1989 Annual Report

Dept of Computing and Information Sciences

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Table of Contents

Tables

Appendices

excellent in all areas. Our limited success in tackling this wide range of duties is due to the differential assignment of duties to faculty. While some faculty are principally teachers, some have a balanced teaching/research load, and some are principally researchers. However, efficiency alone will not solve the problem; additional faculty members is the priority for this department.

We continue to improve our research programs. The hard-work of the faculty is reflected in our modest success in increase of publications and extramural funding (Tables 3, 4, and 5). We are now fourth highest in Arts and Sciences while certainly one of the smallest departments. It is truly an interesting and rewarding experience to participate in the transition of the Department from a teaching unit in 1982 to a promising research unit in 1990.

We have been tremendously successful in acquiring undergraduate instructional laboratories; but the University has not seen fit to support the maintenance of these labs and they are deteriorating rapidly. From Table 10 you can see that our OOE budget has not increased measurably while the commitment to maintaining equipment and expendables has risen astronomically with the addition of the equipment grants. Even the industries that granted us the equipment are disgusted with the lack of maintenance support from the University. We also need help in acquisiton and maintenance of graduate student workstation labs, faculty workstations, and a parallel computing system.

Our pre-proposals for strategic planning set forth the two following distinct goals in order of priority. First, we must, with the help of KSU administration, build a critical mass of faculty, staff, computing facilities to meet the challenge of the Kansas Board of Regents to become a major thrust of Kansas State University. Second, we must integrate our research expertise and facilities into the research programs of other areas of science and engineering through a Center for Research Integration of Advanced Computing Technology.

II. Instruction

A. Undergraduate Program

Service Courses

The service component has continued to grow during the past year. The Introduction to Personal Computers course has grown from five sections to six, and there is sufficient demand for another section (demand thus exceeds 1000 students per semester). Many majors on campus now require CIS 110 as part of their requirements, so the demand should continue to be heavy. There are now approximately 75 personal computers available for that class, or about 12 students per machine. We have not received many complaints about machine availability, but have we have received many complaints about machines and printers not working, and complaints about a lack of consulting in the various labs.

Department Majors

After a rapid increase in Department majors in the early 1980's, and then a steady decline, the enrollment appears to have leveled and increased slightly. The fact that many jobs are available in computer science seems to be filtering down to the high schools. Several companies now make it a policy to visit high schools in their area to explain the opportunities that are available. Recruiters like our program but continue to express disappointment that we have low numbers of available graduates. We have continued to maintain close ties with the community colleges in Kansas to encourage those students to make their transfer to Kansas State.

We have raised significant funds for undergraduate scholarships. Our goal is to attract better students to KSU through both quality programs and financial scholarships. The sources of funds, as shown in Table 13, are alumni and industry. These funds, and matching funds from the Dean of Arts & Sciences are essential for excellence in education because we compete with the College of Engineering, which has almost unlimited scholarship funding.

We have continued to study accreditation by CSAB to determine what would be required in the process, and if there might be any long-term negative aspects. We feel our curriculum meets the guidelines, but we cannot meet the guidelines for faculty/student ratio. We continue to have a desperate need for new faculty.

We have revised the programming languages portion of the department majors and service courses, and those changes will be implemented in summer of 1990. Students will now take a baseline course called Fundamentals of Computer Programming which will implement problem solving in Pascal. This will give the students a foundation of structured programming skills on which to build. After completion of that course, students may elect to take one hour programming laboratories in BASIC, FORTRAN, or C. The newly structured fundamentals course will be taught on PC's, using a graphics approach. This structure will place additional demands on machine availability across campus. Software support will be a critical issue, we must upgrade our version of Turbo Pascal, obtain sufficient copies of BASIC and C, and find a suitable version of Modula-2 for the network server. Upgrading this software will cost about $10,000. The majority of use for this software will be for the service component and should be funded by a central authority.

We continue to need software upgrades for departmental machines to support Computer Science and Information majors. Our students need to be introduced to new software development tools, new languages, and new distributed database systems to keep on the leading edge of technology. Our machines continue to age to the point where we must consider replacement. Clearly, the most cost-effective and technology-effective is to have a Workstation environment. Industry is rapidly moving toward distributed systems, and our students must have that experience to compete in the job market.

Our lack of faculty forces the department to rely heavily on GTA's as teachers. The GTA's are dedicated,

but cannot bring the experience and mature perspective to a classroom of a faculty member.

The quality of our GTA's has increased because we were able to slightly raise the stipends. As the number of undergraduates declined in the late 1980's, there has been a corresponding increase in salary offers by industry. We must offer competitive stipends to attract quality GTA's, especially graduates from domestic institutions.

B. Graduate Program

The graduate program has been a mainstay in this department from our first day as an academic unit. Our priority has been to build a graduate education and research program that enhances the quality of the undergraduate program. Our MS graduates have always been in very high demand; and we produce 20% of all the MS degrees in the College of Arts and Sciences. Recognition of the quality of our MS program is documented in being selected by the AT&T Corporate Education Center as one of only two Computer Science Departments in the nation to have a summer on campus MS program for their employees. The other is the University of Illinois. Our principal goal in the graduate program is now to improve the quality of the PhD program and achieve international distinction in the areas of programming languages, distributed and parallel systems, and software, knowledge, and data engineering.

This past year we revised the MS program to allow more flexability in structuring the Program of Study. This permits students to do a thesis, a report, or a totally coursework option. We have also initiated new requirements for the PhD program which enhance the research emphasis at an earlier stage. We have decoupled the preliminary exam and the proposal for research, thus allowing a student to take the prelims earlier and get into his/her research project earlier. It also is an earlier date for a decision on whether the student will stay in the PhD program. This will enhance both the quality and quantity of research being done. It should also enhance the ability to acquire extramural research grants.

Our current emphasis is on improving the quality of the PhD research program. Thus, we have developed a handbook describing how to conduct quality research in the computing sciences. Improved quality should lead to more quality publications and thus more extramural funding for agencies like NSF whose new emphasis is clearly on quality not quantity of publications.

We have administered preliminary exams to 10 PhD students and have conducted an annual review of all graduate students. We do this to enhance the advising of the student. We have graduated 4 PhD students and 32 MS candidates. This means we are now producing as many graduates from the graduate program as we are graduating from the undergraduate programs.

The quality of students applying to the graduate program has risen dramatically in the last few years. GRE scores are up in some areas as much as 15-20%; and we have a large number of applicants. We receive 1500 inquiries per year, process 300 complete applications, admit 90 students, and enroll approximately 30 per year. The number of student enrolled would be higher if our GTA and GRA stipends were higher. The number of students enrolled in our graduate program has decreased because we are offering a higher proportion of our GTAs to PhD students who need more money and stay longer in the program. We need more money to build the graduate program. It generates more state funds and enhances the reputation of the Department and University. See Section VI on strategic planning for our goals and needs in this area and Table 2 for enrollment patterns.

III. Faculty

This past year the faculty has published 37 refereed conference and journal articles, acquired $432,000 of extramural funding, acquired $700,000 worth of computing equipment, and done an admirable job of instruction in a understaffed and underfunded environment. See Appendix 4 for teaching assignments, Appendix 5 for committee work, Appendix 6 for research publications, Appendix 7 for a summary of grantsmanship, Appendix 8 for a description of current research projects, Appendix 9 for professional activities, and Appendix 11 for faculty presentations for 1989.

We are currently a faculty of size 14. In order to achieve distinction as a research department in the computing sciences, we must have a critical mass of 26 faculty members. There are no successful programs in the country with fewer than 26 faculty members. As a result, the top priority in this department is to hire more faculty members. Specifics for this goal are in Section VI. Strategic Planning.

This year we did not lose a faculty member to another institution or to industry, the first time in the last five years. It is a real pleasure to work in a department where all of the faculty members have a common goal, the advancement of the department. The faculty, as a whole, are good teachers and developing researchers. They are concerned about the progress of both graduate and undergraduate students; they are committed to achieving excellence in their chosen specialty; and they contribute heavily to the Department, the University, the State and the Nation. Specifics on the accomplishments and duties of the faculty for 1989 are presented in Appendices 4,5,6,7,8,9, and 10.

We are far behind our peers in faculty salaries. Table 9 contains a comparison of KSU CIS faculty average salaries with the national average salaries for Computer Science PhD-granting departments across the U.S. In some areas we are as much as 30% below the average of our peers.

Another area of difficulty is in the area of research equipment. We are not yet sufficiently equipped with computing facilities to attract solid faculty in the areas of software engineering, data systems, knowledge engineering, programming languages, and parallel and distributed processing. Last year, we hired Dr. K. Ravindran from Bell Northern Research in Ottawa, Canada. His industrial experience in distributed computing and computer networking, and his research background make him an extremely valuable addition to our faculty. However, we made two other offers to very good faculty candidates who would not accept our offer because we lacked the parallel computing facilities to support their research. Both would have generated substantial extramural funding for this department.

We are beginning to establish interdisciplinary research programs with other departments on campus. Dr. Zamfir is working with Dr. Isenhour in Chemistry on application of artificial intelligence concepts to analytical chemistry. Dr. Unger is working with Dr. McNulty in data aggregation and data base security. Dr. Gustafson is working with Dr.s McNulty (Statistics and Economics) on software metrics. Dr. Schmidt and Dr. Melton are working with Dr. Strecker in Mathematics on category theory applications in programming languages.

Dr. Schmidt has initiated a post-doctoral research program in programming languages. Post-doc appointments include Pascal Fradet from Rennes, France, Karoline Malmjkaer from Denmark, and Olivier Danvy from Paris, France. This is a new and exciting program for CIS because it means Dr. Schmidt has an international reputation capable of drawing the best researchers to KSU.

IV. Research

Research activities in this department are broadly categorized into four general areas: programming languages, software engineering, data base systems, and distributed and parallel systems. Appendix contains more detail on each research project.

Programming Languages

Dr. David Schmidt works in the area of denotational semantics, the meaning of computer programs. He is currently working with three students in related areas. He is working with Susan Even on using action semantics for the design and analysis of programming languages. He is working with Kyung-Goo Doh and Dr. Masaaki Mizuno to develop soundness proofs of the information flow control algorithm of Mizuno. Finally, he is working with Dean Lass on the synthesis of compilers from denotational semantics descriptions. Austin Melton (on sabbatical) is working with Professor Neil Jones on local functional parameters and Kleene's Recursion Theorem as applied to programming languages. Dr. Melton is also working on languages for graphic and category theory as well as automatic program specialization.

Software Engineering

Dr. Austin Melton is working on the synthesis of models of software complexity measure. He is also working with Dr. David Gustafson on standard software measures and mathematical foundations for software measures. Dr. Gustafson is also working on stochastic foundations for software measures. Dr. Hankley and Dr. Gustafson are working on formal program and design specifications. Finally, Dr. Gustafson and Dr. Wallentine are working on expert systems in software engineering.

Data Base Systems

Dr. Maria Zamfir-Bleyberg is developing the formal foundations of object-oriented data bases and is developing a prototype using an object-oriented programming system. Dr. Melton is working on fuzzy relational data bases. Dr. Unger is working on information dissemination deterrents and statistical data base security and integrity.

Distributed and Parallel Computing Systems

Dr. Rodney Howell is working on self-stabilization of concurrent systems, complexity of concurrent systems as represented by Petri Nets, hard real-time scheduling algorithms, and verification of concurrent systems. Dr. Hankley is working on temporal specification of Ada semantics. Dr. Unger is working with Dr. McNulty on active data elements. Dr. Mizuno is working on secure information flow in distributed systems, recovery in distributed systems, and distributed mutual exclusion algorithms. Dr. Unger is working on office information systems. Dr. Zamfir-Bleyberg is developing the initial algebra approach to formal models of concurrency. Dr. Ravindran is developing high performance algorithms for ISDN switches and fault-tolerant remote procedure calls. Finally, Dr. Wallentine is working on a knowledge base to help in the debugging of distributed programs and algorithms to implement distributed discrete event simulation on distributed and parallel systems.

Extramural Support

Tables 4a and 4b give the trends of extramural support for this department over the past several years. Clearly we have been successful. In this past year we had more than $500,000 in research and educational funding active within the department. We acquired $750,000 worth of computing equipment for research support for the University (SCS-40 vector computer). Also, we have approximately $200,000 worth of grant proposals currently under review. Appendix 12 contains details about our grantsmanship activities. We expect to improve on this area in the next several years, but only if we have a larger faculty so that we

can cover both research and teaching duties.

V. Computing Facilities

Traditionally, university central computing administration has provided a critical mass of computing facilities for the campus. However, at KSU, due to funding constraints and lack of leadership (see EDUCOM report 1988), only mainframe facilities have been provided to any significant degree. Thus, the acquisition of all workstation, PC, networking, software, vector computers, parallel computers, graphics, hypermedia, etc. has been the responsibility of the departments. This department acquired more than three million dollars worth of equipment and software to support its research and teaching programs. See Table 4b for details. However, acquisition of maintenance funds from extramural sources is virtually impossible. Thus, we are left "holding the empty bag" while central computing has received the bulk of the computing funds (while not writing one grant proposal). To be more specific, our OOE has risen an average of 2% per year for the past five years; during this same period we have increased our laboratories by 140 PC's, 15 mini-computers, 4 super-mini computers, a mini-supercomputer, five networks, & 300 software systems. We have also grown from 50 to 500 users. This past year the problem has been exacerbated by the acquisiton of the mini-supercomputer SCS-40. There are also no funds for the maintenance of this system which is a university-wide resource.

To be more specific, our OOE (see Table 10) has risen an average of 2% per year for the last five years. Considering inflation, this is a decrease of 5 to 10%. In the same time period, we have increased our laboratory inventory by more than 140 PCs and workstations, 15 mini-computers, 4 super-minicomputers, five networks, and a near-supercomputer. We have also increased the number of users of our laboratories from 50 to 500. It is time for KSU to help support these educational and research facilities.

Unless we resolve this problem, no new grant proposals will leave this department until the University commits maintenance funds and matching funds for software. Furthermore, our labs will continue to decline until we receive maintenance funds to maintain our current laboratory base.

Without workstations for current and new faculty and a parallel computing system, we cannot hope to recruit solid research faculty in distributed and parallel computing. A more complete delineation of the need for computing facilities is presented in the section on strategic planning.

VI. Strategic Planning

The CIS Department has been deeply involved in strategic planning for several years. In parts A and B of this section we delineate the specific elements of our planning program. The priority is to build a critical mass of faculty, graduate students, equipment, and extramural funding to continue our climb to prominence in programming languages, software engineering, data base systems, knowledge systems, and distributed and parallel computing. This is given in part A. Second in priority is the establishment of an interdisciplinary Center for Research Integration of Advanced Computing Technology, described in part B. At the present time, we need help from the College and University if we are to pursue either of these approaches to strategic planning. In Section C, we present the goals for 1990, with assumptions on support from the University.

A. Critical Mass for Expanding Essential Research and Graduate Education Programs Highest Priority Needs

Purpose and Rationale

The Department of Computing and Information Sciences is younger than Monday Night Football and the landing of a man on the moon; it was created in response to an overwhelming need to enable industries to be competitive, to empower other disciplines with computing power, and to provide knowledge workers for the 21st century. However, the Department has never been allocated reasonable resources to accomplish these tasks. We have been very successful, however, in producing graduate and undergraduate degrees, increasing our research productivity and providing our own computer labs. In this proposal, we are asking for the resources to accept the challenge of the Kansas Board of Regents in the Mission Statement for KSU to be a major thrust of Kansas State University. Specifically, increasing the number of faculty, improving the stipends for graduate students, and enhancing the research and instructional laboratory environment will substantially increase the size of the graduate program, increase extramural funding, enhance the publication rate in scholarly journals, and improve the quality of the undergraduate programs.

Relationship to KSU Themes

Enhancement of the graduate education and basic research programs of CIS is central to meeting the Regents' challenge. Strengthening our research programs will also improve the quality and quantity of undergraduate education in this high demand area. Electronic delivery of graduate coursework will extend the influence of KSU to industries nationwide.

Proposed Activities

If we are to be competitive in acquiring funding from such agencies as NSF, according to their Notice No. 107, we must "contribute to the education and the development of human resources in science and engineering at the postdoctoral, graduate, and undergraduate levels." More specifically, we must publish in first-rate journals, develop high quality graduate and post-doctoral students, and develop a critical mass of graduate students with which principal investigators can work. Currently, we do not have a "critical mass" of faculty in any area; if we lose one person, we may well lose an entire area. It is impossible to compete for "big science" grants without such a critical mass. We propose to strengthen current areas of expertise with additional faculty in the following three broad areas: programming languages, parallel and distributed systems, and data, knowledge, and software engineering.

It is essential that we install workstations for both the graduate and undergraduate students. Without this laboratory environment, students cannot develop their engineering and experimentation skills or use current research software. In the past we have received lab computers from industrial grants, but because KSU was unable to provide maintenance, industry is reluctant to continue the practice.

It is essential that we improve graduate student stipends. Our current offers are 25% below the offers of some of our peers. With higher stipends (approx. $1000 a month) we can increase the number of quality, research-oriented students who accept GTA and GRA positions. We receive more than 1000 inquiries a year and process more than 300 applications for graduate school, admitting 20-30, of which 10 to 15 accept GTA or GRA offers. With additional faculty, better stipends, and better equipment, we could enroll an additional 30 graduate students (a 50% increase).

With additional faculty, we can reduce our student to faculty ratio, and qualify our bacclaureate degree programs for national accreditation.

At the request of AT&T, we propose to offer MS coursework electronically through National Technological University (NTU). We have a current demand for such courses: in addition to their annual summer school attendance, our AT&T Summer On Campus students must receive MS coursework at their business locations (18 sites across the nation). This initial experience with electronic delivery of courses will open the doors to additional industrial clients for our graduate level courses. Because many computer and computing-intensive industries, such as IBM, Xerox, AT&T, and DEC are members of NTU, we can reach into industry throughout the nation. Specifically, we can and should reach into the industrial areas of Kansas City and Wichita to be supportive of Kansas economical development.

Responding to the increased demand for graduate level degrees in computing technology and information management by nationwide industries like AT&T and Kansas industries such as Boeing, United Telecom, and the insurance companies, we propose to develop two new Master's degree programs - Master of Software Engineering (MSE) and Master of Management Information Systems (MMIS). The model for the MSE is provided by the Software Engineering Institute at Carnegie-Mellon. The model for the MMIS is the program at Arizona State University.

Support for improving the quality of the Joint PhD program with the University of Kansas is essential. We must establish a video link between the two departments to enable us to teach joint PhD level courses, conduct research seminars, conduct collaborative research projects, and interact on economic development projects. KTEC has expressed interest in this type of cooperation.

Resource Requirements

According to the 1987-88 Taulbee Survey of PhD-granting computing sciences departments in the U.S. and Canada, the top 25 departments have an average faculty size of 38. We have 14 faculty members. In summary, in order to meet the Regents' challenge, we require ten additional faculty members ($600,000 per year) to increase the size of the graduate student enrollment, increase extramural funding, and accommodate the expected growth in the undergraduate program. It would also permit us to teach the introductory computing courses that are mandated by the Strategic Planning Charge to the College of Arts and Sciences. We need 25 workstations ($125,000) and software ($20,000 per year). We also need a parallel computing system ($500,000). This can be shared with others across the University through the companion RIACT proposal. Additional graduate stipends amount to $72,000 in incremental funding. Initial fees for NTU are approximately $5,000. Other units such as Engineering could utilize NTU as well. A video link to KU would cost approximately $200,000 for KSU's end. This could also support other disciplines such as Biology, Chemistry, and Geology (cooperative PhD program).

Funding Sources and Outcomes

We expect to produce an additional 800 student credit hours at the graduate level. ($250,000 per year by regents' formula.) One NTU course per semester will generate approximately $20,000 per year. In the past 4 years, we have added 4 research faculty, increased our extramural funding by $250,000 per year, and acquired $4 million of equipment grants. We have not been unsuccessful; we just have a small faculty. With the additional resources, we anticipate an additional $1 million per year in extramural funding.

B. RIACT - Research Integration of Advanced Computing Technology Enabling Interdisciplinary Research Second Level Priority

Rationale and Purpose

If KSU is to be a leading comprehensive university in the 21st century, all disciplines within the university structure must be effective in producing new knowledge; this knowledge must be transferred to Kansas economic enterprises to maintain and improve their competitive stature in a global market-place. The power of computer technology enables this university/industry partnership to advance the economic well-being of Kansas. We propose to establish a center for Research Integration of Advanced Computing Technology in the CIS Department to enhance the research infrastructure of KSU, to contribute to the economic development of Kansas, and to transfer technology to Kansas educational, business, and industrial enterprises.

Relationship to Themes

RIACT (pronounced react) will be a collaborative research and development center which supports graduate students, enhances research capabilities in many departments across campus, contributes new technology to industry, and enhances the competitiveness of business in Kansas. RIACT is also intended to be the incubator for new graduate degrees which train a new type of scientist, one who is a computing scientist and who also is an expert in another science or engineering discipline.

Proposed Activities

For many years KSU researchers have been hampered in their work because they have to re-invent the computing wheel each time they encounter a computational problem. CIS has not possessed the resources to amplify the progress of others; that is, our mission is so broad and our faculty are so few that we were forced to isolate ourselves from the problems of Kansas industry and other researchers. In our technological vacuum, we have supplied technology which may or may not have been useful to other researchers. We have been principally on the supply side. Within RIACT we intend to become more demand-oriented developers of computing technology; we must work with industry and other academic disciplines in developing computing solutions to their problems.

Our initial emphasis will be to work with scientists and engineers on computing paradigms to enhance their research programs. Specifically, we must develop expertise in parallel and vector computing. We also need to increase our graphics expertise to enable scientists to interpret research results via a technology known as Scientific Visualization. In addition, we need to enhance our expertise in artificial intelligence and real-time systems to aid researchers in management of resources (Ag., Bus., sciences, and Engineering) and development of new experiment control facilities.

RIACT must be able to respond quickly to the rapid technological change in business, education and industry. We thus need to increase our capacity to enable Kansas communications and manufacturing capacity through the use of computer software. Specifically, the communications industry in the Kansas City region (United Telecom is a Kansas corporation) and the aircraft industry (Boeing Military Airplane and Boeing Computer Services) are prime targets for economic development enhancement. Software Engineering and Computer Networking research and development are the keys to productivity enhancement for these companies.

In the future, we envision working with Business in development of Management Information and Decision Systems and Office Automation Environments. These are vital areas to the Kansas Economy. We envision collaborative arrangements with Education in the development of Computer Assisted Instruction to empower the state's educational capacity. We will place heavy emphasis on the development and/or

integration of computer-based cooperation systems which support (both centralized on campus and geographically distributed) collaborative efforts. Since RIACT is intended to be an entity which can respond quickly to changing research and industrial directions, new areas and projects will continually arise. Assembly of sufficient resources and expertise to solve a new computing problem must be a principal goal.

Finally, RIACT is intended to be the interdisciplinary research environment that develops new graduate degree programs whose goal is to train scientists and engineers that are experts in applying computing technology to generating new knowledge in their own discipline. It will be the responsibility of the research faculty from the broad spectrum of disciplines within RIACT to develop these degree programs and recommend the academic structure for developing the students. The MS/PhD Degree Option in the Computer and Natural Sciences program at Washington State University is an appropriate model to consider.

Resource Requirements

We have already acquired a significant computing capacity through industrial grants. These systems support a variety of disciplines across the campus from Agronomy to Extension to Engineering to Biology to Physics to Chemistry to Math to Statistics, etc. We need to enhance that capacity with a parallel computing system, with state of the art artificial intelligence software, and with high resolution graphics workstations. Further enhancement of the research infrastructure requires new classified staff and graduate research assistants to develop the software for real-time programming of experiments, to parallelize large modeling systems, to develop large simulation systems, to program large knowledge and data bases, and to operate the facilities of RIACT.

A minimum of four new faculty (parallel processing, artificial intelligence, graphics, and software engineering) are needed. Joint appointments with various departments such as EECE, Physics, Math, Statistics, etc. are appropriate. This would be a yearly investment of at least $240,000. Additional GRA and classified staff would would cost an additional $90,000. A parallel processor would cost $500,000. High-resolution color graphics workstations would require an additional $100,000. Finally, funding for software acquisition and system maintenance would be approximately $150,000 per year.

Potential for Funding Sources and Outcomes

Since computing and information technologies are the enabling technologies for high tech industry, there is strong potential for support from Kansas industries such as Boeing and United Telecom. KTEC and Centers of Excellence funding is also well-suited. Federal agencies are interested in funding collaborative efforts of this kind, including the Information Science and Technology Office of DARPA, the NSF Science and Technology Centers, and the NSF Computing Infrastructure grants. Acquisition of extramural grants for computing resources and staff salaries will be a principal effort within RIACT.

We have already established that computing equipment companies have confidence in us through $4 million of equipment grants in the past 4 years. We are now asking for the opportunity to empower other research and industrial concerns with advanced computing and information systems technology. We are confident that RIACT will enable interdisciplinary research and thereby improve extramural support (by $1 million a year), increase the number of research and development publications, enhance the attractiveness of KSU to graduate students, support scholarly activity in Arts and Humanities, and improve the economic health of Kansas (by developing foundations for and prototypes of new software products).

C. Plans for 1989-90 Academic Year

Objectives:

Our objective is to accept the challenge of the Board of Regents to become a major thrust of KSU. In 1989-90 we intend to improve the CIS Department and advance the cause of the College of Arts and Sciences and KSU in empowering people and generating new knowledge. However, without additional

funding as indicated in the strategic plans attached to this memorandum, many of the goals stated below will go unattained.

Goals:

A. Instruction

1. We will review and probably restructure our service course offerings, CIS 110 and CIS 200. Currently, more than 1100 students per semester enroll in these two courses. With the new Charge to the College to teach introductory computing courses in CIS, we expect an additional 400 students per semester. Our review will focus on the fundamental goal of creating knowledge workers for the 21st Century. We will work with other departments to move comparable courses into CIS, but not before more faculty resources are available.

2. Better integration of the undergraduate and graduate (specifically M.S.) degree programs in this department must ensure that our own BS graduates, as well as incoming graduate students, have a smooth transition into the MS program.

3. It is essential that we move the instructional program laboratory work from PCs to workstations. We will work with ACAC to establish University-wide generic workstation lab and we will work with industry and the College of Arts and Sciences to acquire specialized workstations.

4. We will review the PhD program. Our approach is to improve the quality of the program by providing research guidelines to both students and professors which reflect our goal to attain international stature.

5. We request funds to install a graduate student recruiting program which includes trips to four-year undergraduate schools in the region and strong advertising with graduate student brochures. We have no funds for this activity and the Graduate College can offer no help. This type of assistance should be a University priority.

6. At AT&Ts request, we will investigate delivery of MS coursework remotely to many different AT&T sites across the country. Without this mechanism (assumed to be National Technological University), we may lose the AT&T Summer on Campus program. However, we cannot teach NTU courses unless we have the initiation fees and an additional faculty member.

7. We continually seek to improve the quality and quantity of all departmental programs (BS/BA/MS/PhD) in accordance with the strategic planning documents of Attachments I and II. However, we cannot implement such plans without additional funding.

8. We request permission and funds to apply for accreditation of our BS/BA programs by the Computer Science Accreditation Board.

9. We, in conjunction with the College of Arts and Sciences and the Graduate College, must make plans to solve the problem of low GTA stipends. At the present time, we have a small revolt among our graduate student population. We depend very heavily on this group of instructors. Without their commitment, we cannot exist.

10. In conjunction with the College of Arts and Sciences, we will seek to solve the problem of maintenance support for specialized computing labs in this department. These are laboratories like other traditional chemistry and physics laboratories. They should be supported by a base budget, not

through allocations from a central university computing committee. Without support, they will soon be of no use.

11. We will work with the College of Arts and Sciences to resolve a problem in the graduate student applications process. We currently receive more than 1500 inquiries for graduate school each year. We process more than 300 completed applications per year. Presently, this is poorly handled by student workers and we miss some very good graduate student prospects. We need a full-time classified employee who can handle this task.

B. Research

1. We need to hire two new faculty members to begin to build a critical mass of research expertise. This is well-documented in Attachment I.

2. We will continue our efforts to increase extramural research funding.

3. We will write a grant proposal in hopes of acquiring a parallel processing system. (However, preliminary indications from one industrial enterprise, AT&T, are not good because of our lack of maintenance of their current grant equipment.)

4. Our goal to become nationally known will be enhanced with higher quality publications. This is in keeping with the new statements from NSF about quality of publications versus quantity. Thus, we will place renewed emphasis on quality of publications.

5. We will endeavor to establish a strong post-graduate program in programming languages. Currently, few departments of Computer Science offer this sort of program; but it is essential to improving our international stature and improving our research program. It is a sign of our maturation as a discipline and a department.

6. Publication of a departmental research brochure should enhance national awareness of our research programs.

7. We will "make time for research" among all of our other duties. As we have done in years past, differential teaching and research loads are the norm. This permits the more productive researchers more time for researcher.

C. Department and University Service

1. We will install and operate the SCS-40 as a University resource. This is the beginnings of RIACT, a center for Research Integration of Advanced Computing Technology. Again, without funding as indicated in Attachment II, this effort will fade almost immediately.

2. We will continue to play an active role on College and University Committees (Telecommunications and the Executive Committee of Telecom, CCOP, ACAC, Physical Sciences Subcommittee of Graduate Council, Graduate Council, A & S Deans's Advisory Committee, ISBR, CRCCA, General Laboratory Committee, etc.).

3. Publication of a departmental newsletter to inform alumni and raise funds will be continued.

4. Fund-raising from alumni who work for IBM will be intensified to acquire funds for undergraduate scholarships. We will also start a fund-raising campaign with employees of AT&T to support the graduate program.

Table 1
Undergraduate Enrollment for Fall Semesters 1981-1989

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Freshmen	189	192	193	148	112	77	60	84	90
Sophomore	80	126	131	96	86	66	71	54	54
Junior	78	111	134	114	103	80	71	71	60
Senior	84	103	146	198	160	134	116	85	82
Total	431	532	604	556	461	357	318	294	286

Table 2
Graduate Enrollment for Fall Semesters 1981-1989

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Master	89	80	65	63	83	68	67	43	43
Ph.D.	14	13	9	11	10	21	21	21	20
AT&T (Part-time MS)	31	57	62	72	70	62	50	52	51

Table 3
Allocated Faculty Positions FY 82 - FY 90

1982	1983	1984	1985	1986	1987	1988	1989	1990
10.5	10.5	12.5	12.5	12.0	12.5	12.5	13.5	14.0

Table 4a
Extramural Funding FY 82 - FY 89

1982	1983	1984	1985	1986	1987	1988	1989
135,425	160,000	231,734	214,639	219,435	306,337	152,422	432,535

Table 4b
Extramural Equipment Grants FY 85 - 89

1985	1986	1987	1988	1989
50,000	300,000	1.3M	700,000	750,000

Table 5
Faculty Publications FY 81 - FY 89

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Refereed Publications	4	3	3	5	6	14	22	32	37
Books	0	0	3	0	1	3	1	0	0
Totals	4	8	10	10	10	19	26	32	37

Table 6
Computing Facilities

Type	Quantity	Equipment
Super-mini	1	DEC VAX 11/780
Super-mini	2	AT&T 3B15
Super-mini	1	Harris HCX-9
Mini	10	AT&T 3B2 400
Mini	5	AT&T 3B2 300
PC	10	AT&T 6300
PC	60	AT&T 7300
PC	20	AT&T 6310
PC	30	Zenith 150 PC
PC	16	Apple Macintosh
Terminal	10	AT&T 4425
Terminal	11	AT&T 610
Terminal	40	Esprit 6110
Terminal	10	TeleVideo 925
Terminal	20	Various CRT Terminals
Graphics	1	AT&T Frame Creation System
Data Switch	1	Equinox DSS-1
Printer	1	Apple Laserwriter
Printer	3	Apple Imagewriter
Printer	2	Centronics Linewriter 800
Printer	1	Dataproducts B600
Printer	5	Okidata Dot Matrix Printer
Printer	4	Epson Dot Matrix Printer
Printer	3	NEC Spinwriter 5510
Printer	1	QMS Lasergrafix 800
Printer	1	AT&T 495 Laser
Printer	4	AT&T 479 Dot Matrix
Projector	1	Sony Projection System
Projector	1	Kodak Overhead Projection System
Modem	10	Racal-Vadic Modem
Modem	15	AT&T 212A Modem
Network	2	Ethernet
Network	2	Appletalk
Network	1	StarLAN
Workstation	15	Sun Workstations
Mini-super	1	SCS-40/CTSS

Table 7
Graduate Degrees FY 81 - FY 89

	1981	1982	1983	1984	1985	1986	1987	1988	1989
Master	27	25	36	25	35	39	40	42	32
Ph.D.	2	0	2	2	1	1	3	2	4
Totals	29	25	38	27	36	40	43	44	36

Table 8
Undergraduate Degrees FY 81 - FY 89

1981	1982	1983	1984	1985	1986	1987	1988	1989
45	47	61	62	102	104	86	69	35

Table 9
Department Salaries Compared to National Average

	1984-1985	1985-1986	1986-1987	1988-1989	%Deficit
Assistant Professor	32,742	36,705	37,024	41,184	
National Average	37,455	39,544	41,945	43,959	6.7%
Associate Professor	34,920	36,696	37,266	42,966	
National Average	43,115	45,062	47,425	50,806	18%
Professor	42,060	43,245	44,478	49,533	
National Average	56,952	59,503	63,037	67,205	35.6%

Table 10
OOE Funding FY 82 - 90

1982	1983	1984	1985	1986	1987	1988	1989	1990
37,336	37,336	39,236	41,590	43,669	37,119*	43,669	43,669	44,669

* 15% budget cut

Table 11
Total Student Credit Hours
FY 84 - FY 89

1984	1985	1986	1987	1988	1989
12,519	14,466	14,044	12,903	12,323	11,808

Table 12

Number of Students Enrolled in Service Courses (100 and 200 level) FY 84 - FY 89

1984	1985	1986	1987	1988	1989
2,495	3,105	2,983	2,837	2,577	2,757

Table 13
Department Scholarships

Name	Class	Fund	Amount
Troy Anderson	SR	IBM/Dean Match	1,000
Teresa Detter	FR	IBM/Dean Match	1,000
Jared Friesen	JU	Phillips/Dean Match	1,000
Greg Haynes	FR	Conoco	1,000
Chris Thompson	JU	Conoco/Dean Match	1,000