weekdays, evenings, and weekends. One college has a mobile van, equipped with terminals, circulating throughout the community on a prepublicized schedule.

Most of the colleges featured herein have on-line registration systems. Miami-Dade's system is a well-respected one, modeled after an airline reservation system. Pima's on-line system began in 1974, years ahead of many institutions, and was noted for "ten-minute total registration." It has been expanded today to include diagnostic and prescriptive information as well as on-line fee confirmation. Maricopa's on-line system, which registers 200,000 students a year, includes a transcript system, a comprehensive financial aid system, and a tuition billing-and-receivable system.

A great appeal of community colleges is that their registration systems have been flexibly designed to accommodate a variety of schedules. Coursework is certainly not limited to traditional semesters. Students can register for open-entry/open-exit courses, wherein a student begins a course at any time and completes it at his/her own pace. The systems can also accommodate short-term and fast-track courses. Since community college students tend to have a higher rate of course and program changes than students in four-year colleges and universities, the registration systems also accommodate a heavy drop/add load and late registration.

Many community college registration systems also accommodate extensive non-credit offerings, sometimes referred to as "community services." Students who are not seeking a degree or credit, such as senior citizens, are constituting a larger proportion of community college enrollments. Dallas County Community College District has a registration system that includes these students.

Assessment

This category includes assessment in academic, personal, and financial areas. Many students who would like to pursue postsecondary education but are underprepared are attracted to community colleges because of their open-

door admission policy. One result of this policy has been the phenomenon referred to as the "revolving door": once enrolled, students find that they do not have the background or resources to continue their studies. To address this problem many community colleges have incorporated into their registration process and systems features which assess students' academic ability and potential, financial resources, and professional and personal goals.

Several of the featured institutions have extensive diagnostic and prescriptive modules as part of their registration systems. Pima College students who are registering for the first time and are enrolling for six or more credits take placement tests in reading, writing, and mathematics. The tests are scored immediately and fed directly into the system. When the student's registration information comes up on the on-line terminals, he or she is advised which courses to take. Miami-Dade has a similar but more comprehensive system and requires, rather than recommends, its students to take those courses that will bring the students up to a level of performance that will give them a greater likelihood of succeeding in subsequent coursework.

The proportion of community college students who need financial aid typically is greater than for university students. Consequently, community colleges attempt to make this information available and the process expeditious. Maricopa County Community College District has recently implemented financial aid software developed by Information Associates which continuously updates the program to incorporate new federal guidelines and requirements, monitors the status of students who have financial aid, and provides an analysis of financial aid availability to those students who are interested.

Administration

Because community college students typically work full- or part-time and have family responsibilities as well, their scheduling of courses is inconsistent. Some will take only one course per semester for years, others will take a full load for two semesters and then not resume for several years. This pattern of enrollment necessitates a highly flexible and sizable student record-keeping system.

To accommodate these needs, most of the institutions featured have developed extensive student record-keeping systems which include such features as applicant profiles, student characteristics, no-show lists, and comparative enrollment reports. The systems also provide class lists to faculty with information regarding the student, including phone numbers.

With the increasing availability of mini- and microcomputers, many faculty members are designing personalized record-keeping systems tailored to their own courses, their students, and their program record-keeping requirements.

Grading in community colleges also may differ from other types of institutions. Because of their philosophy of taking students from where they are to a point where they can succeed, many institutions have "non-punitive" or more flexible grading policies than other types of institutions. For example, there are incompletes, withdrawals, pass/fail, and in-progress grades in addition to the A through F grades. The student systems of community colleges are designed to accommodate these more flexible grading policies and procedures.

A system that is gaining use in community colleges is a degree audit system. Because the community college student can be transitory and may not be degree-seeking, this type of system has been particularly difficult to design. Miami-Dade, however, has designed an effective system called the Student Academic Advisement and Graduation Information System (AGIS). It includes specific information for the student such as his/her declared major, courses taken, course prerequisites needed, current enrollment, and remaining courses necessary for graduation. Maricopa will implement a degree audit system in the fall of 1986.

Academics

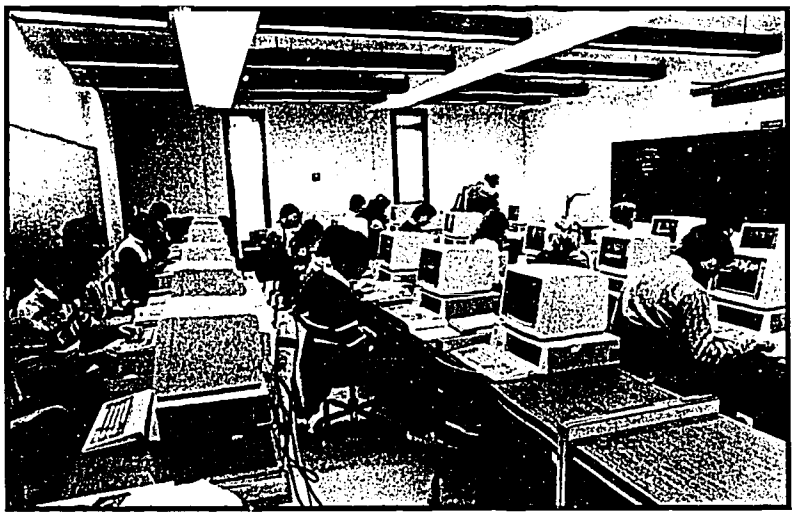
There is a great deal of excitement and enthusiasm in community colleges as they discover new uses for the computer in the classroom. Because of the importance of research in any university, many university faculty members have emphasized their role of researcher over that of instructor. For community college faculty, however, instruction is the primary—indeed, the sole—role. Consequently their energies are channeled into improving classroom instruction. Many have found the computer to be a significant tool. A sample of some of these innovative activities are described below according to the categories of curricula, modes of instruction, and training.

Curricula

Because market trends were signaling the future information society at the time most community colleges were founded, it is typical to find computer science/data processing curricula in community colleges. It also is common to find that these curricula are among the largest in terms of enrollment. Substantial hardware and software resources have been infused into these curricula, beginning with mainframe timesharing, and moving to their own mini- and microcomputers.

Electronics programs are also prevalent at community colleges, and a number of schools have moved aggressively into high technology training. An interesting project is that at Southwestern College, which established a $2.4 million high technology center featuring state-of-the-art computer-aided design, engineering, and manufacturing technology. The center was made possible through a joint venture with Computervision and other major industries and was supplemented with state and college resources.

Mesa Community College, in the Maricopa District, recently completed a $4 million vocational building which features high technology programs such as robotics, CAD/CAM, and electronics. The building includes three computer laboratories and multitudes of personal computers. Glendale College, also in the Maricopa District, will have a unique high tech center ready in December 1986 in which the microcomputer labs will be equipped with some micros, IBM clones, built by faculty. IBM has donated FASTDRAFT equipment to both Miami-Dade and Pima Community College, which has allowed them to expand CAD/CAM instruction. North Central Technical College developed and implemented a robotics course through its task force on robotics. Mercer Community College has a quality engineering technology curriculum and accompanying well-equipped laboratory.



An engineering lab in progress in the computer terminal room at Mercer County Community College.

Community college faculty are utilizing the computer in a multitude of other curricula. In just the few institutions featured in this monograph, the following curricula were identified as having integrated the computer into the classroom using computer-assisted and/or -managed instruction:

- Math/Science curricula: physics, chemistry, mathematics, biology, anthropology, archeology, drafting, meteorology
- Vocational curricula: allied health (including respiratory therapy, physical therapy, and medical radiography), business, office education, accounting, legal assistant, advertising, marketing
- Liberal Arts curricula: music, history, English/writing, foreign languages, psychology

Southwestern College was selected to participate in the Inter-University Consortium for Educational Computing (ICEC), funded by Carnegie-Mellon University. Through the consortium, Southwestern will be developing sophisticated educational software applications for the next generation of powerful computing workstations. There will be continual upgrading of equipment to provide interactive video curriculum support systems.

The use of computers in music is particularly noteworthy at Southwestern, where music classes are taught with computer-assisted instruction in basic music theory, drill and practice, testing, and simple programming on microcomputers. Sixteen tutorial units have been developed for use in the Contemporary American Music course.

The application of microcomputers to the field of archeology has been especially well developed at Pima Community College. Through a grant from the National Science Foundation and subsequent other grants, the archeology program takes the microcomputers into the field where excavation work-plans and data are input on-site. Data bases have been designed using this information and shared with the archeological community nationally.

Since many of these community colleges serve a population for whom English is a second language, they have made extensive use of the computer in teaching the basic language skills. Southwestern College, for example, has an English Language Institute which includes computer-assisted instruction throughout. Funds from a federal grant allowed the college to purchase CAI programs for this purpose.

Numerous other applications exist and, with increased training and new hardware and software, will continue to expand throughout the curricula.

Modes of Instruction

A number of institutions are training their faculty in the use of authoring languages so that they can design peripheral support applications appropriate to their disciplines. Miami-Dade, for example, has designed a system called RSVP, a computer-based instructional management system which provides individualized feedback to students in printed form. The uses of RSVP are as varied as the faculty and advisors using it. It can be programmed to cater to any mode of instruction, size of enrollment, level of education, and kind of time frame. Camelot, an authoring system for individualized information, was a spinoff of RSVP. It helps users maintain personal and individualized communications with students. At Maricopa, an authoring language called TEACH was designed primarily to present drill and practice instruction on the computer. It has been distributed to fifty different colleges.

The telecommunications changes which are taking place in some community colleges can also be used as important curricular enhancements. Dallas County Community College District is implementing a plan that calls for an inter-campus micro-wave/fiber optic transmission path with digital switching equipment at each location to integrate voice and data transmission. Part of the plan is a low-power TV station for the transmission of instructional television courses to students in the county. Rio Salado Community College in the Maricopa District is taking an active role in the use of teleconferencing, television, radio, and other communications technologies. The Maricopa District just approved $8.9 million for a ten-year telecommunications plan.

Support services such as laboratories and libraries are important users of the new information technologies. All of the featured community colleges have extensive laboratory facilities in support of the their data processing curricula and most have general-purpose and multi-disciplinary laboratories for other curricula. In multi-campus institutions, each college or campus typically has a lab, making this resource readily accessible to faculty, staff, and students.

A few of the featured colleges utilize information systems in their libraries—most commonly, a circulation system. Maricopa will implement a comprehensive library automation system in the fall of 1986. Pima Community College has an encumbrance module which is integrated with its student registration system. Mercer has participated in OCLS through the Pennsylvania Library Network (Palinet) and uses DIALOG for on-line

reference searching. Southwestern College has an integrated, automated circulation system, Dynix. This system has replaced the card catalog with on-line circulation information at five terminals. Two on-line computers are available to students and faculty for computer literature search systems.

Training

Community colleges have moved aggressively into providing training for their faculty and staff. Maricopa, for example, has a faculty computer-literacy project. The key feature of this project is the loan of personal computers to individual faculty members. These computers can be used by faculty for a three-month period in their offices or homes. Education consultants, who are full-time staff of the District Computer Services, train faculty on the use of software.

Pima Community College had the unusual distinction for a community college of training the county public school teachers in the use of computers. They were selected as the only community college to participate in IBM's National Model School Computer Literacy Program in 1984. They received twenty-five personal computers and ten PCjrs. The College offered courses at one of the campuses and used a mobile van to reach out to public school districts, including those on the Indian reservation. Pima also received a federal grant to help faculty incorporate computers into the curriculum. Two computer science faculty members will have released time for three years to carry out this project. Approximately $250,000 worth of hardware and software will also be available to project participants.

North Central Technical College also received a federal grant that will help faculty learn how to use instructional technology in computer-assisted instruction, computer-managed instruction, and telecommunications. The grant provides approximately $450,000 over the period from 1985 to 1988.

Many of the community colleges described in this monograph have computer laboratories open to faculty and staff, and in-service programs to train them. Nearly all of the sample had one or more full-time staff members to carry out this function.

Assistance

Many technological applications have been developed to provide direct assistance to the student in all phases of his/her association with the institution—prior to entry, while he or she is attending, and as a follow-up. Many of these systems could have been discussed in one or more of the preceding categories in the sense that almost all college programs are designed to be of assistance to students. Those summarized here are

programs that go beyond "normal" expectations of a college's duty to its students.

Some of the institutions have student information systems through which computer-generated mailers inform students about registration and/or special programs of interest. Miami-Dade has an extensive student profile available to students and advisors to assist in developing class schedules and programs of study.

Once students have enrolled, they may well be in need of tutorial assistance. Community colleges are noted for tutorial laboratories. Within these laboratories are computer-assisted materials in the basic skill areas, and some include material for individual classes. At Maricopa there is a project called TICCIT, funded originally by the National Science Foundation, which is a complete CAI system consisting of 128 stations (data terminals and interactive videos) which present drills, practice, and tutorial lessons in a wide variety of subjects. Student placement tests are also administered on this equipment.

To monitor and assist students while they are enrolled, a few institutions have designed and implemented academic alert and advisement systems. Miami-Dade has been the forerunner in this development. Students are informed through a mailer at mid-term whether their progress is satisfactory. If performance is not satisfactory, students are given a referral to a counselor to determine how their performance can be improved. This system also provides information at the end of the semester regarding a student's academic standing. Pima Community College has implemented a similar system.

When students have completed their programs and are ready to transfer or enter the job market, many community colleges assist through computer applications. Pima College, for example, has a fully-automated Career and Job Placement Office with an information system designed to assist with both record-keeping and placement. A student inputs his resume directly into the computer and his/her skills are matched with available jobs listed by local employers.

In keeping with the community college philosophy of life-long learning, the relationship between student and college does not end when the student has earned a degree or certificate. Numerous follow-ups are conducted, many using the computer. Surveys of both employers and graduates are conducted and the results analyzed using statistical software programs. Alumni systems are also evident as the institutions continue their contact with former students. Tracking of students who transfer to a university is also conducted either in an on-line mode or through the exchange of tapes. The results of these follow-up activities are measures of the community college's success in fulfilling its mission of service to students.

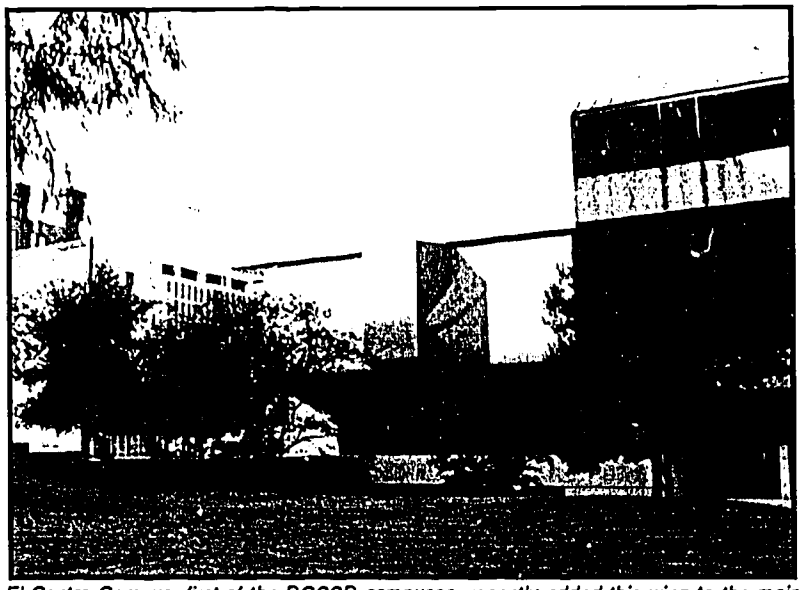
These programs are some among many described in the following chapters. We hope that the reader of this compilation of community college experiences will come away with renewed appreciation for the potential of information technology in higher education in general and community colleges in particular. With the wealth of factual description offered here as a foundation, we hope the reader will be inspired to investigate the possibilities inherent in one or two ideas of his or her own.

Chapter Two

Dallas County Community College District

JAMES HILL was the District Director of Computer Services for the Dallas County Community College District from the inception of the District in 1966 until 1985. He has been Director of Information Technology for the District since February 1985, responsible for all data, voice, and video communications support. This includes District-wide microwave, fiber optics, digital switches, internal video distribution, instructional television, fixed-source transmission, and low-power television transmission. He also has responsibility for the development and support of all administrative systems and all administrative and educational computing hardware and software.

Mr. Hill is active in CAUSE, CUMREC, AEDS, and NCC. He is a frequent consultant for community colleges trying to enhance computer service applications and performance, and has consulted and conducted workshops for the American Association of Community and Junior Colleges (AACJC). He is a member of numerous state advisory committees pertaining to computer usage, financing, and regional centers. Among other publications, he has co-authored two monographs, *The Computer and the Junior College* and *The Computer and the Junior College Curriculum*, published by AACJC.



El Centro Campus, first of the DCCCD campuses, recently added this wing to the main classroom and administration building. It houses a performance hall, a gymnasium, and classrooms.

The Dallas County Community College District (DCCCD) is located in Dallas County, Texas, one of the largest metropolitan areas in the country with a population of about one-and-a-half million people. It enjoys a diversified economy and low unemployment. The District was authorized by the voters in May 1965.

The District is composed of seven separate comprehensive community colleges, each with its own administration and administrative staff. Six of the campuses are located around the perimeter of the county, and the remaining one is in the central business district of the city of Dallas.

The District's budget for 1985-86 was approximately $110 million, with computing activities receiving between 3 and 4 percent of that.

Mission and Programs

The mission of the District is to prepare students for effective living and responsible citizenship in a rapidly-changing world, national, state, and local environment. The mission is accomplished through a broad range of general

academic and technical-vocational course offerings plus a wide variety of non-credit programs: over eighty technical programs lead toward two-year degrees or one-year certificates. Although the general focus is the same at all campuses, some specialized technical programs are not taught at all of them.

Student Demography

Approximately 47,000 students enrolled in credit courses at DCCCD in the fall semester of 1985. It is estimated that this number will remain fairly constant in the immediate future. Although the number of high school graduates in Dallas County is declining, the number of new residents is increasing.

Computing Environment: Background

Planning for Computing

Throughout the years, planning for administrative computing has consisted primarily of discussions and informal planning among the director of computer services, vice chancellors, users, and vendors. Most of this planning has been reactive due to its unstructured nature and the orientation toward finding the best solution to a specific problem or a request for additional support.

A more formal contribution to planning occurred in 1974-75 with a business-system planning program, an eighteen-month effort by a District-wide committee to analyze needs and present recommendations. The results were a data base management system, more terminal interaction, and more timely, useful access to data by users. In addition, an advisory committee was formed to counsel the director of computer services in achieving progress-to-plan. For various reasons the advisory committee, which assigned priorities to programming requests, lasted only slightly more than a year.

Other formal contributors to planning in the District are the annual budgeting process and the biennial operational plan which is a component of accreditation. The primary thrust of these efforts is to respond to the backlog queue, to estimate needs among contending user areas, and to provide resources to accommodate them.

The Foundation: 1966-1969

The District offices were opened in a temporary facility while college facilities were being converted from a department store into a modern, centralized city

college campus, El Centro. The Computer Services Department began operation in this temporary facility in June 1966, shortly after creation of the District. The department, which consisted of five people, and the computer subsequently moved to the remodeled, permanent facility in October 1966.

The first registration consisted of pulling prepunched IBM cards for class sections and writing receipts manually. Cards were later used to create enrollment statistics and class rolls on the IBM 1401. The first application after getting students in class was library circulation using ID cards and badge readers. In the instructional area, the data processing curriculum was oriented to unit record equipment and did not use the computer.

Planning evolved from the concept that was in vogue at the time: a centralized batch computer facility in which punched cards constituted the input, and unit record equipment was utilized for peripheral work. Also during this period, management information systems were being touted as "the answer." In keeping with this bias, an information base was designed around five systems: (1) student records, (2) curriculum, (3) finances, (4) personnel, and (5) facilities. Initial efforts concentrated on the student/curriculum system since it was the largest and most critical due to state reporting requirements and funding.

In 1967 the IBM 1401 was replaced with an IBM 360/40 which provided for the new technology of multi-processing and the use of CRT terminals as input and output devices. In the curriculum, programmer training was added, and students were learning COBOL and Assembly language on the same computer used for administration.

Rapid progress was made in developing applications during this time period. To accommodate the applications effectively and provide for the future, in 1969 Computer Services installed state-of-the-art, on-line CRT terminals for data capture and display in the student/curriculum system. By this time, the District had developed its own batch payroll system and employed a microfilm book catalog as a first in the country.

The Rapid Growth Years: 1970-1974

The year 1970 illustrates the changes experienced by Computer Services and the rapid growth of the District. The department moved to the Main Bank Building across from El Centro leaving the IBM 360/40 for instructional use, and an RCA-3 Virtual Memory Computer was acquired for administrative use. Unfortunately, two months later RCA went out of the computer business. The District was confronted with a new procurement at a very inopportune time: during this same period, the District was growing as the Eastfield and Mountain View Campuses and, later in the year, the Richland

Campus were opened. The registrations for Eastfield and Mountain View used on-line card reader/printers remotely connected by phone lines to the RCA computer.

During 1971 the educational IBM 360/40 was traded in on a new generation IBM 370/155, designated for both academic and administrative computing. The RCA-3 was returned to Univac. Academic computing again shared one machine with administrative computing, using remote card reader/printers from El Centro. A new personnel/payroll system was implemented using remote on-line CRT terminals.

The years between 1972 and 1974 were characterized by rapid growth of the four campuses. This growth resulted in management that was more reactive than planned. Many problems occurred in the use of on-line terminals with less-than-optimal communications hardware and software provided by vendors. To compound the problems, all District offices moved in 1973 to new facilities, while at the same time trying to cope with new demands for service and support.

In 1974 there was heavy terminal use and increased processing by students and by personnel in administrative offices. In response, an IBM 370/158 was installed to replace the 370/155. This hardware provided more capabilities with virtual addressing. Recognizing that demands would continue, the District began an eighteen-month business-system planning effort using District-wide user representatives, administrators from all levels, from vice-chancellors to coordinators, and strong executive commitment (which included funding).

A New Era: 1975-1979

The resulting business system plan was completed in 1975. The committee recommended purchase of a data base management system, increased involvement in on-line, ad hoc query, and access to information in the data base. The committee further recommended that there be on-line involvement in computer-assisted and computer-managed instruction. To implement the recommendations El Centro acquired its own computer (an IBM 360/30) for in-house training of programmers. Other campuses did not teach data processing programming or operations at this time.

During 1975 and 1976 the District purchased ADABAS, a data base management system with query capabilities. They also purchased 165 CRT terminals to be used for CAI-CMI as well as for administrative processing. APL was chosen as the programming language due to its strong interactive attributes and rapid response time. Also at this time the process of converting all files to ADABAS was begun. To support the new technology and increase

in services, the programming staff grew to twelve and the programmers were trained in APL.

The year 1977 was a busy one as Computer Services moved again, this time to a leased site. Moving was much more complex this time due to the number of on-line terminals. Also during 1977, all systems were converted to APL/ADABAS and the personnel/payroll system was redesigned. The design of a new community service system was completed by early 1978.

In 1978 the last of the seven campuses (Brookhaven) opened. Although a new on-line, real time registration system was piloted successfully at Eastfield in the summer of that year, adding more campuses in the fall registration caused an overload of facilities. The long response time necessitated abandoning this registration method.

The Road Forward: 1979-1983

By 1979 the IBM 370/158 was not sufficient to handle the use of APL with increased application growth and student CAI. To alleviate the problem an Amdahl 470/V6 was acquired. This machine, with four times the processing power of the IBM, resolved the load problems and poor response, but prompted a reassessment of plans and priorities. The result of this planning was a decision to abandon APL with its heavy CPU appetite and return to the old, but more efficient, COBOL environment. Other plans called for the acquisition of a new communications monitor (Com-Plete) to provide terminal support. Also at this time, Computer Services took over operational responsibility for the library system on the Data General minicomputer.

Since another conversion was required at this time, other changes were made. The first was to modify and strengthen the student/curriculum system with added features, including a new on-line registration system, continuing education, and job placement. The second change was to design a totally new accounting system with on-line data capture and update. The third change was the development of a new on-line budget preparation system. These tasks were accomplished during 1980 and early 1981.

During 1981 a decision was made to offer the full data processing curriculum at all seven campuses beginning in 1982. To implement this decision, an ad hoc committee recommended separation of administrative and educational CPU facilities. They suggested joint use of communication facilities for economic reasons.

Also during the period 1980-1981, there was a strong thrust in the industry to utilize packaged software in lieu of the traditional in-house developed applications. The benefits of these packages were supposed to be speed of installation, more capabilities, and ultimately lower cost than in-

house development. During late 1981 and early 1982, the District purchased a financial aid system and a human resource (personnel/payroll) system. After working through many internal problems, constant changes to adhere to government regulations, and modifications to develop stronger on-line orientation, the District decided that a conversion was necessary.

In the summer of 1982 Computer Services moved again. This time the move was to a District service center to which other support areas also moved. An IBM 4341-2 computer was obtained to support educational programming for all seven campuses. The Amdahl was retained for administrative use. Communications facilities and some peripheral equipment (tapes and printers) were shared between the two systems.

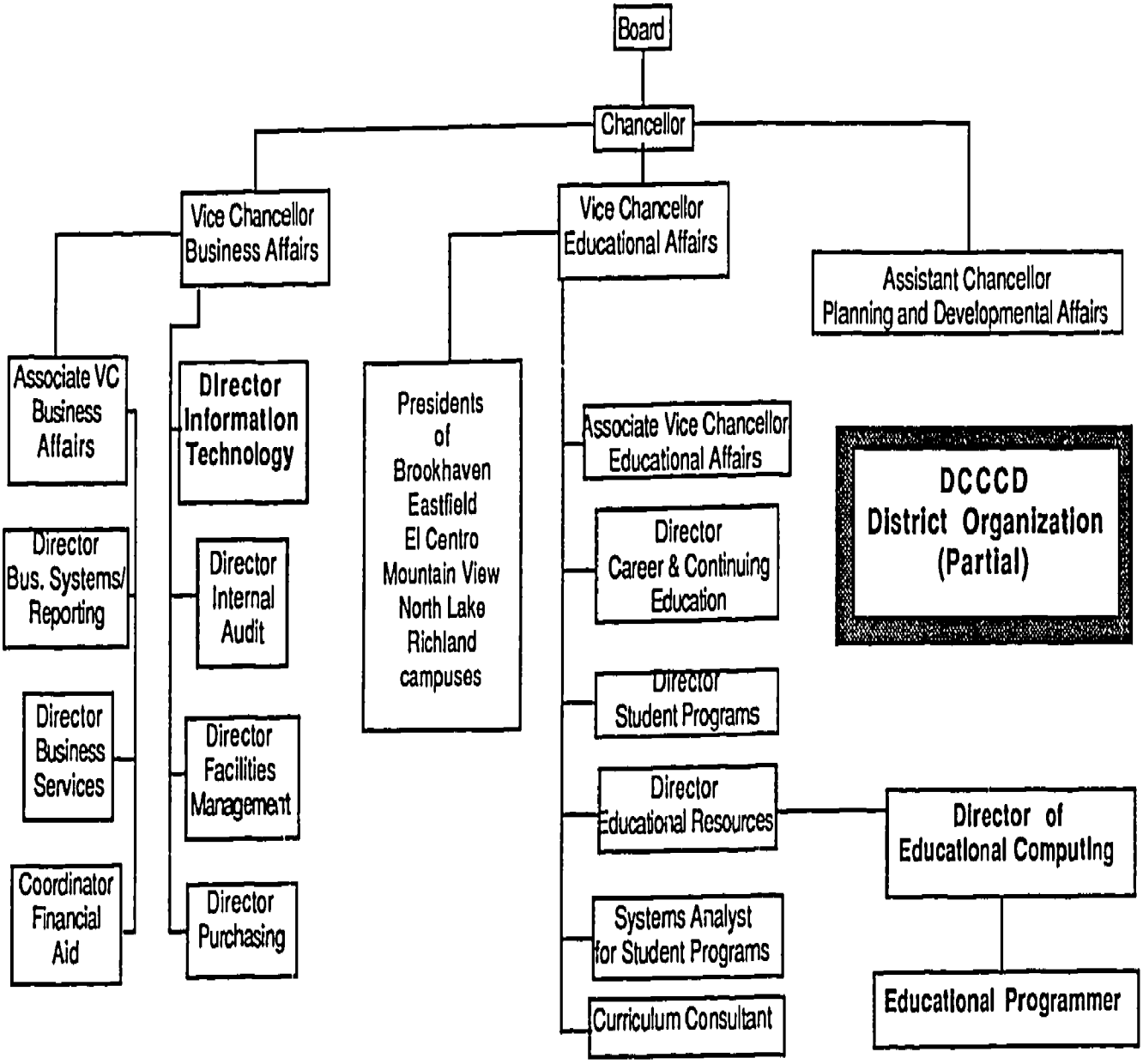
The purchased financial aid system was installed in late 1983, but the vendor for the human resource system abandoned the conversion to ADABAS/Com-Plete and the contract was terminated.These events crystallized resistance to outside software procurement, which had not proved to be advantageous to the District. The personnel/payroll system was redesigned and developed in-house.

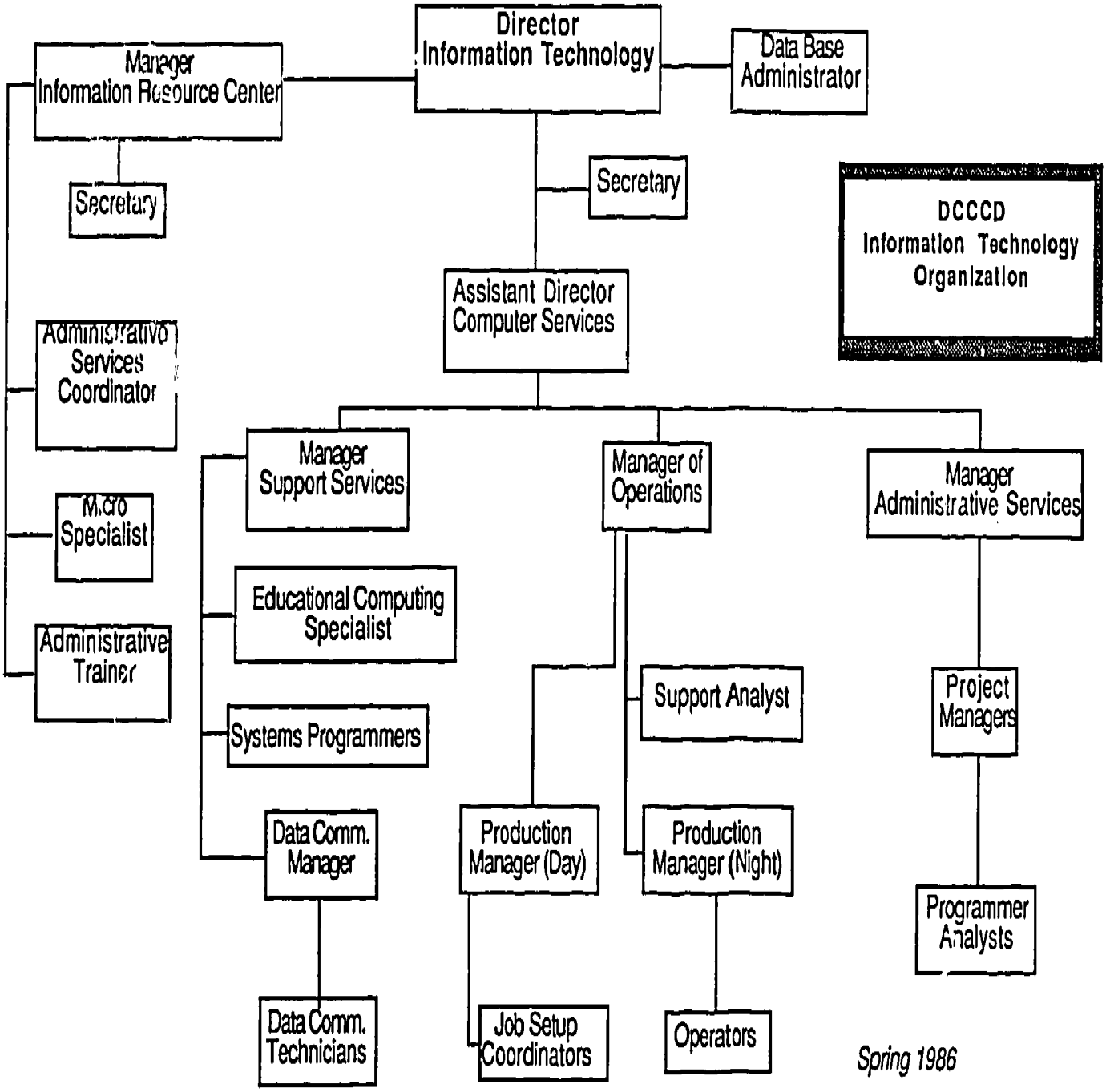
In 1983 an Information Technology Committee was formed with representation from each campus, the President, Vice President of Instruction, students, business, faculty, and District Office. The purpose of the Committee was to address the following needs: the advent of the microcomputer, overall computer literacy, and rapid technological advances in communications technology. The formation of this committee reflected the new importance placed on sound planning and top-level commitment to an expanded computing environment.

Computing Environment: Current Status

Organization of Computer Services

Administrative computing support is under the direction of the Director of Information Technology, as is the hardware and software support of educational computing and all remote communications support. Planning and faculty interface for educational computing is the responsibility of the Director of Educational Computing, whose staff at present consists of a design person and programmer working on development of "expert systems" or artificial intelligence in selected curricula.


Board
Chancellor
Vice Chancellor Business Affairs
Vice Chancellor Educational Affairs
Assistant Chancellor Planning and Developmental Affairs
Associate VC Business Affairs
Director Bus. Systems/ Reporting
Director Business Services
Coordinator Financial Aid
Director Information Technology
Director Internal Audit
Director Facilities Management
Director Purchasing
Presidents of Brookhaven Eastfield El Centro Mountain View North Lake Richland campuses
Associate Vice Chancellor Educational Affairs
Director Career & Continuing Education
Director Student Programs
Director Educational Resources
Systems Analyst for Student Programs
Curriculum Consultant
DCCCD District Organization (Partial)
Director of Educational Computing
Educational Programmer


Director
Information Technology
Manager
Information Resource Center
Data Base
Administrator
Secretary
Secretary
DCCCD
Information Technology
Organization
Assistant Director
Computer Services
Administrative
Services
Coordinator
Micro
Specialist
Administrative
Trainer
Manager
Support Services
Manager of
Operations
Manager
Administrative Services
Educational Computing
Specialist
Systems Programmers
Support Analyst
Project
Managers
Data Comm.
Manager
Production
Manager (Day)
Production
Manager (Night)
Programmer
Analysts
Data Comm.
Technicians
Job Setup
Coordinators
Operators
Spring 1986

Computer Services is organized into four functional areas. General administration and campus users' liaison is provided by six support staff and office personnel.

The first two functional areas are Administrative Services (Programming) and Support Services. In Programming, ten persons are responsible for the design and programming of new application systems and the maintenance or modification of existing systems. In Support Services, nine persons are responsible for programming and the generation and maintenance of system communications software (operating systems, monitors, etc.). They also install and repair all terminals and multiplex equipment.

Operations is the third functional area. Ten persons are responsible for the operation of all computers and peripheral equipment and the processing of daily production workload for distribution to users.

The fourth functional area is the Information Resource Center which has responsibility for all administrative system training and support, microcomputer support (including hardware and software evaluation and planning), office automation training and support, and the interface liaison with campus data processing coordinators.

With these hardware, software, and personnel resources as a foundation, the Dallas County Community College District looks ahead to an institutional environment in which technology plays a major role.

Hardware

Currently, there are three CPUs providing separate functional support: an Amdahl 470/V6 mainframe for administrative applications, an IBM 4341-2 mainframe for educational training, and a Data General Eclipse S/140 minicomputer for library circulation and acquisition. An Amdahl 4705 Communications Processor provides all communication interfaces for remote terminals and routes them to the appropriate CPU. Each computer has its own disk storage, but the two mainframes share tape and printer peripheral equipment.

Communication routing to and from the seven campuses and District offices is provided by Time Division Multiplexor (TDM) equipment using one 56,000 BPS digital telephone circuit per location. The use of the multiplexor equipment allows more terminals per telephone line at less cost.

All administrative, educational, and library functions are performed using on-line CRT terminals and low- and high-speed printers. Currently there are 224 devices on the Amdahl V/6, 178 devices on the IBM 4341-2, and 32 devices on the Data General S/140.

There are over 600 microcomputers utilized in educational and administrative applications, primarily as stand-alone processors used for BASIC programming, word processing, and spreadsheet packages. There is limited downloading of the data from the Amdahl administrative files for subsequent processing on the micros. The micro is substituted for an on-line terminal as a communication path and uses in-house-developed selection and download programming.

Software

For administrative applications, MVS is the operating system. It runs in-house software developed using COBOL/ADABAS for student/curriculum, community service, and general accounting. Payroll/personnel is still APL/ADABAS but is being redone in COBOL. Com-Plete handles communications protocols for most applications, but the purchased financial aid package uses CICS/VSAM. Communications software in the Amdahl 4705 is NCP/VTAM, which provides both bisynchronous and SDLC protocols.

Within the instructional area, training is handled with the VM operating system using an interactive sub-system called MUSIC (McGill University System for Interactive Computing). Language training is provided in COBOL, FORTRAN, PL/1, Assembler, PASCAL, and RPG with advanced training in CICS and operating system. The library uses a specially written application package using MIIS, which provides operating system and language capability. Some processing of master holding files is done in COBOL on the Amdahl.

Computing Environment: The Future

In the decade of the '80s, a synergy of forces developed that raised issues of vital importance throughout the industry. Direction was needed by all professionals involved in data processing planning to a degree never previously experienced.

Strategic Plan for Administrative Computing

These issues became the impetus for the formulation of a plan by the Information Technology Committee. The Committee defined the issues and formulated a strategy to resolve them for the future of DCCCD. The major

thrust of the resulting Strategic Plan for Administrative Computing is expressed in the following "desired outcomes":

1. *Continue centralized mainframe approach.* This approach to application development capitalizes on the District's strength and experience. Remote interactive terminals will be used to capture, forward, receive, and display timely information.

2. *Evolve to limited use of distribution techniques.* Distributed processing as a computing strategy will continue to be explored; however, it is anticipated that there will be an evolving, but limited, use of distributed techniques through microcomputers in conjunction with the mainframe. A well-planned pilot project evaluated on the basis of cost effectiveness should precede implementation.

3. *Continue in-house systems and program development.* In-house system and programming efforts still offer the best results for DCCCD. The staff expertise and experience in developing sound, working applications should prevail over the next few years in the mainframe environment. Outside packages will continue to be examined and analyzed, but a clear-cut preponderance of benefits will be required to justify large-scale movement in that direction.

4. *Apply people, policies, procedures, and politics to accomplish plan.* A District infrastructure compatible with the plan is considered to be a vital ingredient. Such compatibility is integrated into the plan, but commitment and follow-through by all levels of administration will be necessary for successful implementation.

5. *Cluster planning and development around student/curriculum and business systems.* Improvement in operational support systems in these two major areas should yield significant benefits in employee productivity and skills through better information management.

6. *Develop a model decision-support system.* A crucial decision point will be defined, such as class planning and assignment, and a model will be developed that will be useful for planners. The degree of success will determine future directions for decision-support software.

7. *Integrate operational data management, decision support, and office automation.* This was a major focus for the committee. Existing and

future microcomputers will be deployed in local area networks, communicating with each other and the mainframe, and will serve as multi-function tools. With the prerequisite infrastructure in place, the timing is right for a District-wide, planned implementation of office automation.

8. *Train for both application and information levels of literacy.* A higher priority will be given to computer literacy training, not only for particular applications of microcomputers and the mainframe but also for higher levels of information to promote understanding of the capabilities and limitations of computers and systems.

9. *Consider costs prior to decisions for development and expansion.* Budget processes provide a measure of cost considerations, but cost justification should be made a formal part of project request procedures.

10. *Provide staff for new functions.* Two new functional positions are desirable: a student-systems analyst in the educational affairs area and a coordinator of office support functions to give direction to efforts in office automation. The new positions might require new salary funding, but might be absorbed by changing some current jobs.

11. *Replace the mainframe.* The current Amdahl mainframe is rapidly becoming obsolete and its maintenance costs are increasing dramatically.

12. *Acquire fourth-generation language.* Fourth-generation language software would provide more access to information without concomitant personnel costs for programming.

13. *Convert the Information Technology Committee from ad hoc to standing.* The Information Technology Committee should become a standing committee to monitor progress of the plan, endorse necessary adjustments, and continue to provide an ongoing strategic plan on a year-to-year basis.

Strategic Plan for Network Communications

In a second major response to the challenges and opportunities offered by modem information technologies, the District recently completed a long-range

(eight-year) Strategic Plan for Network Communications. To be implemented in 1986, the plan calls for an inter-campus microwave/fiber optic transmission path with digital switching equipment at each location to integrate voice and data transmission through T1 technology. Inter-campus one-way video and two-way audio will be in compressed digital format using the same microwave facilities.

This plan, as approved by the Board of Trustees, also calls for (1) a low-power TV station for transmission of instructional television courses to students in the county and (2) an Instructional Television Fixed Service (ITFS) Station to transmit specialized industry training modules direct to the company location. This service will be offered through DCCCD's Business and Industry Institute.

The value of this integrated approach will be in the reduced costs of all services for voice, data, and video throughout the District and in the flexibility and growth to meet the demands of the information age. In addition, Dallas County Community College District will be able to reduce costs and increase services for public television access for students and industry.

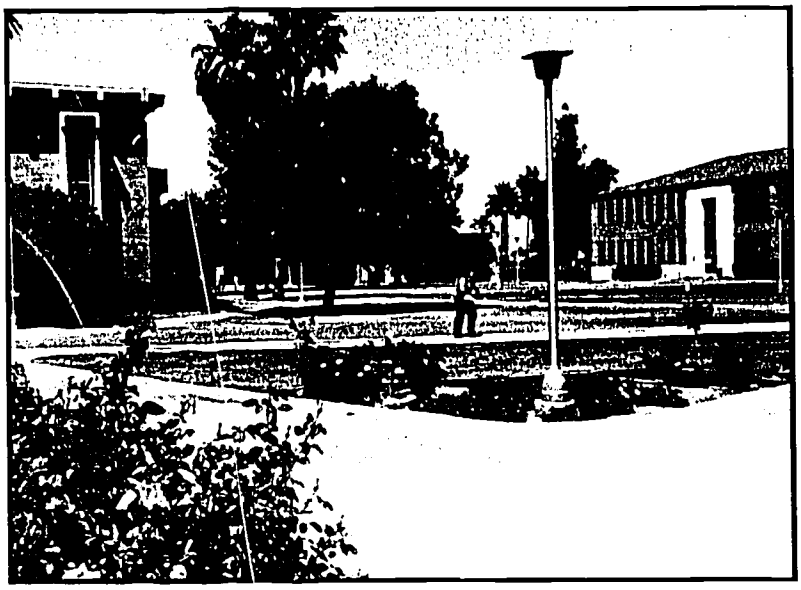
Conclusion

The future of the DCCCD is now based upon a guiding set of recommendations developed through a representative planning process. With the knowledge gained from diverse past experiences and the continued commitment of the administration, the Dallas County Community College District intends to exemplify in the future, as it has in the past, the ways in which computers serve students in community college education.

Chapter Three

Maricopa County Community College District

Ronald D. Bleed has been the Director of Management Systems and Computer Services for the Maricopa Community College District for the past five-and-one-half years. Prior to his current assignment, he was Director of Computer Services for fifteen years at two Illinois community colleges.



The campus of Phoenix College, one of the Maricopa Community Colleges.

Maricopa County Community College District (MCCCD) is the third largest community college system in the United States. It is located in Phoenix, Arizona, one of the fastest-growing areas in the country. In response to this growth, MCCCD plans to expand its present seven campuses by two additional campuses in 1987, and has acquired land for three more campus locations. It is already the largest educational institution in a state that for the last twenty years has had the highest participation rate in public postsecondary education in the nation. The community's respect for the leadership of Maricopa County Community College District is evidenced best by the recent 72 percent "yes" vote for a $75 million bond referendum.

The District currently consists of seven colleges situated in diverse settings ranging from urban to rapidly-developing suburban communities. The colleges have new, well-equipped campus facilities, four of them having been established since 1970.

The total operating budget of the District for 1985-86 was $93 million. When capital and other funds are included, the cash flow of the District is approximately $170 million per year. Approximately 4 percent of the budget is spent on computer equipment and support services.

Missions and Programs

The seven campuses in the District are unique. Rio Salado is a college "without walls," charged with providing outreach educational programs in over 200 locations within the county. Maricopa Tech has a curriculum that emphasizes vocational education, while South Mountain is designed to serve the needs of minority and low-income students. The remaining colleges are comprehensive, including vocational, transfer, and continuing education curricula.

Forty percent of MCCCD students declare an intent to complete an occupational program; 28 percent plan on academic transfer. Last spring, MCCCD awarded over 3,000 degrees.

Student Demography

MCCCD has an enrollment of 68,000 headcount and 28,700 full-time-equivalent students (FTE). Approximately 25 to 34 percent of all adults in Maricopa County have attended one of the MCCCD community colleges, and about 40 percent of all high school students in the county go directly to one of the MCCCD community colleges. MCCCD transfer students account for 25 percent of the total enrollment of Arizona State University; 44 percent of the upper division students at ASU are graduates of an MCCCD college.

The composition of the student body reflects the student population profile which the Carnegie Commission has predicted for higher education in 1990. Fifty-five percent of MCCCD students are women. The average age is approximately twenty-nine years with more than 5,200 students over the age of fifty. The District has a higher percentage of part-time students than the national average, having exceeded that average as early as 1969. Seventy-five percent of the student population attends part-time, and half of those work full-time in addition to attending college. The student population closely reflects the ethnic makeup of the county, and the re-entering student increasingly is becoming a major component of the student population.

Computing Environment: Background

Although the MCCCD serves a diverse student population at a number of instructional locations, and reflects a range of curricular programs, one significant effort is common throughout the system: establishing state-of-the-art information technology. During the past three years, the MCCCD has spent over $10 million to purchase computer-related information technology hardware. In that time the MCCCD has placed over 3,000 computer

terminals, workstations, and word processing units throughout the District, which represents a fifteen-fold increase from three years ago.

For many years, computer services had existed on two mainframes. Many problems were noted with this type of hardware configuration—the limited number of ports, poor machine performance, and user dissatisfaction. To address these problems and to set the stage for future developments, Maricopa decided to transform its computer operations. The transformation began five years ago with the implementation of two major management strategies.

Modification of the Oganization

The first management strategy was to identify participants qualified to address the existing problems and plan a future course, and to establish an organizational structure. The result was the formation of an executive council representing all aspects of computing within the District, which had responsibility for making all computer services policies and decisions. This council was composed of the three vice chancellors and a college president. The director of computer services reported to the council. This council composition allowed all interests to be fairly represented in the development of new computer strategies. Most importantly, with these key people involved, the political base required to change the environment was solidified. The council has now been expanded to include a faculty member and a vice president from Arizona State University.

Establishment of User Groups

The second management strategy was to involve those who would assist in shaping that change: user groups. Two were constituted, one for academic and one for administrative systems. The academic user group formulated a strategy in their long-range planning that was based upon a distributed system of computing. This strategy was designed to allow computers to be placed at the seven colleges in the form of personal computers and super-minicomputers. The administrative user group recommended in their long-range plan that the District implement all new administrative systems in an on-line mode.

Change in Hardware and Software

With the long-range direction established, the District began the task of implementation. The computer services staff researched the available hardware and software alternatives and considered which were most likely to achieve the

long-range goals of the District. After a formal RFP process and a thorough benchmarking analysis of possible vendors, Digital Equipment Corporation was awarded the bid. This decision was influenced by the fact that Information Associates, a major software supplier, was converting its software to an on-line mode to be used on Digital equipment. In selecting this option, Maricopa became a pilot site for Information Associates to develop new software.

Appropriate Implementation

Maricopa's implementation strategy effectively combined both centralization and decentralization features. Decentralization was evident in the location of hardware at each of the colleges, serving both academic and administrative needs. In addition, some management responsibilities for computing were given to each of the colleges. Centralization as an implementation strategy was incorporated both through the development of software which was standard to all of the machines, and through the fact that all computers were networked together.

While this combination strategy was addressing data processing needs, attention also was being given to the personal computer needs of individual users. Apple IIe became a very cost effective computer and received wide acceptance within the colleges, with 600 units used in instructional labs. The IBM PC also was introduced and became a major District resource—900 units are being used, primarily for academic purposes. The DECmate became the standard for word processing and many of the 450 of these units were purchased for automated office functions and instructional purposes.

During the past five years, the computing environment at MCCCD has been transformed. The operational structure has been modified to include an executive council, now referred to as the Information Technologies Executive Council; user groups have been established and subsequently expanded; and there has been a rapid growth in the acquisition and use of hardware and software. All of these factors have brought MCCCD to where it is today: a leading institution in the application of technology.

Computing Environment: Current Status

Leadership

The MCCCD executive management team has demonstrated a commitment to and a high skill level in implementing information technology. The executive team is composed of a chancellor, three vice chancellors, and seven college presidents who use computing systems in their daily work in their offices and

homes. The five locally-elected trustees have Rainbow systems in their homes and use Digital's All-in-1 office automation software to communicate with the MCCCD management. This Board has unanimously and enthusiastically supported all computer initiatives during the past four years.

It is important to note that MCCCD's Governing Board and executive management are nearly autonomous decision-making bodies. MCCCD is not substantially controlled by the state legislature, commissions, higher education boards, or bureaucracies. Consequently, there are few hurdles to clear in making decisions regarding computing technology.

Each college in the district has a president and an administrative staff. All of these managers are using computer equipment and the new data bases to communicate and to gather information to support their decisions. Campus autonomy and decentralization are deliberate management strategies that give more decision-making responsibility to each college. The distributed computing networks match this management direction.

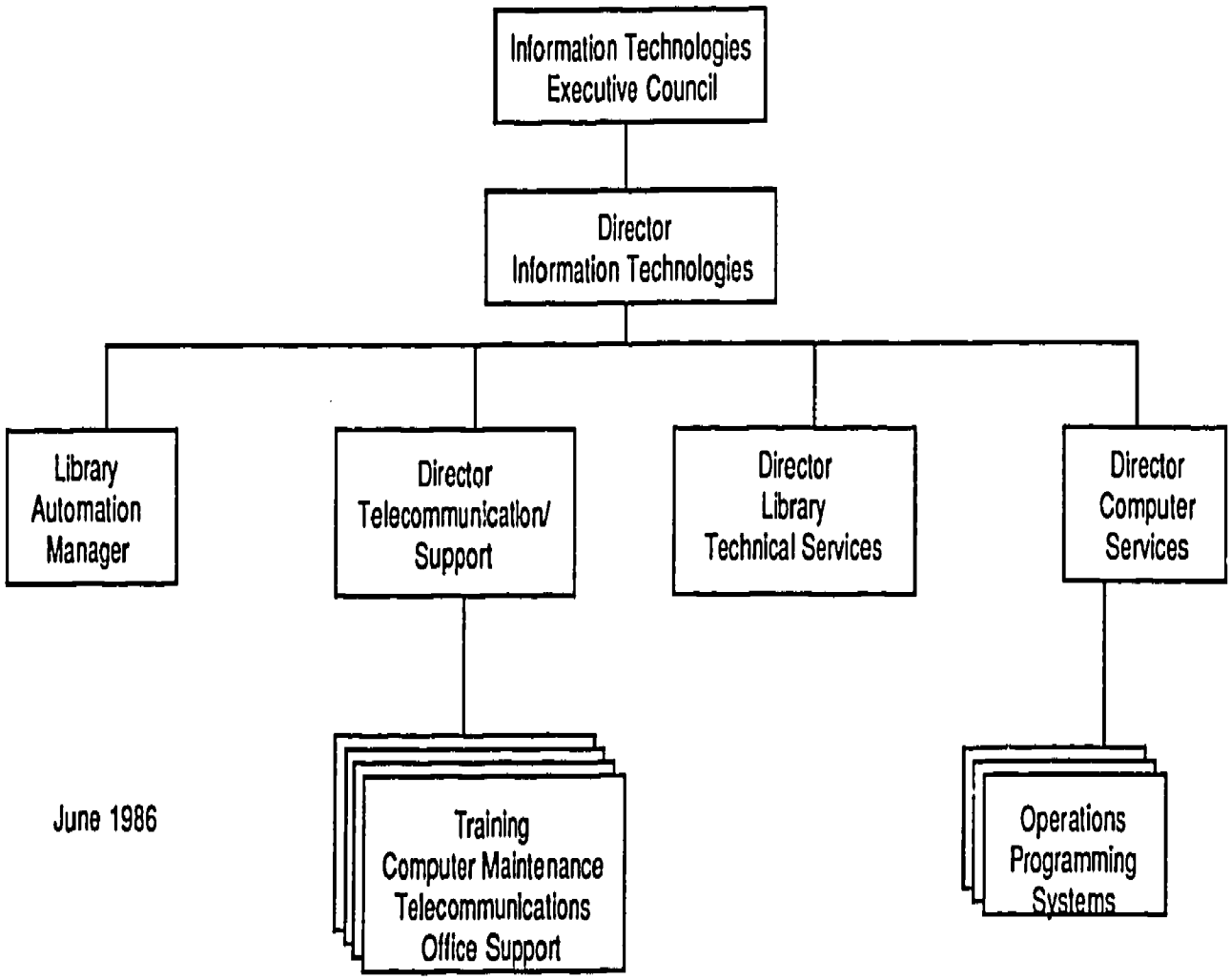
Information technology and quality in management are themes that are interwoven throughout the District. Such renowned leaders as Grace Hopper and Bobby Inman have been consultants and speakers at MCCCD. The District offers forums, training sessions, and presentations to MCCCD staff.

Staffing

The Computer Services Department has fifty-two full-time employees serving both academic and administrative functions. Seventeen professional programmers and analysts are used as a talent pool to write educational application programs. At the colleges, there are fifteen additional people in full-time positions to support computer-related activities. The District recently established a seven-person computer repair department that services the personal computers, terminals, and word processors throughout the colleges. There are four full-time people to provide training and administrative support for the office automation education components.

Six full-time educational computer specialists serve faculty and students throughout all the colleges. They prepare training materials, distribute information, provide answers to questions regarding software and hardware, and teach the faculty literacy courses and other workshops. In addition, two full-time instructional-design professionals provide critical support for the computerization of education.

Maricopa County Community College District
Information Technologies
Organization Chart



June 1986

Academic Computing

The concept of "computers serving students: the community college way" has been implemented extensively at MCCCD. The concept was defined through a planning process; it was supported by the allocation of hardware, software, and personnel resources; and it was implemented in a variety of instructional areas. Substantial progress has been made in achieving the objective of serving students.

Planning

As part of the planning for instructional computing activities, the educational priorities for the District were examined. These priorities were established through a bi-annual internal strategic-planning process coordinated by the Joint Council on Educational Priorities which was composed of faculty and staff. The majority of the priorities funded dealt with the use of high technology in a wide range of disciplines. Most of the projects funded required the use of a personal computer or a time-sharing computer.

Hardware and Software

Since 1982, networked computer resources have been distributed to the colleges. Ten VAX/780s and three VAX 8600s were purchased, and two-thirds of their capability was allotted to instructional activities, including uses beyond the data processing curriculum such as CAI tutorials and statistical packages. The VAXs also allowed a seven-fold increase in the number of college terminals, two-thirds of which were dedicated to academic use and generally are located in open laboratory situations. Computer rooms and terminal laboratories were remodeled, wired, and air conditioned.

A network was created to link all the VAXs together and many of the personal computers and the VAXs can communicate with each other. The VAX computers in the network are now all scheduled twenty-four hours a day. Software and data can be shared District-wide. Also part of the network are two IBM mainframes, one of which is located at a service bureau and another at Arizona State University. Each semester one or two classes at the individual colleges access the IBM computer through their Digital terminals for their advanced IBM training.

As part of the educational plan, sub-networks of personal computers also are being put into place. Personal computer laboratories with ten to twentyy-five personal computers are clustered at each college. Multiple disciplines have open access to these laboratories. Since the original plan was approved, 1,500 personal computers have been purchased for academic use. The four major types of personal computers are IBM PC, Apple II, AT&T 6300, and Apple Macintosh. The concept of personal computer laboratories

has been rapidly accepted. Whereas personal computers were originally bought for specific classroom use, now almost all are bought to be placed in a laboratory that is accessible to students and staff.

Personal computers also have been purchased for specific instructional purposes including music, respiratory care, medical radiography, and engineering. Service areas such as learning resource centers, audio-visual centers, and student activities have also purchased personal computers.

Professional Development

A major activity now in place is the Faculty Computer Literacy Project. The key feature of this project is the loan of personal computers to individual faculty members. These microcomputers can be used by faculty for a three-month period in their office or home. Education consultants, who are full-time staff of District Computer Services, promote and train faculty on the use of software such as authoring languages on the new VAXs.

To make students and faculty knowledgeable as quickly as possible, Glendale Community College developed a one-credit computer literacy course. This twenty-hour open entry-exit course provides students and faculty with the training necessary to begin to use a personal computer effectively. Other seminars and workshops were created to bring faculty up to speed. Future plans call for expanding the one-credit modules in keyboarding and advanced software systems for personal computers. As the modules are developed and evaluated, they will be offered to other MCCCD colleges.

Curricula

Through an NSF Comprehensive Assistance to Undergraduate Science Education grant, five disciplines are now using personal computers. Instruction in physics, chemistry, mathematics, biology, and psychology has been improved through the design and use of carefully structured personal-computer-based learning activities at Mesa and Scottsdale Community Colleges. The project provides special training to accomplish the following objectives:

- to assist students in applying the personal computer in the sciences,
- to update the science background of community college faculty members,
- to provide assistance in the purchase of scientific equipment, and
- to assist in the development, implementation, and evaluation of teaching material.

This training has been accomplished through weekly seminars for faculty and selected students and by giving faculty reassigned time to work on teaching strategies, materials, and personal computer software development.

Another major instructional computing program is the TICCIT Project, a complete CAI system located at Phoenix College and also funded originally by NSF. Through this program, 128 stations present drill, practice, and tutorial lessons in a wide variety of subjects. In addition, student placement tests are administered on this equipment. These stations are data terminals and interactive videos.

The electronics programs at each college are major users of computing. Separate minicomputers exist for the support of these programs. In the business and math programs at Phoenix College, a series of networked personal computers exist. A computer was installed with sixteen terminals on the system. Each user has access to CPM and assorted languages through his own work space, and all users share a shared hard disk system.

Mesa Community College recently completed a $4-million vocational building. This building features high technology programs such as robotics, CAD/CAM, and electronics. In this building, which is the largest building at any of the colleges, are three computer laboratories and multitudes of personal computers. At the Glendale College a similar high technology building is being planned in which computers will be vital in the instructional process. The facility will have one large room that will house 400 workstations.

Much is taking place throughout the District in CAD/CAM. By using a combination of equipment, the use of computers in CAD/CAM is rapidly expanding. In 1985-86 the number of stations for student use increased by forty, and the colleges have plans to increase even further the number of available CAD/CAM stations.

Two laboratories were established at a prison in the Phoenix area under the jurisdiction of Rio Salado Community College. These labs were furnished with personal computers to provide computer literacy programs to the inmates. Other computer literacy labs are being set up by the college for employees in hospitals and government buildings.

Several of the colleges have implemented programs to accommodate the adult student seeking to become computer literate. They have established many weekend seminars, workshops, and specialized programs. In addition, micro and computer camps have been developed to serve the youth of the area.

At Maricopa Technical Community College the computer is being used in many of the allied health curricula. The nursing program, for example, is a heavy user of personal computers for testing, question banks, and instructional delivery.

Word processing as an instructional program is expanding rapidly. Recently 450 full-function DECmate word processors were purchased and installed in various office automation/word processing labs. Specialized word processors were purchased for the court-reporting curriculum. Also, coin-operated DECmate word processors were installed in convenient locations at each college so that students could have access to this equipment to complete their research papers and homework assignments.The word processors are all capable of being used as both personal computers and terminals in the existing computer network. Demand for courses in this area is the highest of any in the District.

Through Rio Salado Community College, MCCCD is taking an active role in the use of teleconferencing, television, radio, and other communications technologies. Several professional staff members are employed to advance and implement these new modes of instruction using a range of communications technologies. Ambitious plans, including linking to satellites, are being discussed.

Staff members at MCCCD have designed an authoring language called TEACH. This program was designed primarily to present drill and practice instruction on the computer in a variety of disciplines. This authoring language has been distributed to fifty different colleges throughout the country. Disciplines that use this authoring language range from foreign languages to data processing. MCCCD has used the TEACH program with IBM and Digital software. The chief advantage of the TEACH software is its ease of use for individual faculty members in preparing materials for their courses. Users of the TEACH language represent a significant proportion of the activity on the VAX network.

Results

With the planning that occurred, the resources that were allocated, and the motivated people who implemented it throughout the curricula, the use of the computer has become what Chancellor Paul Elsner calls "the metaphor for change." Some of the most important aspects of change, such as faculty revitalization, cannot be measured. However, there are a number of indicators of change as cited below.

1. The quality of computer-related instruction has improved considerably. The improved response time has permitted students to do three times as many programming assignments on the computer as before.

2. The relevance of the education students are receiving is improved with state-of-the-art hardware and software.

3. The ease of use of the new systems has meant that faculty and students begin using the computers almost immediately.

4. Because students take the computer literacy sequence, instructional programs in departments do not spend time providing initial operational training on personal computers. They can gear their courses and computer applications to a more advanced level, and counsel students who have little or no background to take the computer literacy course.

5. In data processing courses alone, a 39 percent increase in credit hours was reported. A case can be made that one-half of the original hardware expenditures were recovered through additional revenue from the new enrollments during 1982-83.

6. Practically all data processing courses are filled within three weeks from the start of preregistration.

7. In 1983 Rio Salado Community College established a satellite center at a mall in Paradise Valley. In a period of about two months, a branch satellite center was built in the mall and a computer laboratory was established.Two months after the project began, the college doors opened with an initial enrollment of 1,400 students. Half of those students were directly attributable to the computer laboratory installed at that facility. Last year an identical facility was established at another large mall on the west side of Phoenix.

These lists of programs and their results only highlight the multitude of instructional computer applications at MCCCD. They do illustrate, however, what can be accomplished when strong leadership is exerted, when planning precedes action, when people are trained and motivated, and when resources are available. It is easy to understand why Maricopa County Community College District has received national attention for its achievements.

Administrative Computing

Administrative Systems

MCCCD began a very bold and innovative move in July of 1983. All hardware and software associated with administrative systems that had been in use for nearly fifteen years were completely replaced with systems from

Information Associates operating on the distributed network of Digital VAXs. Even though significant changes and additions were made to the base package of Information Associates software, all major developments and programming changes occurred during 1983-84. This remarkable accomplishment perhaps has never been duplicated at any other major-size institution, and reflects the confidence of MCCCD in Digital equipment and Information Associates software. The success also demonstrates the decision-making abilities of the MCCCD leadership and the skills and hard work of the staff. Some of the highlights of this implementation include:

- An on-line payroll system that processes 6,000 pay checks every two weeks

- An on-line fiscal accounting and budgeting system that handles a million-and-a-half transactions per year.

- An on-line student information system that registers nearly 200,000 students during the year. The system also included for the first time at MCCCD a transcript system, a comprehensive financial aid system, and a tuition billing-and-receivable system. The registration system has been expanded to include voice registration through the use of a Touch-Tone phone at two of the colleges—these students may register any time, from home, without human intervention.

This new system represents a major step forward for the colleges, who have moved from batch-card-oriented systems to state-of-the-art on-line systems.

Electronic Mail

A comprehensive electronic mail system featuring Digital's All-in-1 system now serves nearly 400 users. The system was implemented in a top-down fashion. Members of the governing board, the chancellor, the vice-chancellors, and the presidents were among the first to use the system. The system now has worked down within the organization to mid-level management. Because of the geographic dispersion of the colleges, this electronic mail system has proven to be extremely valuable.

Along with the All-in-1 system, there was a tremendous movement to word processing support. During the past two years, nearly 450 DECmate word processors have been purchased to support the secretarial and instructional functions within the District.

Networking

An integrated distributed network of the administrative systems was created to match the decentralized management style of the District. All VAXs are connected among the colleges and the District offices. The word processors are used in an off-line mode so that documents can be shipped easily around the network through the VAX systems.

Computing Environment: The Future

The acquisition of hardware and software to support instructional and administrative uses at MCCCD will be greatly assisted by the passage of the bond referendum described on page 30. From the bonds, $3 million will be provided for computer hardware and software per year for each of the next ten years.

To augment this fiscal resource, several significant purchasing programs have been contracted with the major computer vendors. This permits Maricopa to acquire hardware and software at a substantial discount. The most significant program was the college-wide partnership agreement reached among Digital Equipment Corporation, Information Associates, and MCCCD permitting the purchase of up to $15 million of Digital equipment at a substantial discount over the next four years. In addition, Digital will provide many support activities, including personnel, to assist Maricopa in the use of the systems.

As part of this partnership, Information Associates and Maricopa reached contractual agreement to develop software systems for community colleges. The two major themes of the projects are networking and a community college model. Many projects are already under development, including:

- Integration of office automation with other administrative systems,
- Budgeting module which includes uploading and downloading,
- Purchasing system,
- Degree audit system,
- Computerized voice registration system,
- Continuing education/non-credit registration system,
- Job placement system,
- Guidance and counseling system,
- Articulation system,
- Personnel system,
- Library automation, and
- Computer-based education software.

Planning for telecommunications is currently in process, and will lead to an extensive investment in the "cabling" of the colleges. Major new digital switches may be installed to replace the current telephone systems. The links to each college and the outside world are being planned.

Conclusion

Maricopa County Community College District intends to exercise leadership in the development of exemplary systems. Achievement of this goal will be brought about through continued foresighted leadership, effective management, skilled and dedicated employees, and a substantial economic base. These college resources will be strengthened through the partnerships established with Digital Equipment Corporation and Information Associates. Maricopa has demonstrated, and will continue to demonstrate, how computers can serve students "the community college way."

Chapter Four

Mercer County Community College

Joseph P. Balabon has been with Mercer County Community College since 1970, currently holding the position of Director of Management Information Systems. Under his administration the College's processing center has grown from an IBM 360 and a DEC PDP 11/45 to the largest community college processing center in New Jersey. He has overseen the planning, hardware installation, and software conversions which have enabled Mercer to become a leading-edge provider of quality data processing education.

As an adjunct assistant professor he has taught various business and data processing courses. Mr. Balabon serves as a consultant for both the American Council on Education and Thomas Edison College in Trenton, New Jersey, for the analysis and evaluation of student work credits in the area of data processing. He is active in CAUSE, in the Government Information Management Association, and with the Mercer County Tax Assessors.

Communications satellite on the quad of Mercer County Community College.

Mercer County Community College (MCCC) is a publicly-supported two-year, coeducational institution. It is an autonomous institution which operates within New Jersey's higher education system of two-year county colleges, four-year state colleges, and the state university. Mercer was established in 1966 to provide equal higher-education opportunities for county residents by reducing economic barriers, under the supervision of the New Jersey Department of Higher Education and sponsored by the people of Mercer County through the Board of Chosen Freeholders.

While many community colleges were constituted initially as junior colleges, MCCC merged with a junior college called Trenton Junior College and School of Industrial Arts, an institution founded in 1901. The merger occurred in July 1967. MCCC started its academic program that same summer in existing interim facilities with a nucleus of experienced faculty members. Opening enrollment was 1,250 full-time students (including 500 former Trenton Junior College students) and 1,600 part-time students.

In June of 1972, the college occupied its newly-constructed 292-acre West Windsor campus which now consists of eleven major buildings and other structures with over 460,000 square feet of facilities. In February 1976 the college moved its Trenton operations to the new two-building James Kerney Center, with nearly 46,000 square feet of space.

Mercer's annual budget for 1984-85 was $17,821,984, funded primarily from three sources: the State of New Jersey, the County of Mercer, and students' tuition and fees. Approximately 5 percent of the budget was allocated to academic and administrative computing with another half million dollars for hardware and software acquisition coming from state and federal grants. Since state support to the county colleges in New Jersey has not kept pace with ever-rising expenses, increasing financial responsibilities have shifted to the counties.

Mission and Programs

Under Mercer's "one college concept," no distinction is made between career and transfer programs within academic divisions. Full-time faculty teach courses in career and transfer programs as well as in day and evening classes. Programs are also offered for bilingual and limited-English-proficient students. In keeping with its mission of a community college, Mercer also offers a wide range of lifelong learning opportunities, cultural events, and community services both at campuses and at extension sites.

Currently, there are seventy-eight associate degree and certificate programs to accommodate the interests and occupational needs of students who wish to continue or resume their education at the college level. MCCC offers Associate in Arts and Associate in Science degrees in twenty-three programs leading to transfer to four-year colleges. It offers Associate in Applied Science degrees in thirty-four career areas (some of which also lead to transfer), certificates of proficiency in nineteen career specialties, and two certificates of completion in association with area vocational and technical schools. In 1983-84, 240 transfer degrees and 468 career degrees were awarded.

Student Demography

Located in Mercer County which, in 1980 had a population of [illegible],111, Mercer had nearly 3,000 full-time and more than 6,500 part-time students enrolled for credit in September of 1984.

The student body is a heterogenous mix that parallels the ethnic mix of the county. Eighty-one percent of the students are white, 13 percent are black, 3 percent are Hispanic, and 4 percent are American Indian, Asian, or foreign. The average age of full-time students is twenty-one; of part-time students, thirty. In recent years the student population has become increasingly female:

49 percent of all full-time and 60 percent of part-time students are now women.

The majority of Mercer's entering freshman class need developmental course work, with 38 percent in provisional acceptance status or preparatory programs. The college administers New Jersey's mandated Basic Skills Placement Test to all incoming students, 29 percent of whom are in transfer programs. The majority of transfer program students will move on to other institutions of higher learning with others stopping out for employment prior to completing degree programs.

Computing Environment: Background

Administrative Computing

In the late 1960s a centralized computer resource was established for both administrative and academic uses. In the early years, administrative data processing consisted of the typical batch applications of the time: payroll, student scheduling, and student collections. A sequence of IBM mainframes has been used including a 1620, a 1401, a system 360 model 40, and a 4331 upgraded during 1984 to a 4361 model 5. Each of these mainframes in turn has carried a growing volume of administrative data processing for internal use and for service to external public agencies. Beginning in 1971-72, computer processing for agencies outside the college was provided in the areas of payroll and tax processing.

The mainframe has been relieved from most instructional duty in recent years as a result of shifting academic computing to minicomputers. Only those academic computing functions which are ideally done on a mainframe have been retained, as will be described later.

Microcomputers also became a valuable tool in administrative areas. Twenty-two IBM PCs were provided in administrative areas to support decision making and word processing. During the period from 1983 to 1985, more than thirty secretaries were provided text processing training on IBM PCs.

Academic Computing

Early Years

The first computer-related curriculum was established by Trenton Junior College in the early 1960s, before Mercer was established. From the 1960s through the late 1970s, Mercer's essential philosophy of academic computing was to provide data processing instruction to those relatively few

students who were planning on careers as computer programmers. Computer curricula were supported originally by unit record equipment. Until the early 1980s all programming instruction other than that in BASIC was processed in a "batch" mode on the IBM mainframe system.

The computer training needs of students were first addressed by permitting access to regular DP courses on an elective basis. During the mid-1970s, a Survey of Data Processing course for non-majors was first established. Several thousand students completed it before it was retired in 1982-83, including hundreds of people who took it in a telecourse version based on thirteen 25-minute videotapes developed by Mercer. The course was replaced by a computer concept course in which 50 percent of students' time is spent in practical laboratory activity.

Recent Years

To supplement insufficient computer resources and improve the academic and administrative computing environments, the following improvements were made between 1980 and 1985:

- on-line programming,
- increased processing capabilities, and
- expanded use of minicomputers and microcomputers.

The mainframe was upgraded and was designated to carry out the following academic functions:

- IBM assembler programming instruction for data processing and computer science students,

- IBM-based RPG programming instruction (supported by a 16-station on-line laboratory using CICS/ICCF communications software),

- service as a laboratory for students majoring in computer operations, and

- home-grown test generation and grading software for courses using the College's Academic Testing Center.

Because the mainframe was used only for these functions, the minicomputer became one of the primary academic computing resources. The utilization of minicomputers, however, had an early start. In 1968-69 the electrical engineering technology instructional unit received a grant-funded

Digital PDP-8 system for use in teaching the BASIC and FORTRAN languages and their uses in solving engineering problems. The second minicomputer was acquired in 1974, when a PDP 11/45 system was obtained to support BASIC programming instruction for beginning data processing and computer science majors and for the small but growing number of non-computer students who elected to take an introductory computer course.

The major thrust in the use of minicomputers began in the 1980s. In 1982-83 Mercer acquired two PDP 11/60s, an additional 11/45, and a smaller 11/40 that provided approximately 150 PDP-11 workstations, including thirty-two at the James Kemey Campus in Trenton. One of the 11/60s was used to support FORTRAN and beginning COBOL courses with a form of job on-line entry which partially relieved the instructional burden on the IBM mainframe. These acquisitions were possible through judicious use of grants and institutional capital funds.

Also during 1982-83, the first major computer software applications course was introduced. Word processing instruction began using Data Processing Designs' Word-11 software on the original PDP 11/45. Later that year, work started on development of a major in-house software package to support basic skills instruction in mathematics on a PDP 11/60 located in the library.

Other major steps in minicomputer acquisition also occurred during the 1982-83 school year. A Digital VAX 11/780 was installed and all COBOL and FORTRAN instruction was shifted to it. Full ANSI instruction sets and a powerful yet simple on-line editor now are used. The VAX supports more than a dozen engineering applications packages and serves a general-purpose graphic software package used by a twenty-two-station computer graphics laboratory which was established in 1983-84. Including this laboratory, the VAX now supports over 100 student stations in three laboratories and serves the original Word-11 word processing laboratory, which was shifted from the PDP 11/45 to the VAX to provide faster processing and expanded storage capability. The second acquisition in 1982-83 was a PDP-based Applicon Series 4000 computer-aided design system.

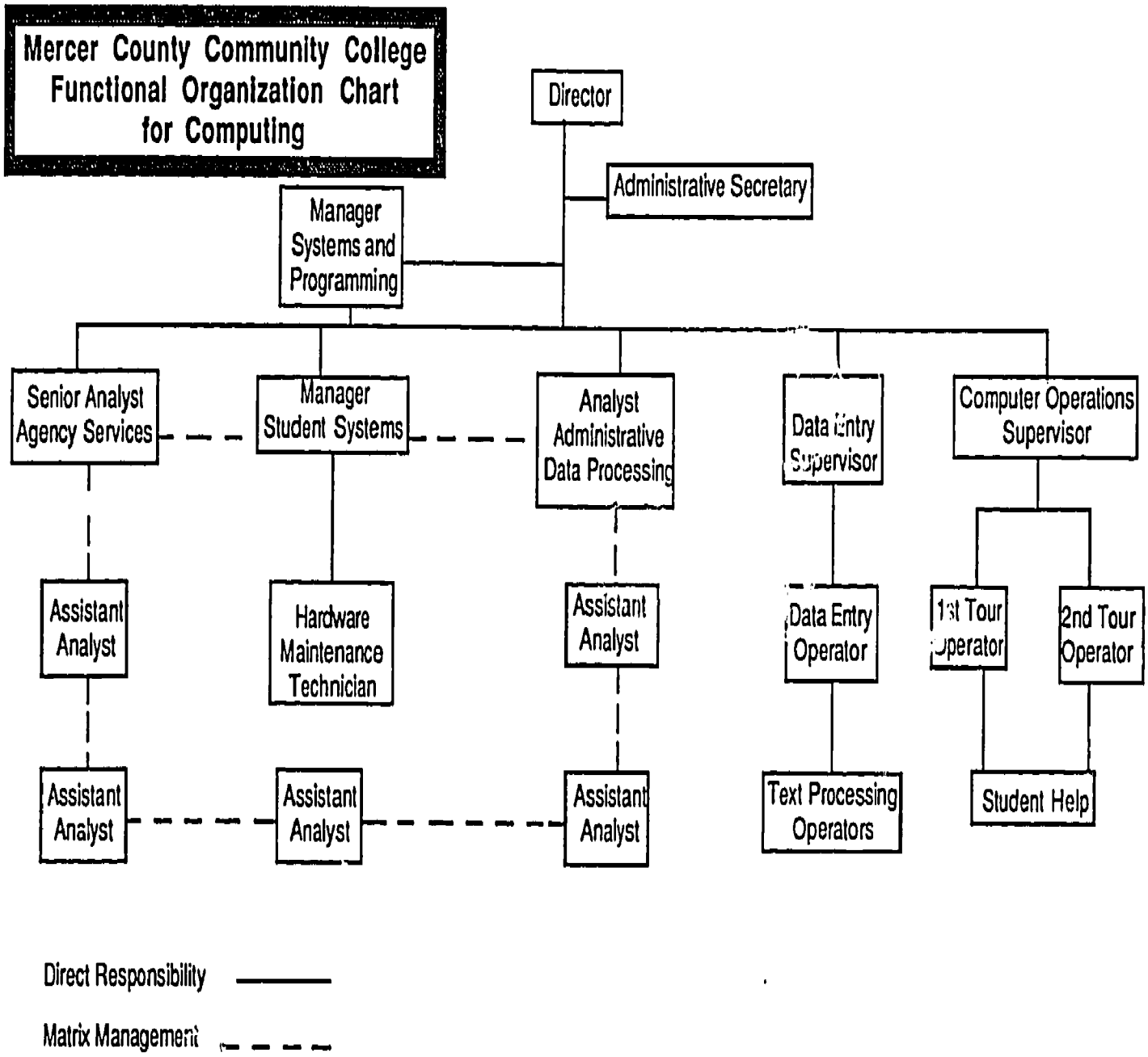
Using microcomputers also improved the computing environment in the 1980s. As with minicomputer technology, microcomputer utilization also originated in the electrical engineering technology curriculum. In 1979-80, a grant enabled the purchase of eight Z-80-based, S-100, CP/M microcomputer systems. These systems are still used for their original purposes of high-level language programming for engineering problem-solving and software development for microprocessor circuits. The laboratory now has twenty-two stations and supports Pascal language instruction for computer science students. In addition, there are some CP/M applications packages for engineering and other areas. Three equivalent CP/M systems also support

data processing instruction in COBOL at the Youth Correctional Institution at Annandale.

While the CP/M systems have remained powerful and versatile through hardware and software upgrading, the progress and diversity of microcomputer software development have produced faculty demand for instructional access to both Apple and IBM microcomputer systems. In response, additional microcomputers have been acquired and made accessible. Thirteen Franklin ACE 1000 and seven Apple IIe microcomputers were installed in the main campus library, and five Franklins were added at the James Kerney Campus. With these additional installations, faculty have access at both campuses to Apple-compatible software.

By early 1984 these new microcomputers were overtaxed by rapidly expanding use in many disciplines. The expansion of microcomputer resources became a high priority and, by late 1984, three laboratories were established through grant funds. The first lab was housed in the Business Building and was equipped with twenty-four IBM PCs. It was designed to be used primarily for business courses and business-oriented data processing courses. A second lab was established in the Math/Science Building. This lab also was equipped with twenty-four IBM PCs, but was designated as an interdisciplinary lab supporting instruction in health occupations. These two PC labs were networked using a forty-five megabyte hard disk to provide shared storage and printing capabilities. A third lab was started in the Engineering Technology Building using eighteen Leading Edge PCs. This lab serves engineering technology, 2D CAD, and pres[illegible] level graphics (art and design). Of particular significance was t[illegible]se of this lab for microcomputer-based, computer-aided drafting [illegible] popular AutoCAD software.

Mercer also has expanded its computing applications in other academic environments. Library Services, for example, has participated in OCLS through the Pennsylvania Library Network (Palinet) and uses DIALOG for on-line reference searching. There also has been in-house development of an off-line circulation monitoring system. Consideration is now being given to acquiring an on-line circulation system.


Mercer County Community College
Functional Organization Chart
for Computing
Director
Administrative Secretary
Manager Systems and Programming
Senior Analyst Agency Services
Manager Student Systems
Analyst Administrative Data Processing
Data Entry Supervisor
Computer Operations Supervisor
Assistant Analyst
Hardware Maintenance Technician
Assistant Analyst
Data Entry Operator
1st Tour Operator
2nd Tour Operator
Assistant Analyst
Assistant Analyst
Assistant Analyst
Text Processing Operators
Student Help
Direct Responsibility
Matrix Management

Computing Environment: Current Status

Staffing

The Computer Center has nineteen full-time employees serving academic, agency, and administrative data processing. Nine analyst programmers participate through matrix management as a pool for writing applications systems and programs. Under matrix management, the person who is given responsibility for developing a new application has control over development. It would not be unusual under such conditions to have a senior systems analyst reporting to an assistant analyst. In addition, seven full-time employees service operations and data entry. The manager of systems and programming serves as systems programmer on the IBM system; the manager of student systems holds a similar position with the DEC network. With so few people, staffing can be a problem, and individuals wear many hats.

Administrative Computing

Administrative computing today has advanced to the point that the College has implemented many on-line applications including budget/appropriation accounting, registration, admissions, financial aid, student accounting, and personnel. The systems are capable of creating, modifying, preserving and reporting on users' data. Other systems are in various stages of design —including a rewrite of Mercer's on-line testing system which was originally written in the early '70s.

As hardware maintenance and teleprocessing costs continue to increase, Mercer has established its own in-house maintenance facility in support of administrative computing. One technician is responsible for maintaining PCs, IBM, DEC, and Telex terminals, AST networks, and optic fiber multiplexing facilities. A savings of over $20,000 was realized in the first year of in-house maintenance.

Academic Computing

The College has provided a number of opportunities for College employees to receive computer-related training. Well over 100 faculty and staff members have participated in a modified version of the computer concepts course offered by data processing faculty between 1981 and 1984. Interested faculty members from various fields have attended training programs related to computer applications in their disciplines. Support for two faculty members

aspiring to complete master's degrees in computer science is continuing at this time, in addition to effort[illegible]ific to faculty in various disciplines.

Mercer has [illegible]ed many opportunities for students to acquire computer-related skil[illegible]ptember 1984 a formal definition of computer literacy was adopted which describes the computer-related knowledge that the college wishes its graduates to attain:

1. A working knowledge of how computers operate and of common computer techniques.

2. An awareness of the application of computers in academic disciplines and in various fields of work.

3. An ability to use the computer and associated software for collection, retrieval, and manipulation of information; modeling; simulation; and decision making.

4. The integration of the computer and appropriate software into discipline-based courses and curricula for problem solving, both through the use of existing programs and through the experience of developing one's own programs.

5. An understanding of the problems and issues facing individuals and society with regard to the use of computers, including the social and economic effects of computers and the ethics involved in their use.

Faculty responsible for major courses in all disciplines are striving to introduce their students to the applications of computers within those disciplines. A committee on academic computing encourages and coordinates faculty efforts to promote computer literacy among students. While there is no mandate yet that graduates become computer literate, virtually all programs now provide either a computer-related requirement or a recommended elective course. Microcomputers were introduced and are being used in art courses to generate animation; in aviation to monitor simulated flight; in mortuary science, where they are used for inventory and accounts receivable; as well as in traditional applications in data processing, business, engineering, English, journalism, etc. Thus all students are provided at least an opportunity for general computer literacy.

In the last eight months, since late 1985, significant improvements have been made in academic computing resources. An engineering CAD lab containing four workstations had been created in 1984 to support introductory

and advanced courses in CAD on a system comparable to those used by major area employers. The hardware was a single-purpose, self-contained system. Although it performed its functions well, its future obsolescence was foreseen, and a VAX-generation CAD system was installed in December 1985.

Also during the past eight months, a second VAX 11/780 was installed and networked via DECNET to the first. A DEC PDP 11/24 donated by Digital Equipment Corporation, running LAT 11 software, was added to the DECNET to provide a front end. Sixty new full-screen editing terminals replaced old Esprits in data processing labs, and a new word processing lab of thirty stations evolved with the second VAX and its network. Old DEC PDP 11/40s, 45s, and 60s, which had served well, have been replaced by the network. More recently a fourth lab with seventy-five Zenith PCs (IBM XT look-alikes) and a fifth lab with twenty-three IBM PCs were added, and are used for computer literacy and skills training.

Community Computing Support

The need to provide training on current computer hardware with limited capital became, for Mercer, an opportunity to better serve both its student and non-student constituencies. The problem, simply stated, was that in the early seventies computer hardware was advancing in design and function more quickly than the College's ability to acquire and utilize it. The solution, after some discussion, turned out to be simple: add applications which generate new equipment dollars.

The first effort was to sell payroll processing that Mercer was doing in-house to the county government. This generated a little capital from which the school purchased new disk technology (IBM 2314s). The school could now offer students the opportunity to use this new equipment. Mercer then added a tax application to its community services and generated more money for CPU expansion and more disks.

This partnership with county, municipal, educational, and other non-profit agencies has continued for over fifteen years. Mercer now provides an on-line court system, voter registration, budget, accounting, payroll, and sheriff's systems. In batch, the school does everything from arena scheduling for a local high school to high school equivalency grading and reporting for the State of New Jersey. Agency billing of this type now provides approximately 25 percent of the Computer Center's budget.

Community computing is coordinated by the Director of Management Information Systems, with strong support from the President and the Dean for Planning and Development.

Computing Environment: The Future

With a history of commitment to providing hardware and software resources, particularly in recent years, and of offering training opportunities for students and employees, Mercer is well positioned to advance the application of technology throughout the academic environment. Faculty and staff interest in discipline-specific, computer-related training is now higher than ever. Employees continue to request training in a spectrum of applications, including spreadsheets, data bases, advertising design, medical laboratory technology, and surveying.

Forecasts indicate that the IBM 4361 will have to be replaced in the 1987-88 time period. Institution officials expect that funds for the upgrade will become available through agency services, grants, and college funds. They anticipate growth in all teleprocessing areas, and planning will soon begin on how to best acquire and maintain future networks.

In the area of academic computing, the DECNET will support anticipated student utilization for the next three years. Continuing education and the training of non-traditional students are growing, and additional PC and communications facilities will need to be identified and acquired.

Conclusion

Mercer County Community College not only meets the needs of administrative and instructional users, but also has the unusual responsibility of serving the computing needs of external public service agencies. Mercer uses technology to fulfill a large portion of the College's mission of serving the community. Of particular note is the College's commitment to computer literacy for employees and students: Mercer has shown how the computer can be utilized effectively not only in computer-related programs, but also in non-computer-related programs and support services. With the help of grants and donations, and with a computer budget significantly enhanced by billing public agencies for data processing services, the College unquestionably will continue to demonstrate the usefulness of information technology in serving the many needs of its student constituency.

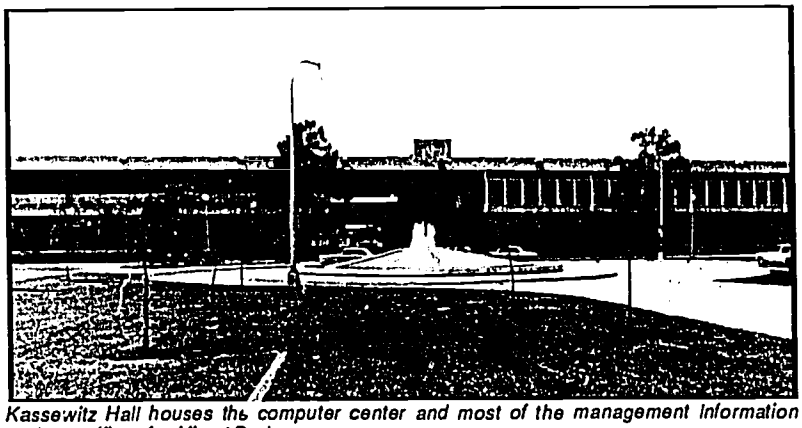
Chapter Five

Miami-Dade Community College

H. Phillip Nicely, Jr., has been dean of Management Information Systems at Miami-Dade since 1974. During that time he has also consulted on systems analysis, computer applications programming, systems engineering, and operations research for various companies, governmental agencies, and educational institutions, and has taught courses as an adjunct professor in mathematics, physics, and computer science at several institutions including the University of Virginia and Pennsylvania State University.

Dr. Nicely has been active in CAUSE, where he currently serves on the Strategic Advisory Council; the National Center for Higher Education Management Systems (NCHEMS); and the Society for College and University Planning (SCUP). He has chaired the steering committee for the Southeast Florida Educational Computing Consortium and has served on several committees in the Association of Florida Community Colleges, as well as the advisory council to the Florida Information Resource Network.

He participates in workshop planning and facilitating, and has published extensively on both scientific subjects and educational planning.



Kassewitz Hall houses the computer center and most of the management information systems offices for Miami-Dade.

Miami-Dade Community College is a publicly-supported two-year institution which serves a population of nearly two million persons in metropolitan Dade County (or greater Miami). From this population base, approximately 64,000 students enroll for credit courses annually. It is one of twenty-eight institutions in the Florida System of Community Colleges. In a 1985 study conducted by Dr. John Roueche at the University of Texas, Miami-Dade was ranked as the number one community college in the country.

Active in local, regional, and national educational organizations, Miami-Dade is a member of the Southeast Florida Educational Consortium in which colleges and universities address issues concerning the future of higher education in Florida in a cooperative and comprehensive manner. Dr. Robert McCabe, president of Miami-Dade, participated in the development of this organization and has served as chairman of the board. Miami-Dade also is a member of the influential League for Innovation in the Community College, discussed in the summary chapter of this monograph.

The history of this institution reflects the evolution of community colleges. The institution began instruction as Dade County Junior College in September 1960. For its first eight years, the College was governed at the local level by the Dade County Board of Public Instruction working in conjunction with an appointed, five-member advisory committee and the College president. The name was expanded to include Miami during this period, and the institution became known as Miami-Dade Junior College. In 1968 the governance structure changed. Districts were created as independent, separate legal entities by the Florida Legislature for the operation of community and

junior colleges. Under this new organizational format, Miami-Dade's advisory committee became the District Board of Trustees, working directly with the College president in all matters pertaining to the governance and operation of the College. By 1973, a third name change occurred: the institution became what it is called today, Miami-Dade Community College.

Miami-Dade has grown from a single temporary site to four campuses. The oldest is the North Campus, located in the Opa-Locka area of Dade County on a 245-acre site which was part of a World War II Naval Air Station. The South Campus opened in January 1967 on a 185-acre site twenty-three miles southwest of the North Campus in West Kendall. The Wolfson Campus is located in the heart of Miami's business community as the only limited-acreage urban campus in the area. The fourth campus is the Medical Center Campus, which is located in Miami's medical center complex surrounding Jackson Memorial Hospital and houses all of Miami-Dade's allied health programs. Most District administration offices are currently housed at South Campus although plans are under way to move selected District administration offices to or near the Wolfson Campus. With the transition from a single campus to a multi-campus college, the administrative operation was reorganized to provide services common to the whole College, and at the same time provide maximum practical autonomy for each campus.

The total annual budget of the College for 1985-86 was approximately $95,037,642 excluding restricted funds (for example, grants). The portion of that budget assigned to computer services was approximately 3.8 percent.

Mission and Programs

The instructional programs offered by Miami-Dade are designed to prepare students for upper division courses at senior colleges and universities, or for immediate entry into career fields. Courses are also offered to meet students' personal interests or to upgrade their occupational skills. One of the educational goals of the institution expresses well the philosophy of community colleges: "to accept students as they are, and to provide them with opportunities to take the next steps according to their choices."

The institution grants three types of degrees: the Associate in Arts (awarded to 80 percent of graduating students); the Associate in Science which comprises 20 percent of degrees granted; and an Associate in General Studies which goes to fewer than 1 percent of graduating students. In 1984-85, over 5,200 degrees were awarded.

Student Demography

In the fall of 1985, 63,360 students enrolled for credit and 41,226 more for non-credit. Almost three-fourths (72.4 percent) of credit students were part-time. The wide ethnic range includes 53.8 percent Hispanic, 16 percent black, and 27.6 white non-Hispanic students. Of students receiving degrees during the 1984-85 school year, 80 percent of the AAs went on to four-year colleges and 20 percent entered the job market; 35 percent of ASs went on to four-year colleges and 65 percent entered the job market.

Computing Environment: Background

Miami-Dade has been recognized for its significant accomplishments in the application of technology to meet both administrative and instructional needs. The discussion which follows describes the policies that Miami-Dade has developed and the resources utilized to implement them.

Computing Policies

Mainframe Policy

For many years, Miami-Dade has been committed to an IBM or IBM-compatible mainframe computer. The three principal reasons for this are:

1. The inventory of applications programs currently in production is extensive, and the cost to convert to a non-IBM-compatible mainframe computer would be so great that it would not be practical.

2. Because of IBM's enormous penetration of the marketplace (including the South Florida area), students taking computer courses involving an IBM or IBM-compatible mainframe computer at the College are believed to be better prepared for the local marketplace than they would be if they did not have experience on IBM hardware.

3. Also because of IBM's dominant share of the South Florida mainframe marketplace, the pool of programmers experienced with IBM equipment is much larger than the pool of programmers familiar with other equipment, a definite asset at hiring time.

The College does not plan to change this policy in the foreseeable future.

Computer Applications Policy

Although the institution has not relied exclusively on in-house development (proprietary line-item Position Control and Labor Distribution Programs were installed in 1985, for example), the College has developed most of its systems in-house. An example is the Audio-Visual Booking System which became operational in January 1985: each major campus has its own set of audio-visual materials; however, each may book another campus's materials. Scheduling of materials that must be transported among campuses is one of the main objectives of the system. The system is menu-driven and contains only one transaction code. The transportion shuttle schedule is an integral part of the system.

The Student Records System, which has received national recognition and is described later, was also developed in-house. The College plans to continue the maintenance and development of programs within this system.

The Financial Records System was also developed in-house, but is not considered innovative. Indeed, although the subject programs are accurate, there are inefficiencies with respect to production costs and maintenance costs. The College plans to replace all programs in the financial area as soon as practical. It is anticipated that remaining major financial programs (for example, general ledger and accounts receivable) will be replaced with newly developed in-house programs within the next two or three years.

The remaining applications programs, for the most part, were developed in-house. When and where it makes sense to do so, these in-house developed programs will be replaced in the future by new ones in order to minimize maintenance costs and perhaps to speed up maintenance activities.

Data Base Policy

The College currently is committed to the Cullinet IDMS/R Data Base Management System (DBMS). The Cullinet Integrated Data Dictionary (IDD) has been in use for four years, and a full-scale pilot project using IDMS/R is currently under way. Following successful completion of this pilot project, most applications-programming developments will be done totally under IDMS/R. Furthermore, most proprietary packages procured by the College in the future will begin their production operation totally under IDMS/R.

One of the greatest practical advantages in selecting the proprietary Personnel Position Control and Labor Distribution Systems referred to above was the fact that their files were VSAM-oriented, making them ideally suited for future migration to IDMS/R. Migration of VSAM files to an IDMS/R data base environment can be easily accomplished. Furthermore, Cullinet's IDMS/R is structured to handle VSAM files very efficiently and with relative ease. The largest problem facing the College with respect to full implementation of IDMS/R for all applications programs will be the conversion of

existing programs in the Student Records System. This step will require the complete rewriting of nearly all of the subject applications programs. This effort will begin during 1987 and is expected to last about five years.

Personal Computer Policy

Thus far the College has deliberately taken a position of not standardizing on specific vendors for microcomputer hardware and software. However, the College anticipates that in the near future consideration must be given to the adoption of limited standards. Pilot tests are currently under way involving PC-to-PC communications and PC-to-mainframe communications. It is expected that requirements involving such communications will grow during the next few years.

In October 1985 a "Microcomputer Service Team" was created by assigning two analysts in Computer Applications Programming to provide this new function on a full-time basis. The objectives of this team are:

1. to translate functional requirements of users to personal computer hardware, software, and peripheral procurement recommendations, where applicable;

2. to assist users in preparing procurement documents and with the installation of the subject items;

3. to tailor off-the-shelf PC software to meet specific client needs; and

4. to provide training and necessary documentation as required.

This function is essentially in a pilot-test mode for at least one year.

Computing Resources

The administrative computing center, headed by the Dean of Management Information Systems, handles all administrative operations and much of the academic operations. Although M-DCC does not have a separate academic computing center, many of the academic departments, particularly in business data processing and engineering disciplines, have their own com-puting resources, usually in the form of personal computers or, in some instances, a minicomputer with attached terminals. The major resources sup-porting computing activities at Miami-Dade are described below according to the categories of personnel, hardware, and fiscal resources.

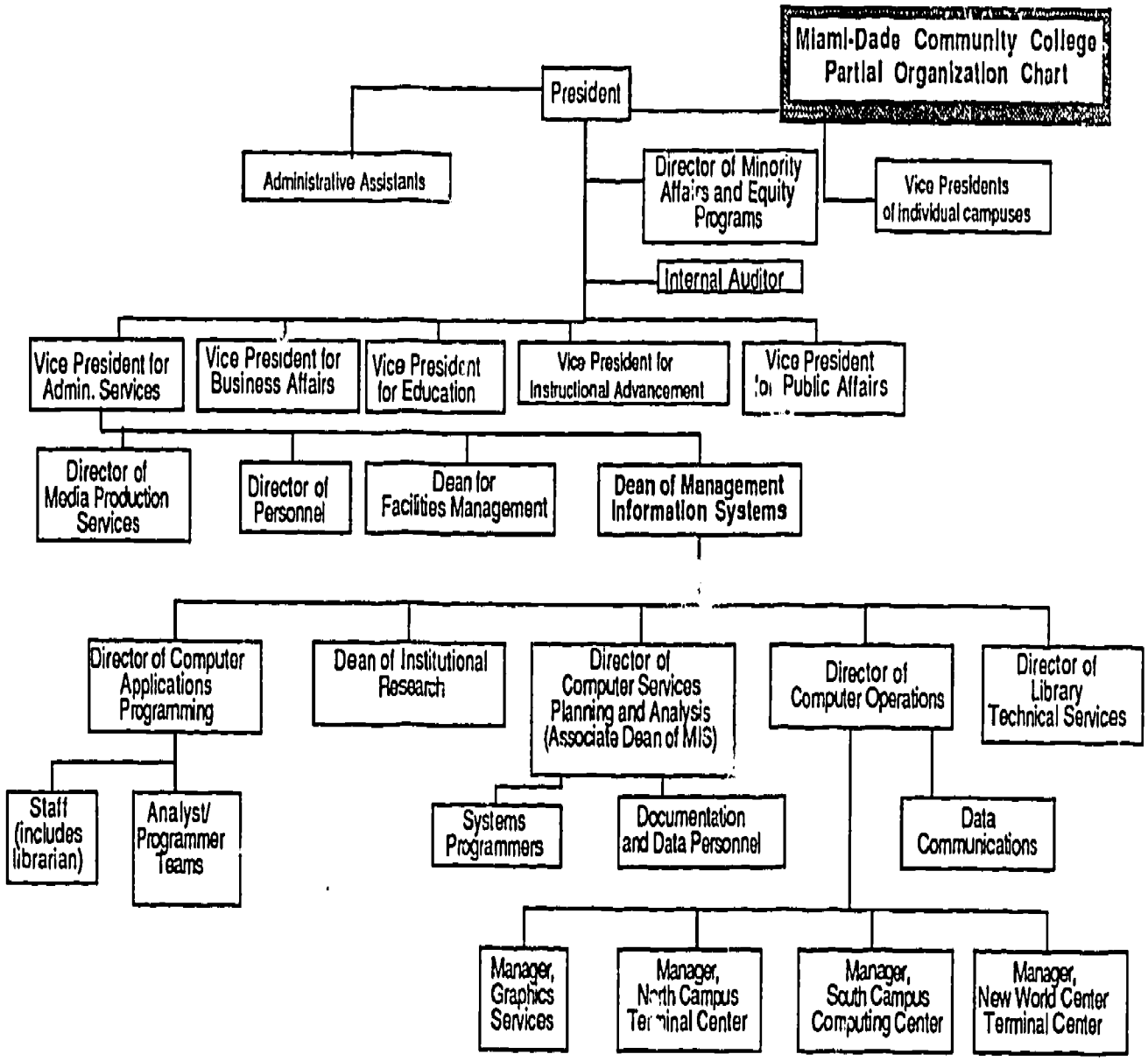
Personnel

The computer services organization consists primarily of three major groups which report to the Dean of Management Information Systems: Computer Applications Programming, Computer Operations, and Computer Services Planning and Analysis. Institutional Research and Library Technical Services also report to the Dean of Management Information Services. An organizational chart showing the computer services administration of M-DCC is included on the next page.

Computer Applications Programming. This group is responsible for applications programming for the mainframe computer. There is a director and a staff of two professional and three clerical/secretarial personnel. There are eight teams of applications programmers, each headed by an analyst. Staffing for these teams includes twenty-two full-time programmers, two part-time programmers, and eight analysts. Each analyst and programmer has available on his/her desk a text-editing terminal using SUPERWYLBUR. Many terminals, some of which have printers, are conveniently located throughout the office area and are connected to the teleprocessing system.

Computer Operations. This second group is responsible for production operations involving the mainframe computer and interconnected devices. Computer Operations is in a production mode an average of six days a week, twenty-four hours a day. The remaining three shifts per week (usually on Sunday) are used for vendor maintenance and special studies by systems programmers. In the case of very large workloads, these three shifts may be used for "catch up" purposes. The total staffing of Computer Operations consists of a director with a staff of three professional and three clerical/ secretarial personnel, three managers, and twenty-seven operations personnel. The Graphics Services function, which provides printing and duplicating services, also reports to the Director of Computer Operations. This particular organizational arrangement was designed to promote and facilitate integration of the computer operations and graphics services functions as appropriate.

Computer Services Planning and Analysis. This group provides technical planning and support to all offices of Computer Services. The director is also the Associate Dean of MIS. There are seven professionals (mostly systems programmers) and two clerical/secretarial personnel.


Miami-Dade Community College
Partial Organization Chart
President
Administrative Assistants
Director of Minority Affairs and Equity Programs
Vice Presidents of individual campuses
Internal Auditor
Vice President for Admin. Services
Vice President for Business Affairs
Vice President for Education
Vice President for Instructional Advancement
Vice President for Public Affairs
Director of Media Production Services
Director of Personnel
Dean for Facilities Management
Dean of Management Information Systems
Director of Computer Applications Programming
Dean of Institutional Research
Director of Computer Services Planning and Analysis (Associate Dean of MIS)
Director of Computer Operations
Director of Library Technical Services
Staff (includes librarian)
Analyst/ Programmer Teams
Systems Programmers
Documentation and Data Personnel
Data Communications
Manager, Graphics Services
Manager, North Campus Terminal Center
Manager, South Campus Computing Center
Manager, New World Center Terminal Center

Also under the Dean of Management Information Systems is the Dean of Institutional Research, who is responsible for many of the internal reports and analyses used in decision-making by executive management at the College.

Hardware Resources

Mainframe. The primary computer resource is the mainframe computer which is an IBM 3083E. It has sixteen channels and thirty-two megabytes of memory. The DASD "farm" currently can store over thirty-five gigabytes of data. The operating system for the mainframe computer is the latest proprietary release of IBM's MVS (SP1.3.5 as of October 1985). The College plans to migrate to IBM's XA operating system during 1987-88 or sooner. There are no plans to use IBM's VM operating system in the foreseeable future.

The teleprocessing monitor associated with the mainframe computer is Altergo's SHADOW II. This TP monitor uses bisynchronous communications. The Text Editor is SUPERWYLBUR by EDS. It is used primarily for applications programming, and it uses asynchronous communications. ADR's ROSCOE is the principal "TSO equivalent" for student use at North Campus and South Campus. ROSCOE also uses bisynchronous communications. The DBMS for the mainframe computer is Cullinet's IDMS/R, as noted in the data base philosophy section. The College plans to convert from bisynchronous communications to SNA/SDLC within the next two to three years.

The principal File Access Method has been ISAM with occasional use of BDAM. However, most recent applications systems developments have used VSAM and the Applications Development System On-line (ADSO) facilities of IDMS/R. It is anticipated that the College will eventually migrate to VSAM because Cullinet's data base can work easily with VSAM files.

Minicomputers. The North Campus Business Data Processing (BDP) lab currently has a DEC PDP 11/40, but plans are under way for its replacement. The Wolfson Campus BDP lab had a DEC PDP 11/10, but it was replaced by a number of microcomputers. The South Campus BDP lab formerly had a DEC PDP 11/60, but it too has been replaced by microcomputers. The DEC PDP 11/60 at the South Campus is now assigned to the Chemistry Department for student use.

Microcomputers. Like other educational institutions in the country, Miami-Dade is experiencing explosive growth in personal computers. First, microcomputer laboratories were established at South Campus and Wolfson

Campus. Both laboratories were equipped with Radio Shack microcomputers, and were designed primarily for use by business data processing students. The next microcomputer laboratory was created to support the non-BDP areas of South Campus, and involved the procurement of thirty-six Apple microcomputers. (One Apple microcomputer was purchased by the Physical Education Department at South Campus in support of student nutrition programs.) Subsequently, a second large laboratory of microcomputers was established in the Business Data Processing Department of South Campus using primarily IBM microcomputers.

The growth of personal computers continued with a similar, but smaller, microcomputer laboratory of IBM PCs at North Campus to support the business data processing and engineering curricula. Another microcomputer laboratory recently began operation at the South Campus. This laboratory consists of about fifteen IBM and fifteen AT&T microcomputers. Although this newest lab is designed primarily for use by students in occupational programs, the lab may be used for all disciplines. Also, the BDP program at Wolfson Campus has recently augmented its microcomputer lab with the addition of over thirty IBM PCs. (Most of the older Radio Shack equipment is now being used in Outreach Centers.) A few microcomputers of various makes and models are in use by some faculty members, campus administrators, and many offices of District administration, most of which were manufactured by IBM.

Three operating networks for personal computers are known to be in operation at present. The Office Technology Department at Wolfson Campus makes use of fifteen IBM PCs using the Corvus Omninet System. Additionally, the Apple-CAD Lab for Architecture at Wolfson Campus makes use of a Corvus Network. Thirty-six of the Apple microcomputers at South Campus (mentioned above) are also interconnected using a Corvus Network. Several IBM "PC networks" and one IBM "Token Ring Network" are currently being installed.

Fiscal Resources

Current funding for the College comes primarily from two sources. The State of Florida provides approximately two-thirds of the revenue, and student fees and tuition account for the remaining one-third. Funding for all community colleges in Florida has lagged behind operating cost increases over the past seven or eight years. Some funding (less than 5 percent) comes from federal and private grants and other sources. For example, the current mainframe and some DASD were purchased using federal Title III Challenge Grant funds. This particular example provided the College with about $1 million in grant funds at a time of extreme need.

Inflation and uncontrollable expenses (electricity, for example) have caused the College to implement more economical ways of handling certain operations. One example was the replacement of full-time janitorial positions with part-time positions. A more recent example was the replacement of the intra-campus and inter-campus telephone system by a ROLM telephone network and microwave links. The College is now investigating alternatives to the data lines currently leased from Southern Bell to link the campuses, with the hope that a much less expensive alternative can be found.

In the computer services area, maintenance of Telex terminals is now done in-house rather than through a maintenance contract with a vendor. The College also recently began handling telephone maintenance in-house. If these changes in maintenance policy continue to prove effective and econom-ical, other maintenance areas of computer services and departments through-out the College will likely also be converted to in-house maintenance.

Computing Environment: Current Status

Miami-Dade's extensive computer facilities, inter-connecting its campuses, are used to serve students in a multiplicity of ways, most importantly in administrative functions which assist students, instructional computing (such as in the College's data processing and engineering programs), and computer-based instructional management. The institution has a tradition of being on the cutting edge of new developments in technology. Examples and brief descriptions of these are discussed below.

Administrative Student Information

The main computer supports such administrative student information programs as student admissions, registration, and financial aid. More than a decade ago the College developed and installed one of the first electronic student records systems in the nation, which has received considerable recognition because of its versatility, functionality, and excellent response time. This Student Registration System, regarded by many as exemplary, is modeled after an airline reservation system. The Student Academic Advisement and Graduation Information System (AGIS) also has been lauded for its many features which include such specific information for the student as his/her declared major, courses taken, and courses currently enrolled in. Other major administrative computer support systems which provide information to students include the Academic Alert and Advisement System and the Basic Skills Assessment System.

Instructional Computing

Instructional computing needs are met through data processing laboratories on North, South, and Wolfson Campuses. The labs provide students with support equipment to learn various computer languages and computer-related topics. During 1984 a full-time position was approved for Computer Services to coordinate and help plan for the technical support of business data processing departments—insofar as they involve communication with mainframe computers or stand-alone minicomputers.

Another instructional computing application is apparent in the Engineering Department at North Campus. They are using two IBM FASTDRAFT Mechanical Drawing Systems in appropriate courses. These two bundled minicomputer systems and support for associated development activities (estimated value of $350,000) resulted from a grant received from IBM Corporation. The Architecture Department at Wolfson Campus makes use of Apple and IBM microcomputers in its CAD courses. The Architecture Department at South Campus employs nine IBM-compatible microcomputers (CORONAS) for CAD and other architecture-related courses. Additional computer applications in the academic area are described in the section that follows.

Computer-Based Instructional Management

The year 1986 marks the fifteenth anniversary of RSVP (Response System with Variable Prescriptions) at Miami-Dade Community College. RSVP is a computer-based instructional management system that operates in the batch mode and provides individualized feedback to students in the printed form. The uses of RSVP at Miami-Dade are as varied as the faculty and advisors using it: as a content- and context-free system, RSVP can be programmed to cater to any mode of instruction, any size of enrollment, any level of education, and any kind of time frame. The flexibility of the system is perhaps its most striking feature. It allows the creativity of faculty to emerge, and it assists faculty to improve in their organization and systemization of instructional planning and delivery. In all M-DCC's work with RSVP, curriculum design and assessment have been emphasized, thereby producing quality instructional programs for students.

An important spinoff from the RSVP system was "Camelot," an authoring system for individualized information, operating in a stand-alone microcomputer environment. Camelot helps users maintain personal and individualized communications with clients such as students, parents, and

employees. The software was developed at the College with the support of several grants, and with the cooperation of a number of pilot institutions around the world. Camelot allows users to perform the following functions:

- to describe their clients by such characteristics as demographics, client preferences, and learning styles;
- to describe the methods of assessing client performance;
- to enter textual material so as to provide feedback to clients; and
- to define the rules for individualizing that information.

Camelot is being used at M-DCC in such disciplines as respir y therapy, nursing, and health. It is in operation in twenty other institutions, and is currently in the process of being purchased by 100 institutions.

Computing Environment: The Future

Looking ahead to projected expenditures, utilization forecasts indicate that the mainframe computer will have serious problems contending with registration for classes for the fall term of 1986-87. Although Computer Services has planned for an upgrade of the 3083E computer, it is unlikely that funds will be available in time. The College will probably have to curtail some production activities. Furthermore, development activities may have to be delayed, since their completion would add a further resource load to the already overloaded computer facility.

The future enrollment picture for the College appears to be roughly steady-state. Thus, an increasing enrollment cannot be counted upon to help solve the funding problem. College President Robert McCabe is heading a major effort to persuade the Florida legislature to improve community college funding in general. If this effort is successful, results will be seen no earlier than the fiscal year beginning July 1, 1986. Improved funding is a long-term necessity if future program needs are to be met in any consistent manner.

Miami-Dade intends to remain a leader in the application of information technology in community colleges. One of the important factors in its success is careful planning. What was originally a four-year plan, structured for presidential and board review, is re-formulated yearly into a new three- or four-year plan responding to changing circumstances (even five-year plans were found to be too long-term to be effective). But the key ingredient for this success has been the people who work for the College—in particular President McCabe with his visionary leadership.

What has been shared in this chapter only highlights the computing environment at Miami-Dade. One must personally visit the school to observe how computing has permeated the institution and, most importantly, how this environment has promoted the success of its students.

Acknowledgements

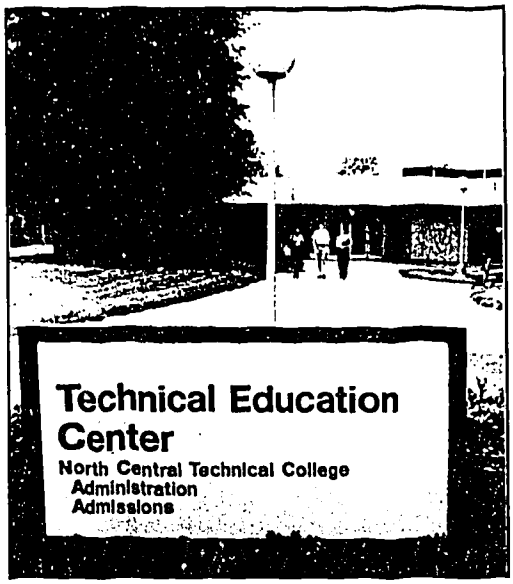
The author wishes to acknowledge many persons at Miami-Dade who provided considerable assistance in the preparation of this chapter. Mr. Al LeDuc was especially helpful with his constructive criticisms and editing changes. Colleagues deserving special notice are: Dr. Kamala Anandam, Mr. Carl Bethel, Dr. M. Duane Hansen, Mr. Harry Hoffman, Mr. Oscar Larrauri, Mr. Douglas Lehman, Dr. John Losak, Ms. Margaret Massey, Dr. Piedad Robertson, Mr. Jean-Charles Ruf, Mr. Bruce De Sautel, Dr. Richard Schinoff, Ms. Roberta Stokes, and Mr. Jose Toro. Special thanks are given to Dr. Robert McCabe, whom the author regards as a genius in conceptualizing and who makes suggestions that make optimum use of the latest proven technologies.

Chapter Six

North Central Technical College

Warren H. Groff is in his ninth year at North Central Technical College. He was Vice President for Academic Affairs for seven years and is now Director of Research and Development. He has written extensively on the topics of human resources development and strategic planning and management for economic development, and has made numerous presentations at state and national conferences. He has chaired the state-wide Task Force on Higher Technology for the Chancellor of the Ohio Board of Regents and served on the OBR Computer Task Force and the OBR Higher Education Telecommunications Committee. In 1984 he chaired a forty-four-member Consolidation Committee for School Improvement for the Board of Education for the Mansfield City Schools.

Dr. Groff was one of two faculty members at the Snowmass Institutes on Strategic Planning and Management from 1981 through 1985. He assisted in conducting an American Council on Education Leadership Seminar on "Strategic Planning Techniques for Massachusetts Post-secondary Education" for the Massachusetts Board of Regents in 1981. He teaches doctoral courses in Nova University's higher education programs. For the past two years he served as president of the College of Education Alumni Society of The Pennsylvania State University.



North Central Technical College (NCTC) is located in Mansfield, Ohio. The College's official service area is Ashland, Crawford, and Richland Counties, an industrial and agricultural area in the north central section of the state. The 1980 census data indicated that 233,000 persons reside in this three-county area of 1,339 square miles. In Richland County, manufacturing accounted for 51 percent of the jobs in 1970 and 41 percent in 1980. This contrasts with 44 percent and 35 percent for Ohio as a whole and 26 percent and 21 percent for the nation in the same periods of time. Ashland and Crawford Counties have some industry, but are primarily agricultural.

In 1961 the Mansfield Board of Education created the Mansfield School of Technology, a two-year postsecondary, diploma-granting school. The mission of the school was to provide students with career skills for employment in the Mansfield area. In 1968 the Ohio Revised Code mandated that all technical schools be chartered by the Ohio Board of Regents. The Mansfield School of Technology became North Central Technical College and was certified by the Secretary of State on May 16, 1969, as an institution of higher education. A nine-member Board of Trustees was formed in accordance with the Ohio Revised Code.

In 1970 North Central Technical College moved from its original location to the regional campus of the Ohio State University at Mansfield (OSU-M). Both institutions currently share all physical facilities and some services. These services include such areas as the Learning Resources Center (library), the Physical Activities Center, student activity events, the bookstore, physical plant services, and security. Each institution, however, has its own mission, policies and operational procedures, curriculum, and faculty.

The College operating budget for 1985-86 was $4,800,000, with $105,576 (or 2 percent) allocated for administrative data processing support and $199,946 (3.8 percent) going to direct instruction for the data processing program.

Mission and Programs

NCTC is a primary source of trained persons for entry into the workforce and also for upgrading the existing workforce. Over the past several years, the College has attempted to better serve the diverse needs of the non-traditional student population. Special programs have included retraining the worker who is displaced and dislocated because of structural unemployment, and retraining and upgrading the existing workforce through customized training programs such as apprenticeships and specialized training for mid-management personnel and service providers in a variety of different establishments.

Programs of study lead to an Associate in Applied Science, an Associate in Applied Business, an Associate of Technical Study, or a certificate. Degree programs include Drafting and Design Technology, Electronic Engineering Technology, Law Enforcement, Mechanical Engineering Technology, Radiologic Technology, Retail Management, Data Processing, and Respiratory Therapy Technology. The College graduates about 340 students each year.

Student Demography

During the fall quarter of1985, 1,860 students were enrolled to yield 1,172 FTE. Part-time students comprised 62 percent of the enrollment. The average age of an NCTC student is twenty-six, but the range is from fifteen-year-olds in the advanced high school program to eighty-three-year-olds enrolled in the College's senior citizens program. The marital status of the student body is predominantly single. NCTC has a significant number of students (39 percent of the fall 1984 enrollment) who attend classes primarily in the evening.

Forty-three percent of the enrolled students for the fall quarter 1984 were male, versus 57 percent female. The economic background of NCTC students is strongly middle class—the 1983-84 ACT Class Profile Report showed that 19 percent of the students who took the ACT examination came from families with less than $12,000 annual income and an additional 30 percent reported family incomes of less than $18,000. The ACT data indicate that students at NCTC are less academically prepared than the national average.

Computing Environment: Background

In the fall of 1977, North Central Technical College made a commitment to comprehensive institutional planning as a prelude for developing its operating budget and its capital plan. The College examined numerous planning models from private and public regional universities and two-year colleges, and found that the best models specified assumptions on which to base subsequent planning. The College specified assumptions under ten categories, and then set goals and objectives under seven categories at the institutional and departmental levels. These categories were:

Assumptions Categories	Goals Categories
1. Societal Context	1. Mission Attainment
2. External Agencies	2. Functional Relationships
3. Institutional Management	3. Qualitative Improvement
4. Programs	4. Program Development
5. Students and Enrollment	5. Professional Development
6. Student Services	6. Public Relations
7. Professional Development	7. Funding Sources
8. Physical Plant	
9. Equipment	
10. Fiscal Resources	

The conceptual framework for this planning effort was based on two assumptions: (1) technology progresses along a continuum beginning with research and development through adoption and utilization; and (2) persons and establishments progress through various stages of development beginning with awareness and extending to familiarization and then utilization.

The following scenario was hypothesized to occur when the model was implemented: during the *awareness stage*, a person or an establishment would discover an idea or technology exists, would develop interest in it, and

would seek additional information about it. During the *familiarization stage*, a person or establishment would use the idea or technology on a small scale in order to determine its utility and impact. During the *utilization stage*, a person or establishment would integrate the new technology in a concentrated and continuous way on a large scale.

During the academic year 1977-78 each department specified assumptions in the fall, set goals and objectives during the winter, and then linked dollars to goals and objectives in early spring. The process was repeated in 1978-79, including an intensive review of instructional department packages of assumptions, goals, and objectives. From this process, high-priority needs emerged.

Formation of Task Forces

Data processing and word processing were among the high priorities. Because these two areas pertained to both instructional programs and administrative support, task forces were appointed to provide direction to these two areas in the fall of 1979. The Task Force on Data Processing (TFDP) was chaired by the Vice President for Student Services and Administration and included representatives from instructional programs and administrative support services as well as the Vice President for Academic Affairs and the Vice President for Business and Finance. The Task Force on Word Processing (TFWP) was chaired by the Vice President for Business and Finance and included representatives from instructional programs and administrative support services as well as the other two vice presidents. The charge to these task forces was: (1) to develop a set of educational specifications for these two technologies for instructional programs and for administrative services, and (2) to make recommendations about specific equipment purchases for these technologies.

Data Processing

The TFDP held thirty meetings over the two-year period of time to develop the educational specifications, to hear and evaluate vendor presentations, and to make its recommendations. All departments within the College were surveyed in an effort to develop a description of data processing needs in the internal environment. The task force relied heavily upon the program advisory committee and several site visits to understand data processing in the external environment. An evaluation form was developed to assess objectively all proposals.

The task force critically analyzed all proposals based on dimensions of the data processing environment including conversion, state-of-the-art tech-

nology, software capability, growth potential, terminal acceptability, hardware and software support, maintenance, security, word and text processing, space requirements, reliability, and other variables. Site visits and inquiries were made to colleges and corporations using various equipment configurations. After considerable analysis, the task force recommended the HP 3000-44 and a contract was signed on October 7, 1981.

Word Processing

The College went through a similar process for word processing. This task force developed educational specifications based on a critical analysis of the external and internal environments. The task force listened to presentations from nine vendors in June 1982. Selected vendors were asked to demonstrate, on-site, the interaction of their equipment with the HP-3000. The task force recommended the Philips Micom system for instructional and administrative purposes, and their recommendation was accepted by the College administration.

Expanding Commitment to Computing Technologies

Engineering

While the two task forces were conducting their research, computers were also being discussed in the Engineering Division. During 1980-81, Apple IIs were used in the electronics laboratory. In 1982, the electronics laboratory had a total of twenty-six smart terminals and programmable logic controllers. That same year Computer Aided Design (CAD) was introduced in drafting and design with four AutoTrol design units and a VAX 11/750 computer. The manufacturing processes laboratory was equipped with two computer numerical control lathes, one Bridgeport mill with digital readout, and other contemporary equipment.

In the fall of 1982, the Mechanical Engineering Program Advisory Committee recommended that a robotics course be added to the last quarter of the second year of that program. A Robotics Task Force was formed to provide direction to this effort. The task force followed a similar process to develop specifications and an equipment list. The course was run for the first time in 1984, and continues to be an integral part of the program.

Training Programs

To become technically familiar with the College's new HP computer system, administrative staff and faculty participated in three vendor courses: (1) a programmers' introduction to expose users to the basic operations of the system, (2) a systems management course to prepare users in allocating and

controlling system resources, and (3) a course to give users a working knowledge of HP's data base called IMAGE. Similar programs were attended by personnel in other areas.

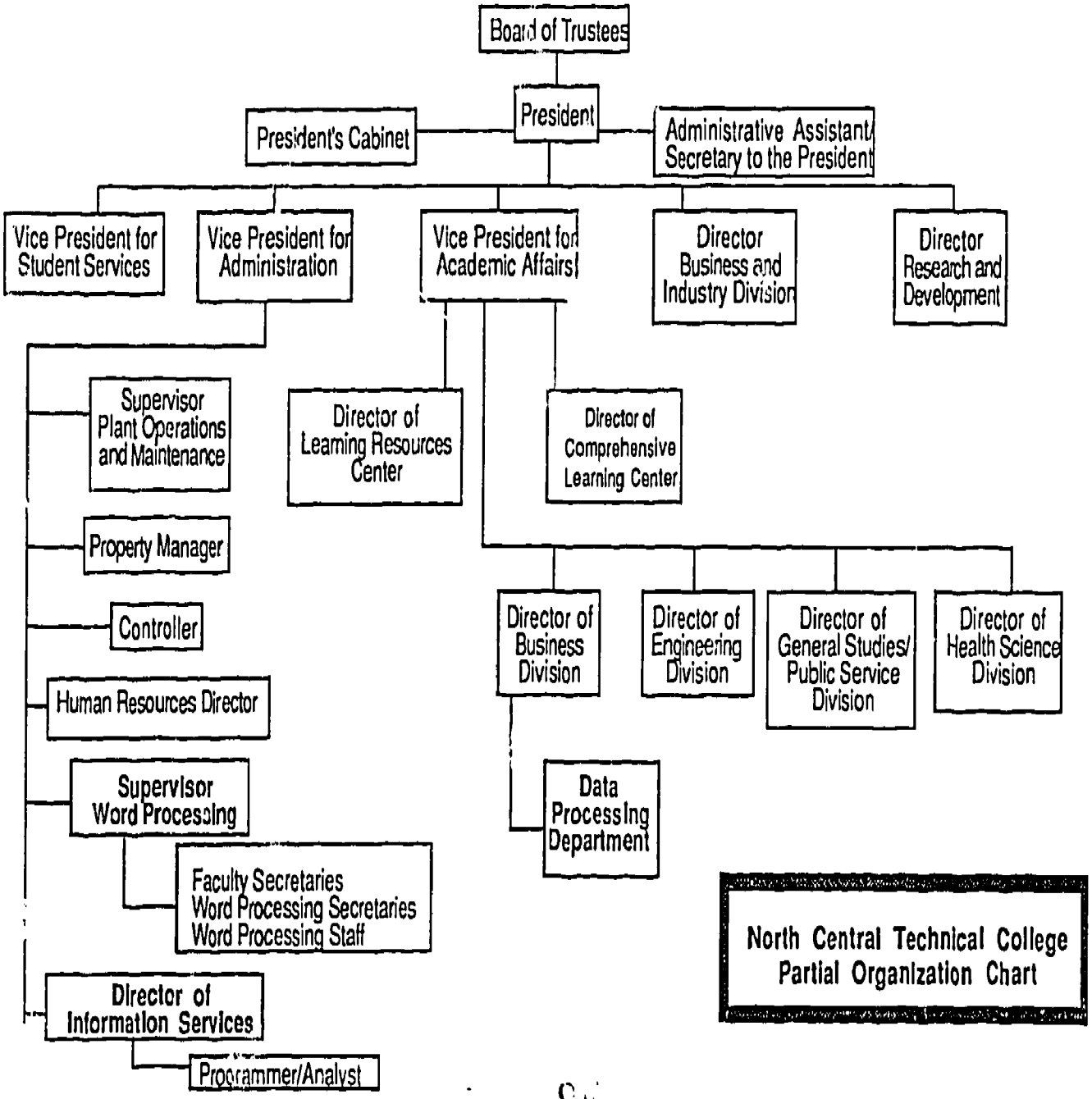
Community Outreach

The combination of the comprehensive institutional planning process, the acquisition of contemporary technology, and the College's commitment to the concept of a community renewal college provided the impetus for a broad range of initiatives such as seminars, workshops, and articulation meetings designed for community members who were not affiliated with NCTC. For example, in September 1982 the College conducted a seminar, "Advancing Productivity Through Systems Automation," for corporate personnel. In December 1982 twenty faculty from NCTC visited Mansfield Senior High to discuss articulation and standards. In March 1983 the College conducted a high technology seminar for business and industry, in preparation for which the monthly NCTC publication *Challenge* contained an article, "High Technology. What Is It?" Other activities included an open house in May 1983 and a strategic planning seminar for the Mohican Valley Chapter of the American Society for Training and Development. In addition, computer literacy programs were conducted for secondary school teachers, law enforcement officers, high school mathematics students, and numerous other groups.

Institutional Commitment

By 1982-83 the College had institutionalized the process of specifying assumptions, goals, and objectives as well as linking dollars to goals and objectives: assumptions were stated and reviewed in early fall, objectives were set for the next year in late fall and early winter, and operating dollars were linked to objectives during the winter. In the context of the original planning assumptions, College personnel had progressed from awareness to familiarization with the contemporary technologies and some persons were intimately involved in utilization on a broad scale. Data base, distributive data processing, and networking took on new meaning.

Assumptions specified in the fall of 1982 indicated quite clearly that data and information processing were center stage for primary and support programs. In the primary program of business, data and information processing were expected to play a major role extending from market research through consumer satisfaction. The same held for the health care program, where data and information processing were regarded as necessary supports for all aspects from health promotion through tertiary care. In the engineering programs, data and information processing were regarded as integral,



North Central Technical College
Partial Organization Chart

extending from computer-aided design through computer-integrated manufacturing. In terms of the overall institution, data and information processing came to be viewed as the essential element in a strategic planning, managing, and evaluating system.

The advances that had been made at North Central were manifested in many ways. External recognition came when a survey was conducted by the Ohio Board of Regents Computer Task Force in 1982. The results showed that NCTC had more computer workstations per full-time equivalent student than any of the other sixty-two public institutions in Ohio.

Computing Environment: Current Status

Organization

The Director of Information Services, who reports to the Vice President for Administration, is responsible for all academic and administrative computing. Personnel support of computing at NCTC are separate for administrative and academic services, as the organization chart on the next page indicates. The Director of Information Services and a Supervisor of Word Processing both report to the Vice President for Administration. The Supervisor of Word Processing oversees a staff of three persons.

The curriculum coordinator for the Data Processing Department, who manages the associate degree program, reports directly to the Director of the Business Division. This department, staffed by four and a half positions, teaches all courses in the associate degree program, offers data processing courses for other associate degree programs, runs continuing education courses, and supplies some assistance to faculty interested in developing projects using a computer.

Hardware Resources

The major hardware resources for North Central Technical College at the current time are a VAX 11/750, HP 3000-48, HP 3000-64, Philips 3004, 2005, and Apple and IBM microcomputers. These are allocated as follows:

Administrative Area Hardware

Philips 2005	cluster of three stations each with 256K main memory each with an 8" floppy disk drive cluster shares a 27 MB disk drive 40 cps letter-quality printer 45 cps wide-track printer	
HP 3000-48	main memory	3 MB (expandable to 4 MB)
	disk drives	3 120 MB units
	tape unit	1 1600 bpi unit
	terminals	26 black and white
		1 console
	printers	1 400 LPM unit
		1 180 CPS unit
		1 200 CPS unit
		1 180 CPS printing terminal
	ports	64
	modems	2 DTI 9600 baud short haul units
		1 Racal Vadic 300/1200 baud unit

Academic Area Hardware

Philips 3004	25 stations each with 128K main memory each with two 5 1/4" floppy disk drives 14 40cps letter-quality printers	
VAX 11/750	main memory	3 MB
	disk drive	1 120 MB
	tape unit	1 1600 bpi unit
	terminals	6 GIGI RGB color graphic
		4 Autotrol CAD
		1 VT125 graphic
	plotter	1 HP 7580
	printers	1 180 CPS unit
		1 thermal unit
	modem	1 Racal Vadic 300/1200 baud unit
HP 3000-64	main memory	3 MB (expandable to 8 MB)
	disk drives	2 400 MB units
	tape unit	1 1600 bpi unit
	terminals	68 black and white
		9 color graphic
		1 console
	plotters	1 8 pen
		2 2 pen
	printers	1 1000 LPM unit

HP 3000-64 (cont.)	printers (cont.)	1 400 LPM unit
		1 180 CPS unit
	ports	96 ports (expandable to 300)
	modem	1 Racal Vadic 300/1200 baud unit
IBM PC/XT	15 units with 256K RAM, with Corvus network	
	disk server	1 45 MB hard disk
	utility server	1 server
	modem	1 Hayes 300/1200 baud
	printers	2 Epson LQ1000 dot matrix
	tape unit	1 The Bank
Apple Macintosh	15 units with 512K RAM, with Corvus network	
	disk server	1 45 MB hard disk
	modem	1 Novation 300/1200 baud
	printers	2 Imagewriter dot matrix
		1 Apple laser
Apple II+	20 units	
Apple IIe	10 units	
	printers	10 Epson dot matrix

Support Systems

Administrative systems which have been computerized include student services functions from admissions through placement, business and finance, and academic administration.

In academic areas, over the years the College had been investing considerable resources in high technology in its attempt to serve the diverse needs of individuals. These efforts, however, were fragmented and often stopped short of actual needs, particularly those of developmentally disadvantaged and handicapped persons. In order to better address student needs, during 1984-85 the College submitted a grant proposal to the federal government's Strengthening Program under Title III of the H[illegible]on Act, and was awarded funds for three activities: (1) a Com[illegible] Learning Center, (2) a Comprehensive Assessment System, and [illegible]l Development. The grant provides support for four full-ti[illegible] for each basic skills area, and approximately $30,000 in course[illegible]ach year. The grant provides $450,000 for the period October 1, 1985, [illegible]gh September 30, 198[illegible] The first year has been, effectively, a planning period as curriculum [illegible]les and needs are identified; implementation is scheduled for the next [illegible] years.

Comprehensive Learning Center

The first of these activities, the Comprehensive Learning Center (CLC), provides remedial assistance to students in reading comprehension, writing, mathematics, and science via four full-time personnel, courseware, and hardware.

Historically, reading remediation for NCTC day students was handled by the Educational Enrichment Laboratory (EEL) operated primarily by the Ohio State University at Mansfield. In the transition fall quarter of 1985, the Nelson-Denny Reading Test was administered to all students enrolled in Fundamentals of Communication 100 and Basic Communications 101. EEL, working in conjunction with the CLC, identified those students whose Nelson-Denny Reading Test scores fell below the thirty-first percentile (about 36 percent). The test both identifies the students' present reading levels and provides a diagnosis of their problems. Under the new program, students below the cut-off point go through an individualized reading program and then, at the end of each quarter, take a one-hour Nelson-Denny post-test to measure their progress.

While enrolled in either of the two communications courses, students deficient in reading are required to spend at least ten hours per quarter in the CLC working on reading improvement and are encouraged to spend additional time in the lab. Hours are arranged to fit into the students' course schedules: the staff of the CLC established a flexible work schedule so that the facility can be staffed from 8 a.m. to 8 p.m. Monday through Thursday, 8 a.m. to 5 p.m. Friday, and 8 a.m. to noon on Saturdays.

Special equipment purchased to facilitate the individualized reading programs includes four controlled readers, a pacing skimmer, twelve Apple computers, three video cassette recorders (two VCRs and a Beta), and four audio tape recorders. Two computer programs consisting of multiple disks for vocabulary and comprehension with pre- and post-test assessment are available to remediate basic reading deficiencies. Other computer programs are a developmental speed-reading program and an in-house-developed Tachistoscope-like computer program to increase eye span. To meet the needs of students with decoding problems, three in-house auditory tapes were made to correlate with a commercial vocabulary program of a visual nature only.

Programs dealing with writing, mathematics, and science are in effect at the CLC but are not as fully developed as the reading program. The College is currently analyzing curricular needs in these fields and developing plans of action for implementation in 1986-87. At the present time, students who are taking Fundamentals of Communication, a remedial writing course, may receive additional assistance in the CLC on the recommendation of their course instructor. This service is helpful for students who, because of weak educational backgrounds, need foundation work in areas not directly taught in

the class. For example, students might come to the CLC for explanation and practice in subject-verb agreement, spelling, or sentence construction. Instruction is primarily accomplished through referring the student to appropriate software for the Apple computers. An entire Career English program at an eighth-grade reading level produced by BLS Corporation (Random House) is available, as well as a spelling program at approximately the same reading level. Work on this material is voluntary, and students may schedule as much time as needed in the lab.

Comprehensive Assessment System

The second activity funded through the Title III grant is the Comprehensive Assessment System which all entering students participate in at the time of admission. This system assists in diagnosing basic skills deficiencies as well as helping students in career planning. The College is pilot-testing the American College Testing Program's ASSET, a program designed for group administration and immediate scoring. Basic skills measured include numeric skills (eighteen minutes), reading skills (twenty minutes), and language usage (eleven minutes). Advanced skills measured include elementary algebra (twenty-five minutes), college algebra (twenty-five minutes), and advanced language usage (twenty-five minutes).

Personnel Development

The third activity being developed under the Title III funding is Personnel Development. This activity is intended to help faculty learn how to use instructional technology to improve the quality of instruction through programs in computer-assisted instruction, computer-managed instruction, and telecommunications. The focus is two-fold: (1) as a complement to the first two grant activities, training provided under this program gives faculty an understanding of the CLC and the assessment system so they can apply both more effectively to their students' needs; and (2) this training provides a track to lead faculty in all fields through the three-stage process of development involved in learning new technological skills described on pages 76-77. Training under this program is mandatory for all fifty-two full-time faculty members and some of the part-time faculty.

Computer Labs

As part of its computer support, the College has fifteen Apple Macintoshes and fifteen IBM microcomputers in several computer labs located in the Henry R. Fallerius Technical Education Center, which are open to students on a walk-in basis as they achieve computer competency. However, the labs are currently very heavily scheduled both for degree- and certificate-program instructional use, and for the activities of Business and

Industry Services, a program which markets College resources to local bus[illegible]s and industry, scheduling special courses in current technologies and customized training programs which appeal to mid-management personnel.

Computing Environment: The Future

NCTC is using computer support for a wide range of activities, both to increase the effectiveness of its educational programs and to prepare its students to participate in the growing high technology field. The College leadership is strongly committed to the development of electronic systems to support its educational goals.

The strategic focus for the immediate future will be on the Engineering Center. Areas to be affected include the open data processing labs, the computer-integrated manufacturing lab, the digital electronic design lab, and the computer engineering application lab. Expansion of these facilities will accommodate special business and industry needs which the College anticipates will provide a valuable extension of practical experience for students as well as a source of revenue for the institution.

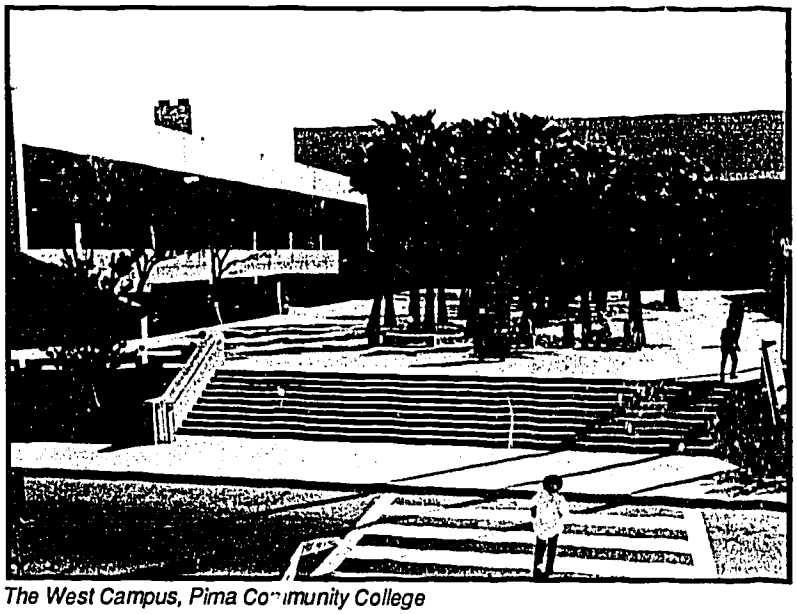
North Central Technical College has integrated computers into all aspects of its activities. The institution has taken a leadership role in preparing students for the high technology field. In carrying out this role, North Central Technical College has become a critical ingredient in the revitalization of its community.

Chapter Seven

Pima County Community College District

Judith W. Leslie served as the Vice President for Planning and Development at Pima Community College from 1981 until April 1986. In that capacity she was responsible for long-range planning; Board of Governors liaison; Computer and Information Services; resource development, including grants, foundation and alumni; legal affairs liaison; legislative relations; and public affairs. Dr. Leslie coordinated the Pima County High Technology Advisory Council, a select group of business and educational leaders, and coordinated the IBM Model Schools Program-1985 for Pima County. Her earlier positions at Pima include Executive Assistant to the President and Assistant Dean for Budget Planning. In April 1986 she became Director of Computer Services for Maricopa County Community College District.

Dr. Leslie's previous professional experience includes serving as a senior planning analyst for Penn State University. She received her B.S. and M.Ed. from the University of Utah and her Ph.D. from Penn State University. Dr. Leslie currently serves as president of the Board of Directors of CAUSE. She has published in *CAUSE/EFFECT*, and has made presentations at CAUSE, AEDS, CUMREC, and NACUBO conferences.



The West Campus, Pima Community College

Pima County Community College District (PCCCD) is a comprehensive, multi-campus institution located in Tucson, Arizona. The District serves a population of 580,000 people residing within the 9,240 square miles of Pima County. The economy of the area has shifted in recent years from mining and agriculture to information and services/tourism. There are a number of large high tech companies located in Tucson, including IBM, Hughes Aircraft, and Garrett AirResearch, and several major resorts recently have been completed.

A citizens' committee of 100 members had initiated planning for the institution in the mid-sixties. Their efforts culminated in a bond election to provide funds for the construction of the first campus, the West Campus. The College officially opened in 1970 using a rented hangar at the Tucson airport, with the largest opening-day enrollment experienced by a community college. Shortly thereafter, the West Campus was ready for students. The rapid growth of the District in those early years led to expansion in 1974 to an additional site, this time in the downtown region. The concept of a community campus was established in 1975, whereby over seventy leased facilities were used to house classes throughout the county. By 1976, a third campus was established to respond to the growth in the eastern portion of the Tucson

urban area. Enrollments continued to grow through 1981 and have moderated since that time.

The West Campus is located on a 273-acre site in the foothills of the Tucson Mountains, three miles west of Tucson's central business district. Campus facilities include eleven permanent buildings and six relocatable buildings. The Downtown Campus, which opened in 1974, is located on a thirteen-acre site in the vicinity of the downtown business district, with thirteen buildings housing classrooms, laboratories, and support services. The East Campus, which opened in the fall of 1976, is located in a peaceful desert setting on Tucson's east side. The new facilities include classrooms, laboratories, and support services. The office for Community Services is located near the Downtown Campus. The District also includes a District Service Center, located in Tucson's business district, to house administrative offices. A Southside Learning Center was opened in January 1986, and a parcel of land is available for development on a long-term basis in northwest Tucson.

The total operating budget of Pima Community College is approximately $32 million. Of that amount, approximately $1 million or nearly 3 percent is appropriated for the computer services operational budget. Yearly capital allocations typically amount to $350,000 for mainframe lease/purchase payments. It is estimated that an additional $250,000 is expended for computer-related equipment for the instructional areas of the institution.

Mission and Programs

The College offers a comprehensive curriculum. Approximately 24 percent of students intend to enroll in a transfer program; 45 percent are interested in occupational programs, and 31 percent intend to enroll for general interest. The College offers 112 two-year degree programs and 93 advanced, technical, and basic certificate programs. There are about 1,000 two-year degrees awarded each year.

Several of the campuses offer their own, unique programs. The Community Campus—a campus without walls—utilizes the facilities of the community, including the public school systems, various businesses, agencies, and neighborhood centers in Pima County. Classes are offered through the Community Campus at over seventy locations. The Skill Center, located on Tucson's west side, is a non-profit adult vocational training facility which trains 250 to 300 persons annually. State and federal funding as well as private contracts help support basic job-skills training and career counseling, on a year-round basis in a short-term mode. Community Services offers non-credit programs and classes in over fifty locations.

Student Demography

The College enrolls approximately 21,000 students in credit course programs and another 20,000 in non-credit. One out of every four citizens in Pima County has attended the College. The current composition of the student body is heterogeneous: 74 percent are white, 18 percent are Hispanic, 4 percent are black, and 2 percent are Asian and American Indian respectively. Seventy-three percent are part-time students; 80 percent are employed full- or part-time. The majority of students have family unit incomes lower than the median incomes for Tucson households. The average age of a Pima student is twenty-nine.

Computing Environment: Background

When the College opened in 1970, an IBM 360 Model 25 was installed. In 1971, a PDP 8 minicomputer system was acquired for instructional support. A change occurred in 1973 when the College converted from the IBM 360 to a DEC 10. Sixteen terminal lines were available and a remote job entry station was installed in the computer science department. A disk, printer, memory, and terminal lines upgrade occurred in 1974 to accommodate the demand brought about by the new on-line systems.

Another upgrade occurred shortly thereafter in 1975 to include additional disk and memory. For the next two years, more upgrades occurred: processor, memory, and disk upgrade to the DEC 10 and network upgrade to support a remote job-entry station at the new East Campus.

By 1978, the need for additional computer resources became apparent in the instructional area as enrollments in computer science increased dramatically. The College responded by purchasing twelve IBM 5100 mini/-microcomputers and an IBM Series 1 for computer science. In addition, two Northstars and four miscellaneous micros were acquired.

Concurrently, instructional programs other than computer science sought computer resources. The College received a National Science Foundation (NSF) grant, which provided fifteen Apple microcomputers for the application of technology to physics. A microcomputer center for general use was established on the West Campus, utilizing the Apples from the NSF grant. Grants also were received from NSF by the archeology program.

By 1981, the DEC 10 was heavily overloaded and response time was exceedingly slow. To respond to this problem, the DEC 10 was upgraded from a 1055 to a 1091. A DEC System 2020 was then installed at the East Campus to replace the RJE.

Enrollments in computer science continued to increase from 1981 through 1983, with a resultant overcrowding in the laboratories and demand on the DEC 10. A VAX 11/750 and an IBM System 36 were acquired through vocational education grant funds to meet this demand. Computer science instructional work at the West Campus then shifted from the DEC 10 to the VAX 11/750. The West and East Campus laboratories were equipped with six additional Apples and five more IBM 5100s. Continuing the expansion of computer resources, ten Commodores were added to the East Campus computer science laboratory, and twenty-five microcomputers were purchased for the Community Campus, which started a computer college in leased facilities to handle the additional computer science enrollments.

Despite the fact that computer science instruction at the West Campus had shifted off the DEC 10 by 1984, the demand for computer resources still exceeded the capacity acquired through the 1981 upgrade. This demand was present in both administrative and instructional areas. Furthermore, the advent of the microcomputer had generated interest among faculty across disciplines, and staff were eager to convert to an automated office.

Planning for Computing Needs

To address the problem of inadequate computer resources District-wide and to establish a basis for future needs, an ad hoc task force was constituted to develop a three-year plan for computer resources. Members included representation from the four vice presidents' administrative units, the computer center, the microcomputer center, office education faculty, computer science faculty, liberal arts faculty, libraries, and the Computer College. With this composition, all areas of the institution were represented, all levels within the organization participated, and expertise on computers was available. The plan, referred to as the Information Processing Plan, 1984-87, included the following components: philosophy/goals/objectives, definitions, history, instruction, administration, microcomputers, office automation, telecommunications, and training. Within the instructional component, there were three categories: (1) direct instruction, 2) instructional support (e.g. libraries, counseling, and advising), and (3) management of instruction. Within the administrative component there were four categories: student services, academic affairs, planning and development, and administrative services. For each of these categories, the following information was presented:

1. Need statement
2. Task/objective
3. Responsible party

4. HST (hardware, software, training)
5. Description
6. Target date
7. Yearly fiscal request

When the plan was completed in March of 1984, it was presented to the Board of Governors for approval. Some of the highlights of the plan are presented below, beginning with the philosophy:

> "Information is one of the important resources of Pima Community College. It is a critical ingredient in the classroom; a foundation for faculty members; a vital tool for staff members; and a basis for decision-making by administrators. The college will use those means and processes most appropriate, effective, and efficient to provide needed information resources to all employees."

The Task Force also formulated four goals and accompanying objectives:

1. *The acquisition and development of computer resources will have a high priority within the College.*

- Significant centers and supporting clusters will be established at each campus to support all aspects of student academic computer use.
- The College will provide resource centers to assist personnel with all aspects of computer use.
- The College will periodically review and update computer resources to remain current in the technology as needs warrant.

2. *Within three years, College personnel will be computer competent, as applicable within their jobs.*

- The College will provide a means for faculty to use computers readily for administrative tasks as well as direct instruction and services.
- Staff training and retraining in the use of computers will be an ongoing function within the institution.

3. *Computers will be utilized to expedite current tasks and improve productivity.*

- Information and access will be structured to facilitate institutional communications and decision making.
- All areas of the College will be able to communicate electronically.

4. *Creativity in the use of computers will be encouraged.*

- College resource centers will assist personnel in the development of new computer applications.
- Cooperation with other institutions in the use of computers will be established as appropriate.

Within the planning process, the Task Force also formulated an implementation strategy for both personnel and financing. The personnel strategy called for the following: establish policy council support, constitute an advisory council, formalize operational committees, appoint persons to coordinate major functional areas of the plan, and identify responsibility for implementation of the plan.

Financing Strategies

The financing strategies included these: determining available capital funds from the College budget, establishing an annual Foundation capital campaign, initiating fund raising activities (e.g., a state-of-the-art annual dinner to promote advanced uses of technology in the institution, a computer lecture series, education/business partnerships), initiating an enrollment incentive plan, implementing a cost savings plan, developing grant proposals, marketing products, assessing user fees, and encouraging employees to enroll in computer professional development classes.

The fiscal resources for the three-year plan amounted to approximately $1.2 million per year beyond routinely-budgeted expenses. The funds for the College budget portion of the plan, however, were contingent upon anticipated legislative funding and enrollment growth. Unfortunately, that next budget year, the capital funds appropriated to community colleges statewide were reduced and enrollments did not increase. Despite the financial limitations, however, a number of the personnel strategies and a few of the financing strategies were implemented during 1984-85, 1985-86, and are planned for implementation in 1986-87.

Partnerships with business and industry are one example of financing strategies suggested in the plan. In 1984, the College was selected by IBM to participate in three projects. The first entailed the design of two in-service modules for use on the PC to be used by IBM in their training program for public school teachers. Personnel from the Microcomputer Center developed the two modules: English as a second language and networking/communica-

tions. When these were completed, the College received ten PCs and $5,000 for software and supplies.

The second IBM project was to participate in the IBM 1984 National Model Schools Computer Literacy Program. As the only community college in the program, Pima College coordinated training, provided expertise, and served as a software clearing house for the local school districts. The College received fifteen PCs and $10,000 for software and supplies. In addition, the participants were involved in a training program at the Bank Street College of Education in New York. The Microcomputer Center at the West Campus housed the microcomputers, and two full-time faculty members coordinated the project. IBM also contributed ten PCjrs which were incorporated into a mobile van which circulated throughout the county, including the Indian reservation.

The third project in which the College participated with IBM was in the drafting/engineering program. IBM donated two FASTDRAFT systems and $60,000 for training and supplies to develop a two-year curriculum in this area. This project, along with the previous two projects, allowed the College to implement several objectives in the Information Processing Plan.

The development of grant awards was a second financing strategy of the plan. During 1985, a federal grant in the amount of $600,000 was awarded to implement, over a three-year period, a number of the objectives in the instructional component of the Plan.

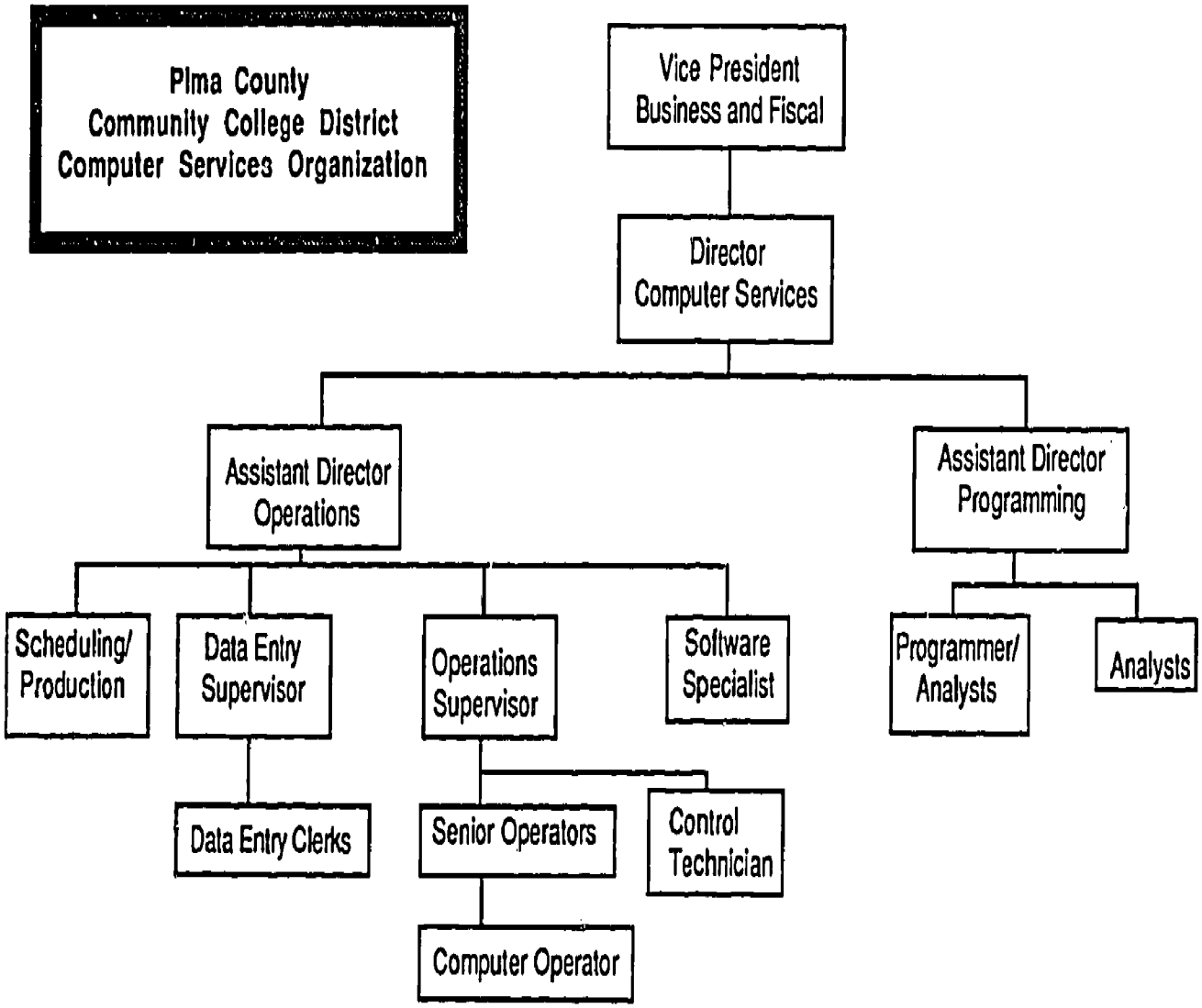
A third financing strategy was to obtain an allocation from the College budget. The administration and Board of Governors have acknowledged that a major portion of the administrative component of the Plan can only be accomplished if there is an upgrade/replacement of the DEC 10. Consequently, new hardware has been established as a high priority for the 1986-87 budget.

Computing Environment: Current Status

Overview

The current personnel resources for computing include, within the Computer Services Office, twenty-three employees. The staff has declined from a high of twenty-eight employees in 1979-80, due primarily to attrition as an institutional cost-cutting measure.

An organizational chart indicating the position of computing in the administrative system is included opposite. The Director of Computer Services had reported to the Vice President for Planning and Development


Pima County
Community College District
Computer Services Organization
Vice President
Business and Fiscal
Director
Computer Services
Assistant Director
Operations
Assistant Director
Programming
Scheduling/
Production
Data Entry
Supervisor
Operations
Supervisor
Software
Specialist
Programmer/
Analysts
Analysts
Data Entry Clerks
Senior Operators
Control
Technician
Computer Operator

until April 1986. At that time, responsibility for the Computer Center was shifted from Planning and Development to the Vice President for Business and Finance. The scope of responsibility of Computer Services extends to all administrative computing application.

Currently, there is no formalized reporting structure for academic computing. Computer science faculty are responsible for a VAX 750, a DEC 2020, an IBM System 36, and a microcomputer laboratory of approximately thirty stations on the West Campus and thirty on the East Campus. The microcomputer center on the West Campus is headed by a director who reports to the dean of the West Campus. Previously, the Information Processing Advisory Council served as a coordinating body between academic and administrative computing.

Administrative Computing

Nearly all of the present administrative information systems have been developed in-house. The data base has a relational design and includes a Student Information System (SIS), a Fiscal Information System (FIS), a Library Information System, and a Personnel Information System.

The Student Information System has been the most innovative system developed at Pima College. In 1974, when most colleges were still processing students manually, Pima College had an on-line registration system. Today, the system has the additional features of (1) an encumbrance module; (2) a student profile, which includes basic skills testing results and recommendations; (3) previous course work; (4) an academic alert module; and (5) on-line fee confirmation. The system also accommodates scheduling for open-entry/open-exit, short-term, and fast-track courses. A series of programs and files also has been developed to allow for close monitoring of special students.

The financial aid data base has been expanded to include all types of awards and grants by semester. Payroll and job placement offices are both tied into this data base to allow closer tracking of all work study students. The Career and Job Placement Center has a fully-automated job placement system which is regarded by many as a first in this field. The student inputs his/her application, which includes a skills inventory, on-line. The computer program matches the skills and objectives with the available job postings. The system also has a reporting feature which tracks all job postings, placement, and dollar amounts.

The personnel data base allows for all inputting and updating to be done on-line. All files and affected programs were reorganized to provide the

necessary links to introduce personnel into the Administrative Relational Data Base. A new, computer-produced Request for Personnel Action (RPA) document system has also been implemented.

Within the last two years, a number of enhancements have been made to the Financial Information System. All salary input by personnel and payroll offices is edited against budget control data. The Payroll Department has on-line control of input and payroll runs. Authorized users can make on-line inquiries to the following information regarding their budget: adopted budget, adjusted budget, current month activity, year-to-date activity, and comparison to the previous year.

The Library System entails an automated circulation module, an encumbrance module, and a reserve shelf module. This system is closely connected to the Administrative and Student Information Systems.

A system currently being completed is the Board of Governors Reference System. All Board actions from 1967 to the present will be incorporated into the data base. When completed, information will be accessible by date, subjects, board member, or motion number.

Third-party software on the mainframe includes a Guidance Information System (GIS). It is contracted for as part of a national and state vocational project to provide information to students regarding colleges and careers. Terminals are located in area high schools to allow on-line access by students. Other third-party software includes MUSE, for word processing in a number of administrative offices, and SPSS, a frequently-used statistical software package.

A number of administrative offices also utilize microcomputers, but efforts in this area need to be continued. For those offices that are automated, most use either IBM Displaywriters and PCs or Digital DECmates and Rainbows. Although they are not networked at present, within the next three years, they will be networked within buildings and among campuses. Electronic mail has been piloted and will be implemented next year. Of particular note is that all the community college presidents in Arizona have just begun to communicate electronically through Maricopa County Community College District's All-in-1 System by Digital.

Some interesting cases of microcomputer applications are found in Administrative Services. Within plant operations, a key control program, an energy conservation program, and a facilities maintenance schedule have been developed. Within security, computers access a national data base, and in facilities planning, an institutional inventory of all facilities has been developed. Within the budget planning office, the microcomputer is used for modeling and simulations.

Instructional Computing

The computer science program is one of the largest programs at Pima Community College. Curriculum-intent data reveal that from 1979 to 1983, there were 1,647 students pursuing coursework or a degree in computer science. The program is largest at the West Campus, but is also offered at the East Campus. Introductory courses are available on the Downtown Campus and through the Community Campus. Students at the West Campus use the VAX 11/750 and IBM Series 36 as well as Apple, IBM, and miscellaneous other microcomputers in the laboratory. Students at the East Campus use the DEC 2020 and, within the laboratory, primarily use Commodores and Apples.

Non-credit, computer-related courses are offered through Community Services. The courses typically are for a specialized purpose, such as word processing, spreadsheets, DOS, etc., and may be on a short-term basis.

The computer is used extensively in a number of high-demand programs at the College. In the College's electronics program, there were 686 students seeking courses or a degree from 1979 to 1983. This department has an instructional laboratory and also provides computer repair service to the Computer Science Department. Office education, another large program at the College, uses word processors at all levels of instruction. The most common word processors are Northstar and Lanier. The drafting program has CAD labs at the West and Downtown Campuses.

An valuable instructional microcomputer application has been put to use in the archeology program, where students are first trained in the use of the microcomputer and then taken to excavation sites to input the data on-site. A data base has been developed, and computer graphics are part of the output. The program has received national recognition for its computer applications.

The Microcomputer Center on the West Campus, which was equipped primarily by IBM, is serving as a resource to all College faculty and staff. Faculty are using the Center to acquire skill in the use of the microcomputer and as a laboratory for their classes. The two staff members of the Microcomputer Center (who are faculty) have developed a user-friendly authoring language to assist faculty as they develop new courseware. Software, donated by IBM, is available for review by College employees.

There are many other instructional applications for computers. A mathematics faculty member is using the mainframe for testing and records management. A psychology faculty member is working with the concepts of artificial intelligence and networking. In the writing program, the primary tool is increasingly the word processor.

Computing Environment: The Future

With these accomplishments as a basis, and with the commitment of new hardware resources, Pima Community College is positioning itself to once again move aggressively into the future. Some of the specific activities which are to be implemented within the next three years are highlighted below.

The highest priority of the Information Processing Plan described on pages 91-93 was the utilization of computers for direct instruction. This will be accomplished primarily through the federal Title III grant referred to above. The grant will provide for the released time of two full-time computer science faculty (beginning January 1986) to train non-computer science faculty on microcomputers over a three-year period. Four to five faculty members in different curricular areas per campus will participate in the grant.

The grant also will result in the establishment of three microcomputer laboratories at the campuses. Each lab will include fifteen microcomputers and a MicroVAX. The MicroVAXes will be used for electronic communication among the microcomputers and among campuses. Since microcomputer laboratories will be available at each campus, other faculty may also avail themselves of the microcomputers.

The second priority of the plan was instructional support involving a new library system and an expanded Student Information System. Previous library automation plans are being updated, and the SIS enhancements are being developed. The enhanced system will include pre-requisite checking, degree audit, course equivalency information for transfer students, and student follow-up. This information will become accessible to counselors and advisors in an on-line mode.

The use of microcomputers and office automation were next in priority in the plan. Electronic mail is being piloted, and will be implemented among administrative staff next year using proprietary software. An electronic bulletin board has just been initiated from the Computer Center and will be expanded along with the bulletin board which originates from the Microcomputer Center.

Although unanticipated at the time the Information Processing Plan was formulated, the development of an Alumni and Foundation system will be completed within two years, due to the resources provided by the Title III grant. The Alumni System will be integrated with the mainframe while the Foundation System will be a stand-alone application.

The District's hardware upgrade will entail the replacement of the DEC 1091 and 2020 with newer technology. The proposed configuration will include a VAX 8650 and 8200 (or equivalent) for the District, plus a VAX 8200 (or equivalent) for the East Campus. There will be MicroVAX IIs (or equivalent) located at the Downtown Campus and District Service Center.

The Information Processing Plan for 1984-87 called for the following five results:

1. Pima Community College will become state-of-the-art in its use of computing and information technology.

2. Pima students will be trained appropriately and educated for the information society.

3. The quality of instruction will be enhanced as faculty apply technological tools to the development, dissemination, and management of instruction.

4. The nature of staff work will be upgraded and "service to the people" will emerge as technological tools do the routine.

5. The College will work in synchronization as information and communication permeate the organization.

The College has made progress in achieving these results, but lengthy strides must be taken in the immediate future to accomplish them fully.

Conclusion

During the early developmental years, Pima Community College exhibited an unusually strong commitment to the use of information technology. Much of the initial planning efforts were oriented to the future information society. The first campus was prewired to accommodate electronic transmission of information, and computer resources were provided on a regular basis to respond to increasing demands.

Within recent years, fiscal limitations have slowed the acquisition of computer hardware. Despite the lack of additional resources, the College has moved ahead in the enhancement of existing systems, the development of some new systems, and the acquisition of microcomputers. A three-year plan was developed in response to the District-wide strategic planning guideline stating that "the institution will become and remain abreast of technological development." Some portions of this three-year plan have been implemented. Other portions have been delayed, but are included in numerous objectives throughout the 1986-1991 institutional plan. When the new hardware is received next year, the institution should be able to make strides in catching

up. Telecommunications plans are yet to be implemented, but should be addressed next year with the acquisition of computers and related equipment.

Since its beginning, Pima Community College has emphasized service to students. The College intends that this tradition will continue. The computer, as an instructional methodology and administrative tool, will continue to be one of the significant ways that the College will maintain this tradition.

Chapter Eight

Southwestern College

Allan MacDougall has served as Vice President for Information Systems and Services at Southwestern College since March 1984. For seven years prior to that he was Southwestern's Dean of Research and Information Systems. Dr. MacDougall came to SWC in 1973 from the communications faculty at Brigham Young University.

Dr. MacDougall has been a member and an officer of a number of state-wide research and computing professional organizations, and has had considerable professional experience in development of policy analysis. He holds a bachelor's degree in industrial technology from California State Polytechnic University, San Luis Obispo, and M.A. and Ph.D. degrees from Brigham Young University with major emphasis in communications. Married, with seven children, he is active in church and community affairs.

Southwestern College is one of seventy publicly-supported California community college districts. The College serves the multi-cultural population of California's most southwesterly corner. Located just south of San Diego, seven miles north of the Mexican border, the college district comprises an area of 162 square miles which is typically suburban in nature.

The community served by this school is characterized by an active aerospace industry, extensive shipbuilding, large naval facilities, what is probably the most active international border in the world, and an increasing number of *maquiladoras* or light manufacturing operations designed as twin plants, with related facilities on either side of the U.S.-Mexico border, for which the school trains many office workers, marketing and distribution employees, and floor supervisors.

At Southwestern, Mayan-inspired buildings are located on a beautiful 158-acre campus with park-like landscaping. Founded in 1961 to satisfy the increasing demand for post-secondary education, the College has grown to a headcount enrollment of 11,000 students and a full-time-equivalent enrollment of approximately 7,000. The school traditionally serves an unusually large number of Mexican-national students because of the nearby border.

Approximately 4 percent of the total operating budget of $20 million is used in support of computing activities at the college.

Mission and Programs

The College offers associate degrees or certificates of completion in programs for transfer to four-year colleges and universities, vocational training in over forty occupational programs, and life-long learning for personal enrichment. The more-than-sixty degree programs include special emphasis in the development of language competencies, support of service industries, and aerospace.

Student Demography

Approximately 57 percent of the students are members of ethnic minorities, the most predominant being Hispanic (31 percent). Thirty-seven percent are evening students; 28 percent are full time; 59 percent are currently employed. The average age of the total campus population is 27.7 years. Recent studies show that almost 75 percent of vocational graduates were employed in jobs related to their training, and 76 percent of the liberal arts graduates transferred to accredited four-year schools, with the great majority attending California State University at San Diego.

Computing Environment: Background

Southwestern has moved to the forefront of computer technology in three short years. It is the only two-year-college member of the Inter-University Consortium for Educational Computing (ICEC), which is funded by the Carnegie Foundation and coordinated by Carnegie-Mellon University. To become a member Southwestern had to demonstrate the following characteristics: (1) commitment to innovation in the uses of information technology in educational applications, (2) breadth and depth in integration of computing into the curriculum, and (3) computing capacity for undergraduate students.

Since 1980, Southwestern has had a campus-wide Computer Services Committee and a Committee for Instructional Computer Use with faculty participation. The transformation of Southwestern College gained speed in 1981 under the direction of new leadership. With a new president and the support of the governing board, the College made a commitment to integrating computer technology in the delivery of instruction and management. A decision was made to utilize a flexible computer network involving 32-bit superminicomputers, distributed network microcomputers, and multifunction workstation technology. In support of this decision, the College made an investment of over $1.5 million in hardware and software which was added

to the College's existing systems. Further acquisitions were made possible through successful linkages with business and industry.

Office automation was initiated in 1982. Software was acquired that permitted the close integration of electronic mail, word processing, calendaring, and electronic filing and retrieval. Because it was important that the office automation efforts be integrated with the instructional, administrative, and management information systems on campus, the system was implemented on one of the PRIME superminis within a network. Training of staff was begun to prepare them for the widespread installation of terminals in faculty members' offices, and support and managerial employees went through extensive in-service training.

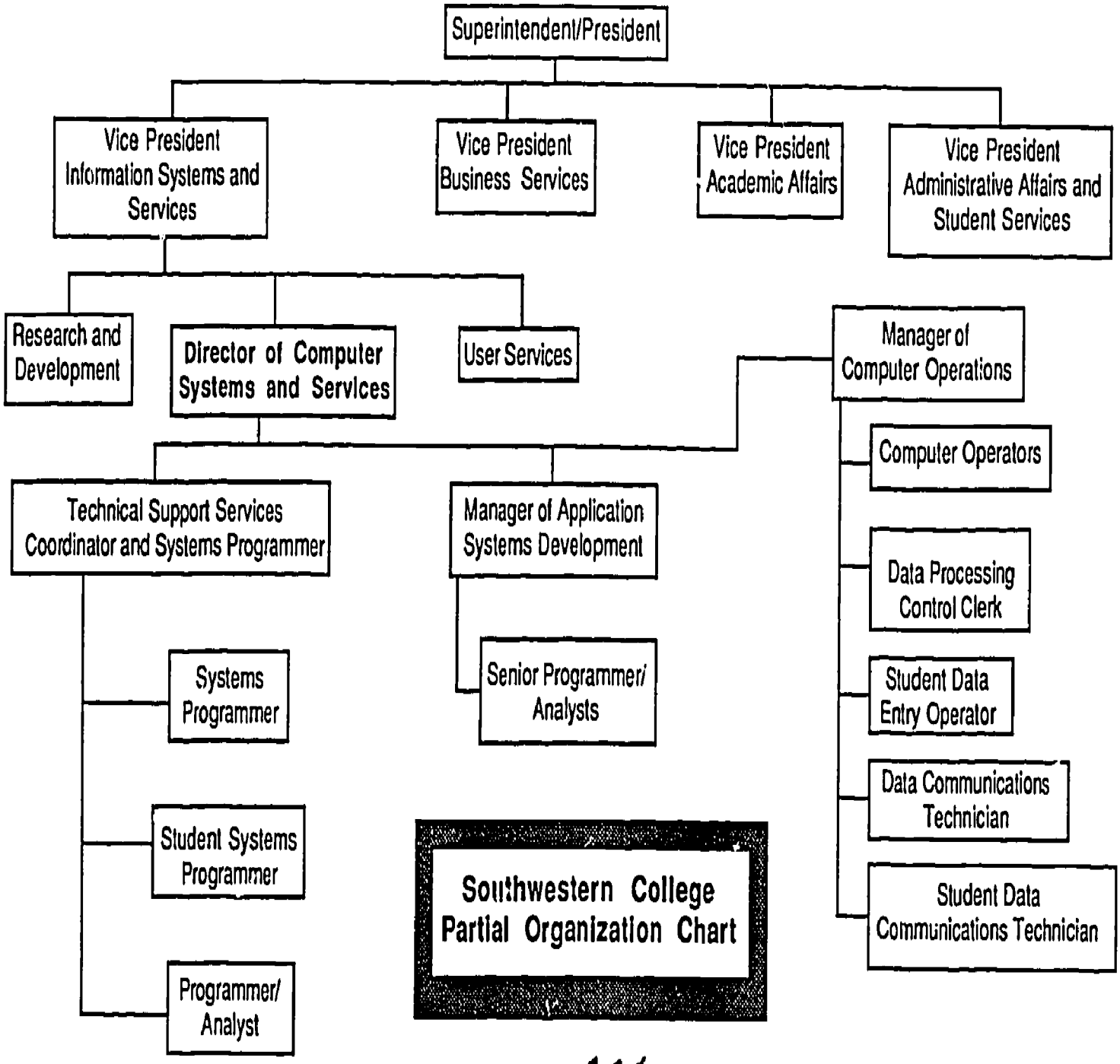
Between 1982 and 1986, six multidisciplinary microcomputer labs involving more than 200 microcomputers were installed at various locations on the campus. Additional terminals were also acquired so that by 1985 more than half of the faculty had computer terminals at their desks.

Today, access to computer resources is prevalent throughout the institution. Some of the continuing costs are subsidized by business and industry—for example, Computer Vision, CIMLINK, and Rohr Industries are assisting in the subsidy of the Computer-Assisted Design (CAD) High-Technology Center. A flexible, distributed-process system allowing for the introduction of new networked workstation technology has enabled the College to keep up with the changing technology. The following sections describe specifically how computers are used today in administrative offices and instructional departments.

Computing Environment: Current Status

Administrative

The Vice President for Information Systems and Services administers the Department of Computer Systems and Services. His span of responsibility includes the Institutional Research Office and is coordinated with the Learning Resource Center, which includes the campus-wide microcomputer lab. This office also is responsible for the management information systems and office automation activities. The support staff for these functions includes twelve people covering computer systems and services, three assigned to user services, and two to microcomputer lab support.



Southwestern College Partial Organization Chart

The College presently has a major network of minicomputers to support the computing needs of the institution. All of the twenty-two administrative offices and seven academic divisions are supported by a computer network consisting of seven PRIME super-minicomputers which are connected together via PRIMENET. Two of the seven minicomputers are used for administrative computing: one system supports office automation, research, and management information systems; and another system supports administrative transaction processing systems for admissions, registration, and financial services. These two machines support 166 terminals and twenty-eight printers. The five instructional time-sharing machines support more than 260 terminals and twenty-two printers. There is also dial-up capability. Total network memory capability is twenty-eight megabytes and the total disk storage capacity is more than five gigabytes.

The software to support administrative computing is primarily proprietary. The installation, modification, and support have been the responsibility of college staff members. The new computing system includes on-line admissions, registration and fee collection, student records (including transcripts, financial aids, counseling, and testing), financial and personnel services, and library circulation and automated catalog.

Office automation has been fully integrated into Southwestern College. The system operates on three of the systems within the network so that office automation is integrated with the instruction, administrative, and management information systems on campus. More than seventy-five staff members regularly use the office automation system, including twenty administrators with managerial terminals, and another twenty-five are occasional users. Any of the stations can send information to the shared printers. The secretarial workstations on the system have more word processing capabilities than do other stations.

Nearly all offices on campus are using this system to facilitate daily work. A users' services department is available to support users over the telephone, by electronic mail, and through personal visits and group training sessions. Many of the staff are currently learning to use the data base management tools.The business services, personnel, and community services offices have already made substantial and productive use of the DBMS capabilities by designing and implementing systems themselves to support various office functions. The current community services system maintains enrollment and financial records involving 232 classes and 3,593 students each year.

A unique approach to management information systems (MIS) has been taken by Southwestern. They provide an Interactive Financial Planning System (IFPS) to serve MIS needs. Summaries of administrative information are transferred automatically through the network from the minicomputer

serving administrative information systems and office automation. A menu-driven access system provides current and historical administrative information in pre-defined spreadsheets; integrated graphics are also available. The system goes beyond college information by providing external information relevant to the college environment.

The presence of the computer in administrative offices has been strongly advocated and supported by the governing board and the president of the College. The computer is regularly used for electronic mail, for calendaring of meetings, appointments, and rooms, and for management information. Computer graphics are used in a real time mode as the governing board meets to deliberate policy and by college administrators in communicating with each other and to faculty groups. Full system capabilities are available in every administrative office.

Instructional

An Instructional Computer Services Committee monitors, coordinates, and recommends instructional computer use and development. The committee consists of four faculty members representing a variety of disciplines, two administrative members, and a technical staff member. In addition, there are a number of faculty involved in a variety of instructional software projects for such fields as music, art, anthropology, reading, chemistry, and physics.

Currently, there are two full-time-equivalent staff members committed to educational applications development and support. Two additional full-time-equivalent employees are maintaining the technical environment for classroom computer use. There are sixteen full-time-equivalent instructors in Computer Information Systems and Computer Science.

In addition to the supermini network, Southwestern has six microcomputer laboratories for instructional uses. The first, as referenced above, is a multi-disciplinary microcomputer laboratory which is in the learning resource center. The laboratory is designed to extend computer use throughout the campus. For students, the lab offers a quick turnaround on specific software designed for individualized instruction. For faculty, the lab offers a general introduction to computers and how computers can be used in the classroom. A sample of software offerings available in the lab includes Aristotle's Apple, Grade Book, Bank Street Writer, Test Generator, Word Handler, File Cabinet, and Visicalc. Software development classes are also sponsored jointly through the efforts of the LRC staff and district software writers/technicians.

A second micro laboratory is available for business/mathematics students and for the microcomputer technician and computer science technician programs. The lab contains twenty-two IBM personal computers networked to a hard disk. The third laboratory is the electronics laboratory, used by eighteen faculty members and 400 electronics students, which contains a number of DEC minicomputers and a wide variety of smaller computers.

One of the College's outstanding accomplishments in instructional computing was the establishment of a $2.4 million high tech center featuring state-of-the-art computer-aided design, engineering, and manufacturing technology. The center was made possible through a joint venture with Computervision and other major industries, and was supplemented with state and college resources. The center serves both entry-level and in-service trainees in a variety of course offerings, including intensive workshops, one-year certification, and two-year transfer programs. By June 1985, the center's staff had trained over 240 Computervision CAD/CAM students.

The center includes a 1,378 square-foot lab housing the master Computervision Designer V-X Computer. There are two additional lab/lecture rooms with eight Computervision advanced graphic design workstations, ten Cadlinc engineering workstations, and twenty-five microcomputers. These hardware resources provide students access to mechanical, electronic, and architectural software applications. As a result of this effort and related accomplishments, the College is noted to have one of the strongest computer electronics programs in southern California.

Southwestern also serves as a minicomputer training center for Digital Equipment Corporation. The repair of more than 200 computer terminals and 200 microcomputers, twenty-five printers, and 400 microcomputer disk drives, which would cost more than $150,000 for commercial maintenance contracts, is maintained on campus as a part of the electronics instructional program for a cost of less than $13,000 a year. Not only does this program serve the College, but service has also been extended to the local high school district through a subcontracting agreement.

The faculty in business and mathematics have developed new state-of-the-art computer-related curricula in the disciplines of accounting using microcomputers. The students in these programs are using mini and microcomputers in designing computer information systems. In the area of office administration, the students have access to the College's office automation hardware and software, as well as stand-alone word processors and microcomputers.

In non-computer related curricula, use of the computer also is evident. Music classes, for example, are taught with computer-assisted instruction in basic music theory, drill and practice, testing, and simple programming on microcomputers. Sixteen tutorial units have been developed for use in the

Contemporary American Music Course. Several disciplines offer make-up examinations using Aristotle's Apple.

There is also a computer-based laboratory with twenty-eight terminals which includes word processing software and plans for CAI capability related to language development. The center is a major component of a redesigned, comprehensive curriculum package which has been labeled the "English Language Institute." The new concept in curriculum design integrates all the dimensions of language skill learning, such as speaking, listening, reading, and writing, into a cohesive unit.

Within the field of art and design, micros are used with menu-driven software to teach principles and concepts of art and design. In anthropology, computer-assisted instruction is used for drill and practice, and testing modules have been developed. Psychology, meteorology, and chemistry departments also use computer-managed instruction for testing.

A large selection of computer-assisted instruction programs suitable for limited-English students was evaluated and purchased through partial support from a grant from the Fund for Improvement of PostSecondary Education (FIPSE). Another project funded from external sources (Higher Education Administration Title III) was the Developmental Reading Lab. A portion of the grant was used to support continued development of an automated diagnostic software package.

In addition to the applications described above, faculty have found many other uses for the computer. They research reading levels to predict student success in their classes; write computer-assisted instructional programs; look at job market possibilities for their students; review instructional data, including the budget; assess enrollment data and trends; and develop more attractive educational materials.

Computers have found a place within the library as well. The College has an integrated, automated circulation system. This system has replaced the card catalog with on-line circulation information at five terminals. Two on-line computers are available to students and faculty for computer literature search systems.

Computing Environment: The Future

As part of the College's participation in the University Consortium for Educational Computing (ICEC), it will be developing sophisticated educational software applications for the next generation of powerful computing workstations. There are plans for continual upgrading of equipment to provide interactive video curriculum support systems targeted to score student

competencies in a variety of disciplines including reading and developmental mathematics.

Southwestern College faculty have shown interest in expanding the application of computers even further into the instructional environment. For example, in the physical education curriculum, there will be a microcomputer program for monitoring and analyzing major physiological parameters as part of the new Circuit Training Program. Ideas abound for the development of additional simulation modules. These ideas are especially prevalent in the areas of engineering (statics and dynamics), chemistry, and mathematics. The engineering, architecture, and mathematics faculty also envision in-depth presentations of topics such as translation and rotation of three-dimensional surfaces and conic projections.

Within the library, future plans include integrated recording systems for periodical tracking and book acquisitions. There also will be on-line cataloging of the learning resource center materials, including microcomputer software. The College has in place the technology to support over 600 ASCII "terminals." Strategic plans are being developed which will accommodate data communications in support of UNIX-type engineering workstations.The College hopes to have a terminal or networked micro on every willing faculty member's desk, with the ideal being envisioned as "everywhere there is now a telephone, there will be a terminal." Southwestern should be able to continue to move forward, assuming adequate levels of funding from state and granting sources.

Conclusion

Southwestern College has been transformed from a typical community college to a nationally-recognized leader in the integrated use of computers in education within the span of three years. The College's selection as the only community college participant in the prestigious national Inter-University Consortium for Educational Computing (ICEC) recognizes Southwestern's accomplishments to date and its potential for the future.

The College has implemented an exemplary office automation system which is fully integrated with instructional, administrative, and management information systems on campus. The computer is evident in nearly every discipline and in a variety of applications. Establishment of a high technology center, through the support and cooperation of the business/industry community, is a particularly noteworthy accomplishment of the College.

How did Southwestern accomplish this rapid and successful transformation? The administrators of Southwestern have identified five factors which they deem critical to their success: (1) coordination of academic and administrative planning for computing, (2) strong top management commitment and continuing support, (3) institutionally-focused organizational structure and system architecture, (4) skilled technical staff, and (5) a responsive campus community.

Chapter Nine

SUMMARY

Each of the seven institutions described in the preceding chapters is unique. Their experiences are not directly transferable to other institutions. But implicit in the details presented here are patterns of computer use and service to students which should be of interest to anyone concerned with community college education. For simplicity of presentation, the summary generalizations have been organized in the same categories as the chapters, i.e., according to institutional environment, computing background, current computing practices, and plans for the future.

Institutional Environment

Nearly all of the featured institutions are located in growing, urban areas many of which—Dallas, Miami, Phoenix, Tucson, and San Diego—are in the sunbelt. These cities are young in comparison to those of the northeastern and midwestern United States. Representative of the other range of the community college spectrum are Mercer and North Central which are located in the midwest/northeast, in older communities with less population and economic growth than the communities of the others. Politically, some operate under extensive coordination and control at the state level, while others are relatively autonomous. Overall, they tend to have more regulation than do research universities.

The majority of these community colleges, like most community colleges, are relatively new, founded in the early-to-late sixties in a time of dramatic enrollment growth in higher education. Governmental resources to build facilities and develop programs and services were readily available to these institutions. The sixties also were a period in which civil rights issues were advanced and the concept of "open door admission" was popular.

These institutions have experienced tremendous enrollment growth since their founding. Like community colleges nationally, however, this growth has slowed recently, and some have steady-to-slightly-declining enrollments. All the colleges share a common student profile. The students tend to be part-time, commuters, and older than the traditional 18-to-21 years. There are more minority and female students than is typically the case in a

four-year college or university, and the median income tends to be lower than the national average.

With the exception of North Central, which offers only occupational programs, these institutions offer both transfer and occupational programs. They award two-year associate degrees and also have shorter programs of certification. The institutions provide both credit and non-credit courses to the communities they serve.

The institutions typically are multi-campus/college, ranging from two campuses/colleges to seven. Of these, most have one of their campuses or colleges located in a downtown business area. Because these institutions were founded in the sixties, their facilities are newer than those of the well-established research institutions. In fact, because of the rapid enrollment growth experienced by these colleges, many have facilities that are less than five years old. Thus, many have been constructed to accommodate the newer technology which is available.

Although the institutions share a common student profile, the size of enrollments ranges from 3,000 at Mercer, to the mid-range 12,000-13,000 enrollment of Southwestern, to the large institutions of Miami and Maricopa at 64,000 and 68,000 respectively.

In other words, this group of colleges is fairly representative of the range of size, purpose, and physical situation of community colleges in general. If these particular institutions are more advanced technologically than many, the programs and resources they have developed should be applicable to—and perhaps worth emulating by—many of their sister institutions.

Computing Environment: Background

It is important to note that growth has been the single most important factor in the background of the community college computing environment. This growth occurred in enrollments, in number of facilities and locations, in staff, in hardware and software, and in the field of information technology. Only in the last several years has this growth abated.

All of the institutions were founded with data processing/computer science curricula. The enrollment growth in this curriculum placed heavy demands on the hardware, which was shared with administrative computing. Much of the impetus for hardware upgrades and expansion was to accommodate these growing data processing curricula. The curricula were extended to other campuses and colleges within these districts, and accompanying laboratories were established. As minicomputers and microcomputers were introduced, much, if not all, of the instructional computing done on the mainframe shifted to this more localized resource. Consequently,

most data processing curricula today have their own computer resources, apart from those used by administrative computing.

Enrollment growth occurred not only in data processing curricula but also in total institutional enrollments. The record-keeping function alone necessitated the design of student information systems with great flexibility, convenience, and speed of response. Thus, it is not unusual in these institutions to find that the first system to be designed was the student information system. Since the designing occurred at a time when considerable modern technology was already available, on-line capability was included in a number of the systems.

Growth in size of the districts has had a significant impact on the computing background of these institutions. It is common to find that the computer center has moved at least one time, if not more. Dealing with relocation while at the same time developing software, undergoing hardware conversions, opening new campuses, establishing new laboratories, and keeping abreast of the new technology, has undoubtedly caused periods of high stress in these colleges.

Growth in computer services staff was necessary to respond to the growth in enrollments and campuses. Furthermore, since proprietary software was not readily available during the early years, all of the institutions have at some time developed their own software. Thus, a relatively large programming and analyst staff is common in these institutions. For the most part, computer services in the featured institutions are organized similarly to those of other institutions of higher education. With the introduction of mini and microcomputers, the need for user training and support emerged. These community colleges have emphasized the importance of this training and typically have in-service training programs for faculty and staff.

Hardware resources initially were mainframes. These colleges have gone through several mainframe upgrades, and some have had major software conversions. More recently, some have undergone total replacement of their hardware and software. The type of mainframe hardware varies, but IBM has the greatest presence. Within the minicomputer range, Digital tends to dominate; among microcomputers there is variety, although Apple and IBM are used most extensively.

It is important to note that much of the hardware resources in these community colleges, particularly mini and microcomputers, were obtained with the help of governmental grants or private industry donation. Title III, a federal grant designed for developing and strengthening institutions, has assisted several of these institutions significantly. The National Science Foundation has been an important grantor as well. Digital Equipment Corporation and IBM also have been contributors to several of the institutions. Many of

the laboratories and some of the faculty training programs were established through these external sources of funds.

The other type of growth that has affected these colleges, as it has other higher education institutions, is the growth in the computer field. This growth is also characterized by rapid change. The introduction of the microcomputer and user-friendly software was particularly well received in these community colleges by innovative faculty who were continually searching for new ways to improve instruction.

A significant theme in the stories of each of these community colleges is planning. A number of them have developed three-to-five year plans to guide the development of computing in their institutions. What is particularly noteworthy about their planning is that it has been done by committees and task forces in a highly participatory fashion, including lay persons as well as those with computer expertise. It reflects the overall orientation of community colleges and the management style of their leaders.

It is obvious from these descriptions that executive-level commitment is essential for technological progress. Institutions that have had this commitment, from the simple (but convincing) fact that the chief executive uses a computer personally through a clear policy statement that computing is integral to the institution's growth, have achieved noteworthy advances in both resources and direction.

Computing Environment: Current Status

Enrollment growth, significant in the background of all of these institutions, has today moderated in most cases. Enrollments in community colleges nationally declined by 4 percent in 1984-85. The colleges featured here typically are in a period of constant to slightly increased enrollments, although a few are declining. The majority of the institutions have completed their campuses and districts, with Maricopa being a notable exception. Data processing curricula continue to attract students, but not at the same growth rate as several years ago. Staff for computer services generally have stabilized, although positions to train users have increased.

There are two areas where growth continues to affect these institutions. The first is the continued and increased demand for computer hardware and software support. The financial resources, however, are not as available as they have been in previous years. In response, institutions are seeking external sources of funding. Maricopa, for example, obtained substantial funds for hardware through a county bond election. Southwestern teamed up with industry in the construction of a high tech facility, and Pima and North Central are recent recipients of Title III grants.

The second area of growth is in the use of microcomputers. These institutions are acquiring micros at a dramatic rate, putting them into the faculty members' hands, into the classrooms, and on the desks. They generally have training programs and some have released time for faculty to develop courseware. The majority of these institutions have dedicated laboratories for data processing and nearly all have open access microcomputer laboratories. A number of them have laboratories for business, electronics, math/science, and basic reading, writing, and mathematics skills. The use of CAD/CAM is prevalent in all the institutions and computer-assisted and -managed instruction continues to extend into all areas of the curriculum.

The differences among these institutions are primarily in the magnitude, not the nature, of their computing environments. At least two have fully implemented an office automation environment in administrative offices, but others are at varying stages of implementation. They differ in comprehensiveness of the mainframe systems, but all have the major administrative applications. Most still function with a configuration of mainframe linked to terminals, although there is a recent trend toward networking, clustering configurations. They differ in number of microcomputer laboratories, but they all have laboratories. They also differ in the types of microcomputer applications in the curricula, but they characteristically use microcomputers extensively for instruction.

The institutions differ widely in their organization. One computer center director reports to an executive committee, while another reports to a state board for community colleges. One is a vice chancellor and others report to a vice president/chancellor. A few are two to three persons removed from the chief executive officer.

Computing Environment: the Future

While these institutions are at varying stages of computerization, there are some plans for the future which they have in common. All the colleges are planning for more computer resources, in all categories of hardware. Mainframes are in need of replacement or upgrading; more minicomputers are needed to respond to high demand user areas; more microcomputers are needed for faculty, staff, and students; and telecommunications and networking equipment are needed. A number will be going through major software conversions or will be acquiring proprietary software. More training of faculty and staff is necessary, and positions are needed in the areas of office automation and, particularly, telecommunications.

Telecommunications is an area that these community colleges are pursuing aggressively. At least one has plans for a satellite. Teleconferencing and interactive video instruction are expected to increase. Networking is also emerging prominently in future plans, with one institution having a formalized plan for network communication and a TV station.

A number of these institutions are planning to expand their student information systems into a comprehensive system, to include more diagnostic, prescriptive, advising, monitoring, and follow-up features. Several have plans for on-line library circulation systems to replace card catalogs and distribute information electronically to students and faculty. A few institutions will be expanding their capability to provide high technology training.

In spite of financial constraints, these community colleges have high hopes for exciting developments in technological support systems. One institution has formed a partnership with computer hardware and software companies to jointly develop administrative software. Another college is part of a consortium, which is university dominated, that will develop sophisticated educational software applications.

These institutions represent only a sample of the progress and technological innovation that is occurring in community colleges today and is forecast for the future. They do signal important indicators of the future, however, and can serve as a valuable resource to those who are aware of their programs. They are to be commended for their successes and are encouraged to continue in their pursuit of using computers to serve students.

Need More Information?

There are other worthwhile resources for people involved in community college education besides these particular institutions and publications like this one. One of the most noteworthy community college efforts going on today is being conducted by the League for Innovation in the Community College, under the leadership of Dr. Terry O'Banion, executive director of the League, and Dr. Paul Elsner, president of the League and chancellor of the Maricopa County Community College District. The League's membership includes nineteen community college districts representing 850,000 students. The League has been joined by a select group of computer and computer-related corporations to develop a national five-year project on "The Community College and the Computer." During the five years of the partnership, League colleges and their partner corporations intend to:

1. design and develop a series of special projects to apply computers to improving student learning and institutional management;

2. develop and publish a series of guidelines and related documents on computers in community colleges; and

3. sponsor an annual national conference on computer applications in the community college.

The first monograph published by the League for this project, entitled *Guidelines for Developing Computerized Student Information Systems*, includes the following features of a student information system: student admissions; assessment, advising, and counseling; student registration; academic alert monitoring; degree audit; transfer program requirements; student follow-up; and hardware considerations. Published in 1984, this monograph is available from The League for Innovation in the Community College, 23276 South Pointe Drive, Suite 103, Laguna Hills, CA 92653 (714/855-0710). (29 pages, $5.)

Other bellwethers to watch for future trends are the approximately eighty community and two-year colleges which belong to CAUSE, the Professional Association for Computing and Information Technology in Higher Education. The 1985 CAUSE National Conference in New Orleans dedicated a speaking track to special environments, including community colleges, so that their achievements could be showcased and plans for the future discussed. Even more exciting is the new CAUSE constituent group for community colleges which convened for the first time at that conference, and which promises to be a valuable forum for the exchange of information and experiences among its members. The group plans to meet again at future CAUSE conferences. Information about participating is available from the CAUSE National Office.