take approximately $30,000 to repair this equipment. The only state-of-the-art equipment we have are the workstations and the X-terminals.

B. Deficiencies

In the undergraduate curriculum, we need 25 X-terminals attached to a multi-processor file- and cycle-server. We also need a multitude of software in the areas of software engineering, programming languages, computer networks, operating systems, data base systems, fourth generation languages, and graphics. At the graduate level, we need 10 workstations (Sun Sparc 2) with a multiprocessor file server. In research, we need a large parallel processor for research in parallel algorithms. No self-respecting computing science department can do without this type of computational power. To support interdisciplinary research we need high-resolution color graphics systems for scientific visualization. While this department has acquired most of its instructional and and research equipment, it is now necessary for the University to support the acquisition of this needed computing infrastructure.

C. Grantsmanship

As stated earlier, this department has acquired more than $4 million dollars worth of computing facilities through extramural grants and contracts. That is 90% of our computing capacity. This past year we have been diligent is seeking such support, but all our proposals have been rejected. A proposal was submitted to AT&T for a multiprocessor for graduate education and research ($800,000). It was rejected with no reasons. A proposal was submitted to Hewlett-Packard, jointly with Engineering, which requested equipment and software ($1.5 million) to support undergraduate instruction in Computing and Information Science and in Engineering. It was rejected with no reasons. A proposal was submitted to NSF for support of faculty and graduate student workstations and file servers and support personnel ($1,365,691). It was rejected because we do not have a critical mass of senior computer scientists to warrant a major investment by NSF. Finally, a proposal was submitted to NSF for support of undergraduate instruction. It is pending. One of the fundamental problems we face is lack of state funding to bring us up to a level to be competitive with the rest of the academic world. More detail is provided in the section on Strategic Planning.

VI. Strategic Planning - Top 45

A. Abstract

In this section we present the rationale for funding Computing and Information Sciences at KSU at a level commensurate with the Board of Regents Mission Statement for the University. That is, we want to make computer science a major thrust of the University in fact, not just on paper. The tangible rewards that are possible if CIS is given a central focus within the University's strategic plans are listed below.

1) Federal funding is projected to double in the next five years in computing sciences and engineering. If we are funded at a Top 45 level, there is the potential to generate two million dollars per year in outside funding.
2) An increase in the number of CIS faculty will also enable CIS to improve the quality of our instructional programs and meet the demands implied by the Common Undergraduate Degree Requirements. It will also permit us to extend our graduate program classrooms to a nationwide industrial clientele.
3) Additional faculty in computational science and engineering, specifically in parallel systems and visualization, will permit the building of research partnerships of CIS faculty and computing-intensive research faculty in other disciplines to leverage the power of the computer to be more competitive for the "grand challenge" projects set forth in the High Performance Computing Initiative.

While the cost:reward ratio to attain these goals is not high, we are requesting a significant budget increase. The requisite resources to achieve these goals are:

1) six new faculty in "core" computing sciences;
2) at least two new faculty in computational science and engineering, particularly in parallel computing and visualization; and

3) a computing infrastructure which supports computing-intensive research.

In this document we enumerate the costs of becoming a Top 45 and the rewards that accrue from such an investment by the University.

B. Introduction and Overview

1. History and Objectives

The Department of Computing and Information Sciences at Kansas State University is younger than Monday Night Football and was created after the landing of a man on the moon; it was developed 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. We have been very successful in producing significant numbers of graduates from both our undergraduate and graduate degree programs, increasing our research productivity and providing our own computer labs. However, we have never been allocated reasonable resources to achieve our teaching and research potential. In this proposal, we are asking for the resources to accept the challenge of the Kansas Board of Regents, given to this department in the Mission Statement for KSU; and that challenge is to be a major thrust of the 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, increase the publication rate in scholarly journals, and improve the quality of the undergraduate programs.

2. Goal

Our goal is to become a Top 45 Department of Computing and Information Sciences in the US by 1995-96. There are several reasons for KSU to consider this a top priority.

a. The Board of Regents of Kansas has mandated in its Mission Statement for KSU that Computer Science be a major thrust of the University [Boa86].

b. The federal pool of extramural funding for computing research is predicted to double (from 300 to 600 million per year) in the next five years and a major portion of this funding is to be earmarked for the Top 45 computing science and engineering departments in the country [Won90]. It is our belief that the potential for funding from industrial sources is also increasing.

c. There is a nationwide concern about the lack of human resources in computing and information sciences to enable the nation's information industry. Eugene Wong, Associate Director of the White House Office of Science and Technology, has said that these human resources are the primary factor in enabling the US to maintain leadership in information technology and that information technology affects 2/3 of our GNP [Won90].

d. Research in many disciplines which depend on advances in computing will be disadvantaged at KSU if interdisciplinary research in computational science and engineering is not a strong part of the research infrastructure of KSU.

e. Enhancing the CIS program is in exact agreement with KSU's criteria for prioritizing programs.

f. Achieving a critical mass of CIS research faculty and infrastructure is consistent with the strategic planning themes of KSU.

Let us be more specific.

3. Kansas Board of Regents Mission Statement

In the mission statement for KSU the Board of Regents states, "The major thrust of the institution is guided by its land grant tradition, embodied in agriculture, architecture, business, **computer science,** engineering, veterinary medicine and human ecology/home economics, and those disciplines necessary for the support of these fields: the natural and physical sciences, mathematics and the social sciences." We are a major thrust of KSU and we are asking to be funded sufficiently to meet this challenge.

C. Funding Potential

There is a computing initiative before congress (Gore Bill - S. 1067 National High-Performance Computing Technology Act of 1989, Johnston Bill - S. 1976 A Bill to Provide for Continued United States Leadership in High-Performance Computing, Walgren and others - H.R. 3131) which could possibly double the amount of funding for computing research in the next five years. At the 1990 Snowbird conference, the bi-annual meeting of the Heads (Chairs) of the PhD-granting Computing and Information Sciences Departments in the U.S. and Canada, this high performance computing initiative was discussed with representatives from industry and all the major granting agencies. The attendees who were most knowledgeable of the high performance computing initiative and most influential in structuring the initiative were Eugene Wong - Associate Director, White House Office of Science and Technology Policy, Erich Bloch - Director of NSF, Bill Wulf - Director of the Computing and Information Science and Engineering Directorate of NSF, Barry Boehm - Director of DARPA/ISTO (DOD), and Andre van Tilborg - CS Director of ONR (DOD). The message was clear: the High-Performance Computing Initiative will attempt to bring 35 additional departments of CIS up to the level of the current top ten research departments in CIS in the U.S. Any department below the top 45 research departments would clearly be in a (possibly long-term) disadvantaged position. While there was a lively discussion about "big science" versus "small science", most agreed (during the coffee breaks) that there would be a top 45 and then the rest. This was specifically stated by Eugene Wong. It is clear that if we are to be a major source of research funding for KSU, we must be a top 45 department. Currently we are not.

In a related document [Hop89], the NSF Advisory Committee for Computer Research proposes "That a major initiative in software engineering research be initiated ... [and] ...a new program of research for medium-size, multiple-investigator projects be initiated. Such Projects would typically be funded at $200,000 to $800,000 per year." This tells us that being a top 45 department will have significant rewards.

D. Dearth of Human Resources in Computing

In his address to the the 1990 Snowbird conference, Eugene Wong also stated that there is a "decline in the supply of human resources in the computer science educational pipeline". He later indicated (and we paraphrase) that the federal government must have a hand in improving this supply of computing professionals because the competitiveness of the US in the world economy depends heavily on information technology, and computing is the "driving technology" of the industry. We have also seen this dearth of computing professionals in our connections with industry that recruit at KSU in CIS.

E. Interdisciplinary Research in Computational Science and Engineering

Increasingly, science and engineering researchers are turning to computational models of physical, chemical, and biological systems to conduct their basic research. Scientists and engineers are also more dependent on computing technology and processes to implement prototypes and control experiments. A partnership of scientists and engineers at KSU who are actively involved in research with CIS faculty who are experts in parallel and distributed algorithms, scientific visualization, artificial intelligence, and software engineering would significantly increase the potential of success in research funding. This strategy for interdisciplinary research teams in computational science and engineering is documented in the High Performance Computing Initiative which indicates the essential nature of computing in tackling the "grand challenges" of science and documents a national purpose of maintaining international superiority in computing and computing technology.

F. Compliance with KSU Planning Criteria

Clearly, improving the quality of research and instruction in CIS coincides perfectly with the mission of KSU, as embodied in the Board of Regents' statement. Second, demand for our degree programs has already been documented. The quality of our programs is clear from the demand for our graduates from all of our programs and our own determination that our BS curriculum in Computer Science qualifies for accreditation by the Computer Science Accreditation

Board. Furthermore, we are the only program in Kansas which brings Computer Science programs and Information Systems programs together within the same department. Finally, the instructional programs provide courses central to the mission of all KSU departments and research central to the computational science and engineering research paradigm.

G. Relationship to Planning 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. Critically needed CIS faculty will help strengthen the service teaching programs mandated by the Planning Charge to the College of Arts and Sciences [KSU89]. Electronic delivery of graduate coursework will extend the influence of KSU to industries nationwide. Finally, a cooperative research and graduate education program with the European computing sciences community will enhance the international stature of KSU.

H. The Plan: Investments and Rewards

1. What Needs to be Done

The CIS Department at KSU is not a top 45 department; to enter this elite group, and thereby enable us to compete for significant multi-investigator large grant extramural funds, we must:

a. increase the number of research faculty in areas with potential for funding,

b. hire established researchers with good "track records",

c. create critical mass research groups,

d. focus on excellence in a few research areas,

e. provide the research infrastructure - computing facilities and operating budget - to entice new computing sciences researchers to KSU,

f. increase the number of quality teaching faculty,

g. insure the quality and quantity of comprehensive teaching laboratories, and

i. extend the KSU CIS graduate classroom, via electronic delivery, to a nationwide industrial clientele.

2. Departmental Impact of a Top 45

We are currently a department of 14 tenure track faculty, generating about $30,000 per year per faculty member in extramural funding. If we are to understand the economic impact of creating a critical mass of researchers in CIS, let's look at the configuration of the current Top 25 departments in the US, as reported in [NRC82]. While numbers in the rapidly changing academic computing field are few, we do know that, according to [Gri90] and [Gri86], the Top 25 are substantially larger in faculty numbers and extramural funding than the remaining 75+ programs. The Top 25 have an average faculty size of 28 and average $140,000 per year per faculty member in extramural funding from the federal government. (Industry funding is unreported, but is believed to be a significant percentage of the federal funding.) The remaining departments (below 25) average approximately $20,000 per year per faculty member. It seems clear that a critical mass of faculty in research contributes to increased extramural funding. If KSU CIS were raised to the level of a current Top 25 in faculty size and extramural funding, we would have the potential for generating an additional two million dollars of extramural funding per year (in 1986 dollars). Including consideration of the High Performance Computing Initiative, this potentially produces double the 1986 dollars - four million dollars per year.

The increased visibility and reputation of a top 25 department also improves the quality of graduate and undergraduate students. There is a significant national concern (again using the 1990 Snowbird Conference and industry demand as indicators) for the dearth of human resources in computing. Based on the number of qualified students we cannot admit because of lack of funding and faculty, we feel we can attract additional highly qualified students.

3. Needs of a Top 45

In the previous section, we used the Top 25 (in 1982) as a benchmark against which to judge the rewards of a high quality Department of Computing and Information Sciences. We feel it is a good benchmark for being a top 45 department. The rewards of being a Top 45 department are now clear; let us make sure that the costs are also very clear. First, we will need an additional 8 faculty members to reach a critical mass of 22 tenure-track research faculty. While this is substantially below the average size (28) of a top 25 department, it is our belief that there are still a significant number of courses which can be taught by GTAs and thereby reduce the teaching load on faculty and this will be an investment of approximately $600,000 per year in salaries. A computing infrastructure must be established to entice quality faculty to KSU. A large parallel processor, high-resolution graphics facilities, and faculty workstations are an investment of approximately $800,000. Maintenance and management of these facilities will require approximately $100,000 per year, in addition to our current $100,000 per year deficit in maintenance of computing equipment and software. However, if we do our faculty hiring, promotion, and development in a responsible way, two to four million dollars per year, plus national stature, are the rewards.

I. Research Focus

1. Background

If we are to be competitive in acquiring funding from such agencies as NSF, according to their Notice No. 107 [NSF89] we must "contribute to the education and the development of human resources in science and engineering at the postdoctoral, graduate, and undergraduate levels." Additionally, NSF states that "Evaluation of scientific productivity must emphasize quality of published work rather than quantity." Our interpretation of these statements is that 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, an entire area may be crippled. It is impossible to compete for "medium and 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 systems, and software engineering. It is important to note the specific sub-areas which have been included in these broad areas. Under software engineering, [Hop89] included data systems, operating sytems, software development, software maintenance and testing, software design, and software environments. Distributed computing was included in parallel systems as well. We have chosen these three broad areas for several reasons. First, we already have the beginnings of research groups in these three areas. Second, the NSF Advisory Committee for Computer Research has recommended that these areas be among those chosen for high priority in future research funding [Hop89]. Third, these research areas are mutually supportive of one another, that is, several faculty can work in research that integrates these areas.

2. Core Computing Sciences Research Focus

Let us now provide a more specific focus. Our strongest research program is in programming languages. At a more detailed level, our strengths in denotational semantics, applicative programming, logic programming, and category theory have given us the beginnings of a national and international reputation. By adding two more faculty positions in programming languages, we feel confident that we can establish this program as among the better programs in the nation. Presently, several faculty have strong connections with programming language research groups abroad at Copenhagen, Edinburgh, Glasgow, and Rennes (France). Research visits and postdoctoral students have been exchanged, and NSF has granted funding to continue the exchanges. We want to expand this human resources pipeline to include PhD students (one this year already). Additionally, there is a potential for multi-million dollar grant cooperation through the European equivalent of NSF, called ESPRIT. KSU (along with Yale and Northeastern) is listed as a potential participant in new NSF/DARPA/ESPRIT initiative [Hud90], but we need additional high quality faculty in programming languages to attract this funding.

In parallel systems and software engineering, we have faculty who work in data systems, distributed systems, distributed algorithms, software metrics, software specification and verification, software debugging, and concurrent systems. However, we do not have a critical mass in any of these areas and no one that works in parallel algorithms and systems. Our goal is to build a critical mass of faculty researchers who can provide national leadership in "Software for Parallel Systems". This means that we must add two software engineering faculty and two faculty in parallel algorithms. More optimally, we need three in each of the areas; however, it is intended that the two positions in programming languages will have some expertise in software engineering or parallel and distributed language structures, and thereby strengthen our ability to conduct significant research in software for parallel systems.

At present, our faculty is dominated by bright, young, hard-working faculty who hold great potential. However, in order to upgrade this department in time to acquire money from the High Performance Computing Initiative, we must have senior faculty who can compete on the national level. Therefore, at least three of these new faculty positions must be at a senior level.

3. Interdisciplinary Research

The High Performance Computing Initiative [Hol90] clearly states that fundamental research in computing and information sciences is essential to the well-being and economic development of the US. It also gives computer scientists an additional task. Computing scientists are urged integrate their research into the national purpose of competitiveness in information technology and embed their research goals into some of the "grand challenges" of other disciplines. Global weather modeling, mapping the human genome, improving the product cycle, and development of computational scientists and engineers are given as examples of such grand challenges. Thus, it is essential that we create a critical mass in computing research by developing interdisciplinary computing research teams with members from CIS and other disciplines. With this goal in mind, CIS submitted the RIACT pre-proposal for strategic planning in the Fall of 1989 [Wal89]. The goal of RIACT is to build on the strengths of CIS and other disciplines that have computational research problems. For example, linguistics research in speech and English can benefit from knowledge in programming language semantics. Parallel and distributed algorithms in CIS provide a powerful computational tool to many of the scientists and engineers in solving their computationally intensive simulation problems. Deductive data bases, data base integrity and security, and object-oriented data bases can be significant factors in solving problems in computational biology, geographical data bases, office automation, flexible manufacturing, etc. Parallel algorithms can help to solve problems in computation science and engineering, such as computational physics, computational chemistry, parallel simulation, circuit simulation, real-time algorithms, and numerical computing. Software specification, verification, and implementation can improve productivity in research areas which must build software systems. Theorem provers in CIS can help mathematicians solve some humanly intractable proof problems.

Once CIS has a critical mass of researchers in the "core" computing sciences, described above, this interdisciplinary research can proceed. The fundamental areas of software engineering, data bases, programming languages, and parallel systems can provide the underpinnings to programs within RIACT for computational science and engineering. Joint projects conducted by faculty from departments such as math, stat, physics, chemistry, biology, bio-chemistry, engineering, and others are obvious.

There is, however, one obvious deficiency in our ability to conduct this type of research. It is essential that we build an expertise in visualization. In scientific visualization the scientist or engineer is enabled by high-resolutions color graphics to use his/her image recognition senses and faculties to understand a physical, chemical, or biological process. To promote this scientific method, two positions in graphics and visualization must be allocated to CIS. With at least one of these two faculty being a senior person, early success in obtaining extramural funding for such projects seems promising because of the strength of the science and engineering programs at KSU.

J. Instructional Focus

1. Enhanced Quality

With the increase in number of quality faculty, instructional programs will also be improved. We must concentrate on presenting quality programs at all levels. Without quality undergraduate programs, our graduate programs and research programs will be disadvantaged because of ill-prepared students. The curricula will not be changed substantially in core computer science areas. However, with the addition of visualization faculty, our ability to train students as computational scientists and engineers will be established.

2. Instructional Infrastructure

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 our peers. With higher stipends 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 400 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.

With additional faculty, we can reduce our student to faculty ratio, and qualify our BS in Computer Science 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 (30 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 economic 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 a new Master's degree program - Master of Software Engineering (MSE). The model for the MSE is provided by the Software Engineering Institute at Carnegie-Mellon.

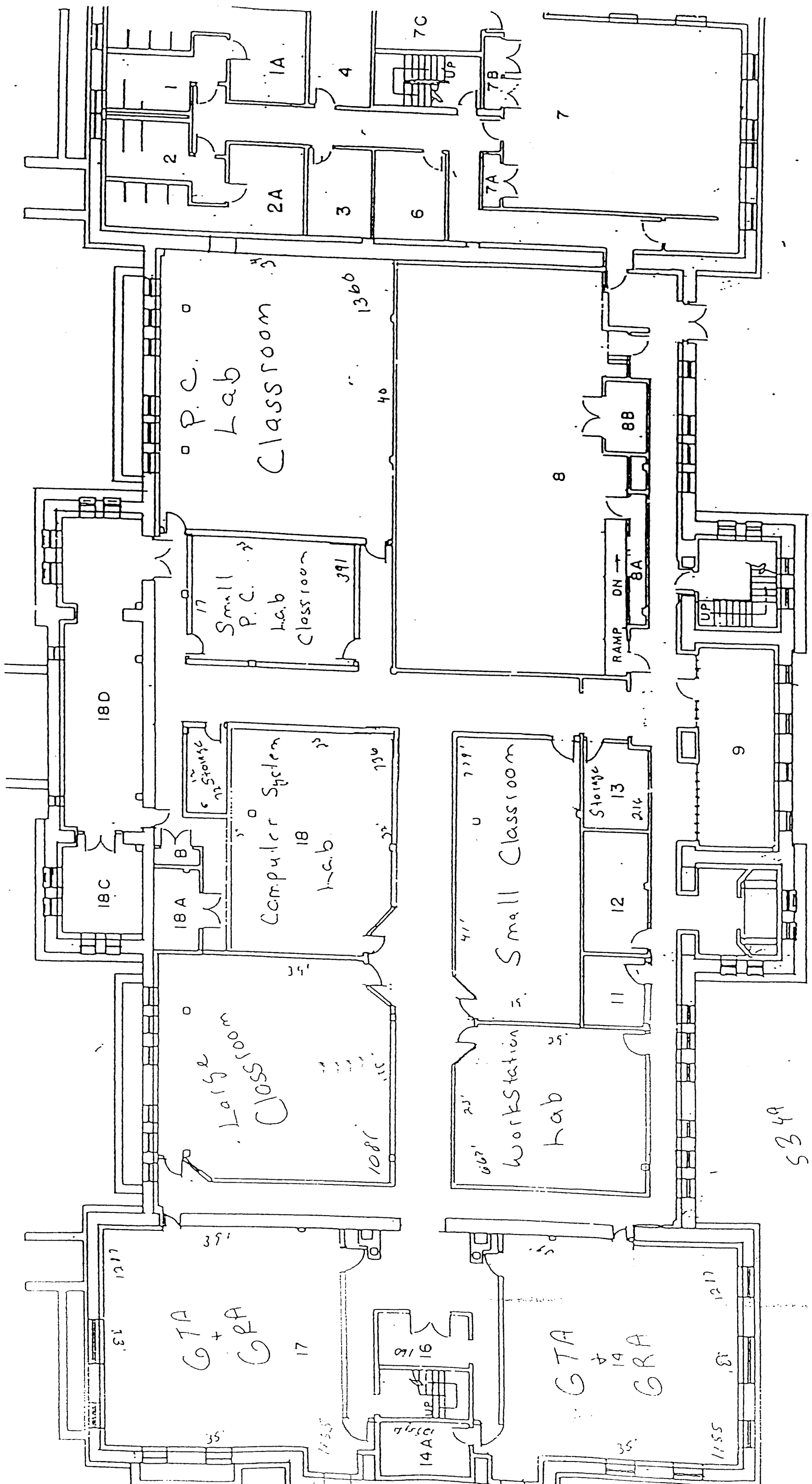
Support for improving the quality of the Joint PhD program with the University of Kansas is desirable. We wish to establish a video link between the two departments to enable us to teach joint PhD level courses, conduct research seminars, conduct collaborative research projects, and interact on economic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

3. Space Needs

The Department of Computing and Information Sciences has high quality space in Nichols Hall. The State of Kansas has provided a very nice working environment in an aesthetic and sentimental setting. However, we are a growing department and the current separation of labs and staff in both Nichols and Fairchild causes difficulties in management, budget, and morale. Our goal is to consolidate all of our space in Nichols. We also need new space to accommodate class-labs for teaching "hands-on" and experimental computing and information technology. An attachment to this document contains a floor plan of the space in the Nichols Basement that we feel is appropriate for solving these problems. We are working on the costs associated with this change. In the remainder of this section we comment on the specific needs which could be met by using this space.

In Fairchild we currently occupy two classrooms (F202 and F208 with approx. 1700 sq. ft.), several areas for GTA instructional staff (F203A, 203B, 203C, 203D, and 203E with approx. 1500 sq. ft.), and several class-labs (F212, F117, F14, and F5 with approx. 1600 sq. ft.). We need space in Nichols basement to consolidate all of the CIS program in one building. In addition, we need more faculty offices in Nichols for expected new faculty, thus displacing current GTA instructional staff on the third floor of Nichols. Finally, we need two new class-labs to support recitation and experimental labs for several beginning classes in programming and computing systems. One small lab of 400 sq. ft. and one large lab of 1120 sq. ft. are needed. The total space needed is thus approximately 6400 sq. ft. With space allocated for walls and hallways, this is approximately the amount space available for allocation in the basement of Nichols.

The basement space, currently inhabited by Farrell Library for storage of seldom referenced books, would accomodate all of these requirements. Thus, we could have two large bay areas for GTA staff, four class-labs, two classrooms, and some storage space that we desperately need. These components are all labeled in the attached floor plan.



J. The Plan: Summary and Time Line

In summary, in order to meet the Regents' challenge, we require eight 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. This increase in faculty 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; it also would permit a potential payback of two to four million dollars in extramural funding. Our requirement is for 25 workstations ($125,000) and software ($20,000 per year). A parallel computing system is also part of the requisite computing infrastructure to attract research faculty to KSU ($500,000); this system could be shared with other researchers across the University through the RIACT proposal. Additionally, workstations and file servers are needed for faculty. These systems will cost $200,000. We need funds to maintain the computing resource infrastructure at the rate of $200,000 per year. Additional graduate stipends amount to $72,000 in incremental funding.

There is a certain urgency about allocation of new faculty positions. We wish to appoint two new faculty each year for the next four years because the High Performance Computing Initiative will be put into place over the next five years and we need our senior faculty in place early enough to get some of that money. Also, we need the computing facilities within the first two years so that we can attract the high quality faculty. We also wish to pursue accreditation of our undergraduate BS program in Computer Science within the next year. We also hope to start broadcasting MS courses across NTU within two years. **Time is of the essence.**

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Table 1
Undergraduate Enrollment for Fall Semesters 1982-1990

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Freshmen	192	193	148	112	77	60	84	90	80
Sophomore	126	131	96	86	66	71	54	54	62
Junior	111	134	114	103	80	71	71	60	56
Senior	103	146	198	160	134	116	85	82	67
Total	532	604	556	461	357	318	294	286	265

Table 2
Graduate Enrollment for Fall Semesters 1982-1990

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Master	80	65	63	83	68	67	43	43	37
Ph.D.	13	9	11	10	21	21	21	20	21
AT&T (Part-time MS)	57	62	72	70	62	50	52	51	56

Table 3
Allocated Faculty Positions FY 83 - FY 91

1983	1984	1985	1986	1987	1988	1989	1990	1991
10.5	12.5	12.5	12.0	12.5	12.5	13.5	14.0	15.0

Table 4a
Extramural Funding FY 83 - FY 90

1983	1984	1985	1986	1987	1988	1989	1990
160,000	231,734	214,639	219,435	306,337	152,422	432,535	227,418

Table 4b
Extramural Equipment and Software Grants FY 86 - 90

1985	1986	1987	1988	1989	1990
50,000	300,000	1.3M	700,000	750,000	50,000

Table 5
Faculty Publications FY 82 - FY 90

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Refereed Publications	3	3	5	6	14	22	32	37	56
Books	0	3	0	1	3	1	0	0	0
Totals	8	10	10	10	19	26	32	37	56

Table 6
Computing Facilities

Type	Quantity	Equipment
Super-Mini	1	Harris HCX-9
Super-Mini	1	DEC VAX 11/780
Super-Mini	2	AT&T 3B15
Super-Mini	1	SCS-40/CTSS
Mini	10	AT&T 3B2 400
Mini	5	AT&T 3B2 310
Workstation	8	Sun 3/60
Workstation	5	Sun 3/80
Workstation	4	Sun Sparc Station 1
Workstation	1	Sun Sparc Station 1+
Workstation	3	Xerox AI System 1186
PC-Unix	60	AT&T 7300 Unix PC
PC	20	AT&T 6310 PC
PC	10	AT&T 6300 PC
PC	15	Zenith Z-150 PC
PC	15	Apple MAC
X-Terminal	4	Visual 19" X-Terminal
X-Terminal	7	NCD 16" X-Terminal
Terminal	11	AT&T 610 CRT
Terminal	10	AT&T 4425 CRT
Terminal	8	Harris 8665 CRT
Terminal	70	Various CRT Terminals
Graphics	1	AT&T Frame Creation System
Printer	4	AT&T 478 Dot Matrix
Printer	1	AT&T 495 Laser
Printer	1	Dataproducts LZR 1260i Laser
Printer	2	Centronics LineWriter 800
Printer	1	DataProducts B600
Printer	3	Okidata 84 Dot Matrix
Printer	5	Epson Dot Matrix
Printer	3	Apple ImageWriter
Printer	2	Apple LaserWriter
Printer	1	QMS LaserWriter 800
Printer	1	Xerox LaserWriter 4045
Printer	3	NEC Spinwriter 5510
Data Switch	1	Equinox Data Switch
Telephone	1	Merlin Phone System
Modem	20	Modem
Fax	1	AT&T FAX 3500D
Projector	1	Sony Projection System
Projector	1	Kodak Overhead Projection System
Network	1	Ethernet
Network	2	Appletalk
Network	1	StarLAN

Table 7
Graduate Degrees FY 82 - FY 90

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Master	25	36	25	35	39	40	42	32	25
Ph.D.	0	2	2	1	1	3	2	4	3
Totals	25	38	27	36	40	43	44	36	28

Table 8
Undergraduate Degrees FY 82 - FY 90

1982	1983	1984	1985	1986	1987	1988	1989	1990
47	61	62	102	104	86	69	35	39

Table 9
Department Salaries Compared to National Average

	1985-1986	1986-1987	1988-1989	1989-1990	%Deficit
KSU Assistant Professor	36,705	37,024	41,184	46,030	
National Average	39,544	41,945	43,959	49,013	6.5%
KSU Associate Professor	36,696	37,266	42,966	48,441	
National Average	45,062	47,425	50,806	55,749	15%
KSU Professor	43,245	44,478	49,533	58,134	
National Average	59,503	63,037	69,326	72,792	25%

Table 10
OOE Funding FY 83 - 91

1983	1984	1985	1986	1987	1988	1989	1990	1991
37,336	39,236	41,590	43,669	37,119*	43,669	43,669	44,669	44,669

* 15% budget cut

Table 11
Total Student Credit Hours
FY 85 - FY 90

1985	1986	1987	1988	1989	1990
14,466	14,044	12,903	12,323	11,808	12,669

Table 12

Number of Students Enrolled in Service Courses (100 and 200 level) FY 85 - FY 90

1985	1986	1987	1988	1989	1990
3,105	2,983	2,837	2,577	2,757	2,988

Table 13
Department Scholarships

Name	Class	Fund	Amount
Teresa Detter	SO	IBM/Dean Match	1,000
Jared Friesen	JU	Phillips/Dean Match	1,000
Greg Haynes	SO	Conoco	1,000
William Smeed	SO	DST Systems	500
Robert Swenson	SO	DST Systems	500
Michael Augustine	FR	IBM/Dean Match	400
Matthew Jones	FR	IBM/Dean Match	400
Chris Luedders	FR	IBM/Dean Match	400
Rick Un	FR	Phillips Minority	1000