Analysis of Significant Trends

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On virtually all indicators of institutional size, quality, and fiscal health, NJIT remains on an upward course. Beneath the gentle curves of institutional trends depicted by graphs of aggregate university data, however, lie a number of significant changes. Some reflect successful implementation of planned shifts in institutional emphasis. Others are the result of unpredictable swings in students' preferences, often related to their perceptions of the job market. Still others are related to vagaries in government policies or funding decisions.

[NOTE: Unless otherwise noted, all changes described below represent differences between Fall 1992 and Fall 1996.]

1. Students

a. Enrollment

- **Total headcount enrollment in NJIT's Fall 1995 semester was the highest in the university's history, a total of 7,885 students. This level remained virtually unchanged at 7,837 in Fall 1996.**

- **NCE enrollment decreased as a percentage of all enrollment from 64 percent to 57 percent.**

- **The student body continued to be approximately 65 percent undergraduate students and 35 percent graduate students.**

- **Doctoral students increased as a percentage of all graduate students from 8 percent to 11 percent.**

- **The total number of bachelor's degrees awarded increased by 20 percent. [AY'92 marked the low point in bachelor's degrees awarded after several years of decline. AY'96 saw the highest number of degrees awarded since AY'88.]**

- **The total number of master's degrees awarded decreased by nearly 10 percent.**

- **The total number of doctoral degrees awarded increased by 167 percent, from 15 to 40.**

- **The total student body continued to be composed of approximately three-fifths full-time students and two fifths part-time students.**

- **The population of students seeking master's degrees became more part-time.**

- **The undergraduate population became slightly more full-time.**

- **The number of first-time freshmen increased by 20 percent.**

- **The number of first-time graduate students increased by 6 percent.**

Total Headcount

Total headcount enrollment in NJIT's Fall 1995 semester was the highest in the university's history, a total of 7,885 students. This level was nearly matched by the 7,837 students enrolled in Fall 1996. The long-term trend of programmatic diversification continued. While NJIT's engineering enrollment has shown relative strength in a weak national market, it has declined and now constitutes a smaller proportion of the university's total enrollment. Decreasing this proportion further is the growth of other programs in fulfillment of the plan to make NJIT a comprehensive technological research university. In Fall 1992, NCE enrollment was 64 percent of all headcount enrollment. By Fall 1996, the percentage had dropped to 57 percent.

The gradual increase in total enrollment is attributable to a large increase in the College of Science and Liberal Arts (CSLA) which was offset by a slightly smaller decrease in the Newark College of Engineering (NCE). The CSLA headcount rose 45 percent between Fall 1992 and Fall 1996 (from 1,353 students to 1,957). The CSLA increase is the result of increases in both the number of degree programs offered and the number of students in certain degree programs, notably computer and information science which experienced a 35 percent enrollment increase between Fall 1992 and Fall 1996. It should also be noted that the increase in CSLA came after several years of decline, and that the previous high occurred in Fall 1987 when the enrollment stood at 1,797. Enrollment in the School of Management (SOM) remained virtually unchanged: 710 in Fall 1992 and 700 in Fall 1996. School of Architecture (SOA) enrollment also remained fairly stable (an increase of 10 students to 680 students in Fall 1996). Meanwhile, enrollment in the Newark College of Engineering (NCE) decreased by 9 percent (4,964 students in Fall 1992 and 4,500 students in Fall 1996).

Degree Level

Although the growth in graduate enrollment relative to undergraduate was dramatic over the last fifteen years, the ratio is now stabilizing at slightly more than a third. In Fall 1981, graduate students comprised approximately 17 percent of the student body. By Fall 1992, this percentage had doubled to 34 percent. In Fall 1996, graduate students comprised 36 percent of the student body. Doctoral enrollments, however, continued to increase more rapidly, by 36 percent from 223 students in Fall 1992 to 303 students in Fall 1996. They also constitute a larger percentage of all graduate students: 11 percent in Fall 1996 versus 8 percent in Fall 1992. The headcount enrollment of master's level students increased by 116 students to 2,527 in Fall 1996. Undergraduate enrollments decreased slightly from 5,063 to 5,007. The total number of bachelor's degrees awarded increased by 20 percent over the last five years from 606 in AY'92 to 728 in AY'96. It should be noted that AY'92 marked the low point in bachelor's degrees awarded after several years of decline, and AY'96 saw the highest number of bachelor's degrees awarded since AY'88. The total number of master's degrees awarded decreased by 9.5 percent over the last five years from 729 in AY'92 to 660 in AY'96. This decrease was largely due to a planned decrease in the number of international students admitted to NJIT at the graduate level. The total number of doctoral degrees awarded increased by 167 percent over the last five years from 15 in AY'92 to 40 in AY'96.

Attendance Status

Although the distribution of full-time students versus part-time students across the entire student body remains essentially unchanged (approximately 60 percent full-time and 40 percent part-time). The percentage of all graduate students who are full-time decreased slightly to 37 percent in Fall 1996 from 39 percent in Fall 1992. The part-time percentage of master's level students went from 66 percent in Fall 1992 to 71 percent in Fall 1996. All doctoral students are full-time. On the undergraduate level, there has been a slight increase in the percentage of full-time students to 68 percent full-time in Fall 1996 from 67 percent full-time in Fall 1992. The number of first-time freshmen increased from 518 in Fall 1992 to 624 in Fall 1996. The number of first-time graduate students increased by 6 percent from 605 to 644.

b. Choice of Major

- **The share of all students at NJIT who enroll in engineering is continuing to decline as the university becomes programmatically more diversified.**

- **At the undergraduate level, the enrollment is becoming more evenly distributed across a larger number of degree programs. The three most popular majors accounted for 43 percent of undergraduate enrollment in Fall 1992, but only 36 percent in Fall 1996. This pattern is repeated in the distribution of bachelor's degrees awarded: the three most popular bachelor's degree majors accounted for 53 percent of bachelor's degrees in AY'92 versus 47 percent in AY'96.**

- **Nine undergraduate majors showed decreases in undergraduate enrollment over the last five years: electrical engineering, mechanical engineering, architecture, civil engineering, industrial engineering, manufacturing engineering, engineering technology, applied chemistry, and management. All others showed increases. Two showed an increase of more than 100 percent: information processing (from 6 to 69 students) and applied mathematics (from 16 to 42 students). A new nursing major, offered in collaboration with UMDNJ, opened in AY'96 with 37 students.**

- **First-time freshmen showed an increasing preference for majors related to computing: computer science, information processing, and computer engineering. In Fall 1996, over 31 percent of first-time freshmen chose one of these three majors compared with 18 percent in Fall 1992.**

- **Seven graduate majors offered in Fall 1992 showed increases in enrollment over the last five years: applied mathematics, applied physics, architecture, chemical engineering, computer science, engineering management, and management. Applied physics doubled from 10 to 20 students. All others showed decreases.**

- **First-time graduate students showed an increased preference for computer science and management. In Fall 1996, 42 percent of first-time graduate students chose one of these two majors compared with 36 percent in Fall 1992.**

- **The program showing the strongest growth in master's degrees awarded was management with an increase of 357 percent between AY'92 and AY'96.**

Choice of Undergraduate Major

Significant shifts have occurred in undergraduate students' choices of major between Fall 1992 and Fall 1996. It is no longer the case that a small number of degree programs dominate the enrollment pattern. Many degree programs showed growth, including applied mathematics (from 16 students to 42) and information processing (from 6 students to 69). A new nursing major, offered in collaboration with UMDNJ, opened in AY'96 with 37 students. Nine undergraduate majors showed decreases in undergraduate enrollment over the last five years. The largest decreases in numbers of majors took place in electrical engineering, mechanical engineering, civil engineering, industrial engineering, and engineering technology. Smaller decreases were experienced in applied chemistry, architecture, management, and manufacturing engineering.

Looking at *full-time* undergraduates only, the pattern is similar, with one important difference owing to the fact that virtually the entire undergraduate enrollment of the School of Architecture (SOA) is comprised of full-time students. In Fall 1992, the three largest majors chosen by full-time undergraduates were: electrical engineering, architecture, and mechanical engineering (45 percent of all full-time undergraduates). Among Fall 1996 full-time undergraduates, the three largest majors were: computer science, architecture, and electrical engineering (37 percent of all full-time undergraduates).

The distribution of *part-time* undergraduates is also growing less concentrated. In Fall 1992, the three most frequently chosen majors were: engineering technology, electrical engineering, and mechanical engineering (62 percent of the total). In Fall 1996 the three most frequently chosen were engineering technology, electrical engineering, and computer science (51 percent of the total).

Choice of Major by New Undergraduates

The choice of major declared by *first-time freshmen* showed the same increased preference for programs related to computing at the expense of the more traditional engineering disciplines noted above. In Fall 1992, computer science, information processing, or computer engineering were chosen by 18 percent of first-time freshmen. By Fall 1996, this had risen to 31 percent. The three largest programs for Fall 1996 first-time freshmen were: computer science, computer engineering, and architecture (31 percent of the freshman class chose one of these three majors). This represents a change from Fall 1992 when the most frequent choices were: architecture, electrical engineering, and mechanical engineering (42 percent of the entering freshmen).

The program entered most frequently by new *undergraduate transfer students* remains engineering technology (approximately 25 percent). Computing-related programs were chosen by 12 percent of such students in Fall 1992 and nearly 25 percent in Fall 1996.

Graduate Students' Choice of Major

Seven graduate majors offered in Fall 1992 showed increases over the last five years: applied mathematics, applied physics, architecture, chemical engineering, computer science, engineering management, and management. The largest percentage increase took place in applied physics which doubled from 10 to 20 students. All other majors showed decreases. At the graduate level, the three most frequently chosen programs in both Fall 1992 and Fall 1996 were computer science, management, and electrical engineering.

Among Fall 1992 *full-time* graduate students, the largest programs were: computer science, electrical engineering, and mechanical engineering (53 percent of all full-time graduate students). Among Fall 1996 *full-time* graduate students, the largest programs were: computer science, electrical engineering, and management (53 percent of full-time graduate students).

Among Fall 1992 *part-time* graduate students, the largest programs were: computer science, management, and electrical engineering, (56 percent of the total). Among Fall 1996 *part-time* graduate students, they were computer science, management, and engineering management (42 percent of the total).

New Graduate Student Choice of Major

The programs chosen most frequently by new *graduate students* did not change substantially, but an increasing proportion tended to concentrate in two programs. In both years, the programs most frequently selected were: computer science, management, and electrical engineering. In Fall 1996, 42 percent of first-time graduate students chose either computer science or management compared with 36 percent in Fall 1992.

Bachelor's Degrees Awarded by Major

The total number of bachelor's degrees awarded increased by 20 percent over the last five years. The three programs in which bachelor's degrees were awarded in largest numbers in AY'92 were: electrical engineering, engineering technology, and mechanical engineering (53 percent of the total). In AY'96, the degrees awarded in largest numbers were in engineering technology, mechanical engineering, and electrical engineering (47 percent of the total). The change in distribution of bachelor's degrees awarded reflects the same pattern seen in enrollment --- a decline in the size and number of dominant programs.

Master's Degrees Awarded by Major

The total number of master's degrees awarded decreased by almost 10 percent over the last five years. The number of computer science master's degrees awarded dropped by 25 percent from 252 in AY'92 to 189 in AY'96. Other master's degree programs showing substantial percentage declines included: civil engineering (46 degrees to 25), electrical engineering (99 degrees to 51), biomedical engineering (15 degrees to 6), industrial engineering (11 degrees to 4), manufacturing engineering (25 degrees to 8), applied mathematics (15 degrees to 8), and applied chemistry (17 degrees to 9). The program showing the strongest growth was management (357 percent increase in the number of master's degrees awarded between AY'92 and AY'96, 35 degrees to 160). Growth was also seen in the number of master's degrees awarded in several smaller programs, most notably architecture (13 degrees to 25) and applied physics (0 degrees to 3). The three largest degree programs in AY'92 were: computer science, electrical engineering, and civil engineering (54 percent of all master's degrees awarded). In AY'96 the three most popular programs were: computer science, management, and electrical engineering (61 percent of all master's degrees awarded).

Doctoral Degrees Awarded by Major

The number of doctoral degrees awarded increased from 15 in AY'92 to 40 in AY'96. In AY'92, all 15 degrees were awarded in only four degree programs: chemical engineering (4), civil engineering (2), electrical engineering (4), and mechanical engineering (5). In AY'96, 28 degrees were awarded in these four disciplines. The remaining 12 degrees were awarded in environmental science (2), computer science (8), and transportation (2).

c. Honors College

- **The Albert Dorman Honors College continued its steady growth.**

The total number of students enrolled in the Albert Dorman Honors College increased 96 percent over the last five years (from 180 students in Fall 1992 to 353 students in Fall 1996). The number of honors students in the first-time full-time freshman class doubled from 47 to 94 during the period. In Fall 1992, honors students were approximately 9 percent of the entering class; in Fall 1996, they were 15 percent.

d. Undergraduate Transfer Students

- **New undergraduate transfer students continued to comprise approximately 45 percent of all entering undergraduate students.**

- **Students who entered as transfer students continued to receive approximately 60 percent of all bachelor's degrees awarded.**

New undergraduate transfer students continue to comprise approximately 45 percent of the undergraduate entering class (entering class includes both first-time freshmen and new undergraduate transfer students). The percentage of bachelor's degrees going to students who entered as transfer students stayed the same between AY'92 and AY'96 at approximately 60 percent. Most engineering programs tend to graduate more transfer students than generic freshmen. Of those bachelor's degree programs graduating at least 15 students in both AY'92 and AY'96, only management graduated more students who started as freshmen than transfer students in both years. Architecture shifted from graduating more transfer students to graduating more generic freshmen.

The freshman class is defined as first-time freshmen, freshman transfer students, and continuing freshmen. In both Fall 1992 and Fall 1996, more of the freshman class entered NJIT as first-time students (66 percent in 1992 and 76 percent in 1996) than as freshman transfer students. By the junior year, however, due to the attrition of first-time freshmen and the addition of transfer students, the balance is reversed. In both Fall 1992 and Fall 1996, approximately 55 percent of the junior class entered NJIT as transfer students. On average, 30 percent of new transfer students are part-time students. Approximately 70 percent of part-time undergraduate students entered as transfer students. Approximately 35 percent of full-time undergraduate students entered NJIT as transfer students.

e. Ethnicity and Gender

- **Four of the five ethnicity groups increased in total headcount enrollment. Two also increased substantially as a percentage of the total, largely because the number and percentage of international students declined substantially.**

- **The number and percentage of women students increased in all enrollment categories.**

- **The number of enrolled women in each of the five ethnicity groups increased. The largest gain was made by Hispanic women whose number increased by 42 percent, from 132 to 188.**

- **The number of bachelor's degrees awarded to women increased, primarily in engineering.**

- **A decrease in the number of computer science degrees earned by international students caused the total number of master's degrees awarded to decline.**

- **Master's degrees awarded to women were more concentrated in computer science and management.**

- **At the bachelor's degree level, a substantial shift from engineering technology to engineering took place among Black Non-Hispanic students.**

Total Enrollment by Ethnicity and Gender

Between Fall 1992 and Fall 1996, the numbers of students classified in the categories Black Non-Hispanic, Hispanic, American Indian/Alaskan Native, and Asian/Pacific Islander increased. Hispanic students increased from 691 to 836, resulting in an increase of nearly 2 percent (from 9 percent to 11 percent) as a share of total enrollment. Black Non-Hispanic students increased from 680 to 772 for an increase of 1 percent (from 9 percent to 10 percent) as a share of total enrollment. The number of Asian/Pacific Islanders increased by 8 students, remaining at approximately 15 percent of the entire student body. The number of international students, on the other hand, declined by more than 7 percent from 992 to 919, resulting in a decrease of 1 percent as a share of total enrollment.

The percentage of women in the total student body went from 18 percent (1,379 students) in Fall 1992 to 22 percent (1,721 students) in Fall 1996. An increase was seen in all major enrollment categories (undergraduate, graduate, full-time, part-time) and in all five ethnicity groups. The enrollment of Black Non-Hispanic women and Asian/Pacific Islander women each increased by more than 10 percent during this time period (195 Black Non-Hispanic women enrolled in Fall 1992 and 251 in Fall 1996; 241 Asian/Pacific Islander women enrolled in Fall 1992 and 271 in Fall 1996). The enrollment of Hispanic women grew by 42 percent from a smaller base (from 132 students to 188), and the enrollment of White Non-Hispanic women grew by 28 percent (from 621 students to 795).

Undergraduate Enrollment by Ethnicity and Gender

At the undergraduate level, the distribution of enrollment by ethnicity remained relatively stable. Among all undergraduates, the largest increases in share between Fall 1992 and Fall 1996 took place in the Black Non-Hispanic category (from 11 to 13 percent of the total) and in the Hispanic category (from 12 to 14 percent of the total). White Non-Hispanic representation decreased by 4 percent (from 55 to 51 percent). International students continue to comprise approximately 4 percent of the population.

Among full-time undergraduates, the largest gain was made by Asian/Pacific Islanders (from 19 percent in Fall 1992 to 20 percent in Fall 1996). Black Non-Hispanic enrollment increased from 11 percent to 12 percent of full-time undergraduate enrollment.

Among part-time undergraduates, Black Non-Hispanic representation increased the most (from 12 percent of part-time enrollment to 15 percent). Hispanic enrollment increased from 10 to 12 percent of part-time undergraduate enrollment.

The number of full-time undergraduate women increased by 23 percent from 532 to 657; the number of part-time undergraduate women increased by 31 percent from 235 to 309. In Fall 1992, women were 15 percent of all undergraduates. By Fall 1996, this percentage had risen to 19 percent. This percentage is expected to increase further as women comprised 20 percent of first-time freshmen in Fall 1996 compared to 15 percent in Fall 1992.

Graduate Enrollment by Ethnicity and Gender

At the graduate level, White Non-Hispanic students increased from 52 percent of the graduate student population in Fall 1992 to 55 percent in Fall 1996. The largest gain in the combined enrollment of Black Non-Hispanic and Hispanic graduate students was in full-time enrollment: from 3 to 6 percent of graduate full-time enrollment between Fall 1992 and Fall 1996 (Black Non-Hispanic enrollment went from 2 percent to 3 percent of graduate full-time enrollment while Hispanic enrollment went from 1 percent to 3 percent). The percentage of graduate students who were international students went from 29 percent in Fall 1992 to 25 percent in Fall 1996. Substantial growth took place in the share of women graduate students. In Fall 1992, women were 22 percent of full-time graduate students and 23 percent of all graduate students. In Fall 1996, women were 27 percent of both full-time graduate students and of all graduate students.

Total Degrees Awarded by Ethnicity and Gender

The total number of degrees awarded increased by 6 percent between AY'92 and AY'96 from 1350 to 1428. The number of bachelor's degrees awarded increased by 20 percent, and the number of Ph.D.'s increased by 167 percent from a small base. The number of master's degrees awarded dropped, largely as a result of a planned reduction in the number of international students enrolled. The number of master's degrees awarded to international students fell from 407 in AY'92 to 186 in AY'96 (56 percent of all master's degrees versus 28 percent, respectively). The drop was most significant in computer science. In AY'92, 252 master's degrees in computer science were awarded, of which 136 went to international students (54 percent of all master's degrees in computer science). In AY'96, 189 master's degrees in computer science were awarded (a 25 percent decline), of which 90 went to international students (48 percent of all master's degrees in computer science).

In AY'96 as compared with AY'92, across all degrees, the number of degrees awarded to the combined total of Black Non-Hispanic and Hispanic students rose by 67 percent from 137 to 229 degrees. The number of degrees awarded to Black Non-Hispanic students went from 64 to 109, while the number of degrees awarded to Hispanic students went from 73 to 120. In AY'96, 8 percent of all degrees went to students in the Black Non-Hispanic category compared to 5 percent in AY'92, and 8 percent went to students in the Hispanic category compared to 5 percent in AY'92. The number of degrees awarded to international students declined by 42 percent (from 453 to 261), and 18 percent of all awarded degrees went to international students in AY'96 versus 33 percent in AY'92. The number of degrees awarded to women rose by 24 percent (from 234 to 290) between AY'92 and AY'96. In AY'96, 20 percent of all degrees were awarded to women versus 17 percent in AY'92.

Bachelor's Degrees Awarded by Ethnicity and Gender

The number of bachelor's degrees awarded to Black Non-Hispanic and Hispanic students increased by 42 percent (from 109 in AY'92 to 155 in AY'96). The number awarded to Black Non-Hispanic students increased from 48 to 76, and the number awarded to Hispanic

students rose from 61 to 79. The percentage of bachelor's degrees awarded to Black Non-Hispanic and Hispanic (combined) students rose from 18 percent of all bachelor's degrees to 21 percent. The number of engineering degrees awarded to this combined group increased from 57 to 97 (70 percent), and the number of engineering technology degrees increased by 50 percent (from 18 to 27). Of all bachelor's degrees awarded to Black Non-Hispanic students in AY'96, 64 percent were in engineering compared to 50 percent in AY'92, a significant shift. In AY'96, the programs with the largest shares of the total Black Non-Hispanic graduates were engineering technology (20 percent), electrical engineering (18 percent), and civil engineering (12 percent). The programs with the largest shares of the total Hispanic graduates were electrical engineering (20 percent), engineering technology (15 percent), architecture (9 percent), and mechanical engineering (9 percent).

The number and percentage of all bachelor's degrees awarded to women increased between AY'92 and AY'96 because of a substantial increase in the number of engineering degrees awarded. In AY'92, 83 bachelor's degrees were awarded to women (14 percent of all degrees). Of these 33 degrees were awarded in engineering. In AY'96, these number rose to 107 bachelor's degrees (15 percent of all bachelor's degrees), of which 59 were in engineering. In both years, the degree programs in which the percentages of bachelor's degrees awarded to women was higher than average were architecture, chemical engineering, computer engineering, computer science, industrial engineering, management, statistics and actuarial science, and Science Technology and Society (STS).

Master's Degrees Awarded by Ethnicity and Gender

The number of master's degrees awarded to Black Non-Hispanic and Hispanic (combined) students rose by 157 percent between AY'92 and AY'96, from 4 percent of all master's degrees awarded to 11 percent. In AY'92, Black Non-Hispanic students earned 16 master's degrees while Hispanic students earned 12. In AY'96, these numbers were 31 and 41, respectively. The program awarding the largest number of degrees to Black Non-Hispanic students in both AY'92 and AY'96 was management (nearly 52 percent of all master's degrees awarded to Black Non-Hispanic students in AY'96 compared to 25 percent in AY'92. In AY'92, the largest share of master's degrees awarded to Hispanic students was in electrical engineering (50 percent of all master's degrees awarded to Hispanic students). In AY'96, the most popular major had shifted to management (51 percent of all master's degrees awarded to Hispanic students).

The number of master's degrees awarded to women rose by 18 percent, 27 percent of the total in AY'96 compared to 21 percent in AY'92. Women received 151 master's degrees in AY'92 and 179 in AY'96. The two programs awarding the largest number of degrees to women in both years were computer science and management with a combined total of 49 percent of all master's degrees awarded to women in AY'92, and 58 percent in AY'96.

Doctoral Degrees Awarded by Ethnicity and Gender

In AY'96, 2 Black Non-Hispanic students earned Ph.D. degrees, but no Hispanic student did so. In AY'92 no students in either category earned the Ph.D.

No doctoral degree was awarded to a woman in AY'92. Four women earned doctorates in AY'96. Over the last five years, of the 139 Ph.D.'s awarded, 10 were awarded to women, 2 to Black Non-Hispanic students, and 1 to a Hispanic student.

2. Faculty

- **The number of full-time faculty increased by 5 percent.**
- **The number and percentage of full-time tenure-track faculty with tenure increased marginally.**
- **The number of full-time women faculty increased by almost 30 percent.**
- **The number of full-time Black Non-Hispanic faculty increased from 7 in Fall 1992 to 10 in Fall 1996).**

Between Fall 1992 and Fall 1996, the number of full-time faculty grew by 5 percent from 336 to 354. The percentages of faculty in the upper ranks remained stable: 35 percent at the Distinguished/Full Professor rank, 30 percent at the Associate Professor rank. However, Assistant Professors declined from 25 percent to 20 percent, while the Special Lecturer/Other rank increased from 10 to 15 percent. The percentage of tenure-track faculty holding tenure increased both in number and in percentage of tenure-track faculty (from 186 to 230 faculty with tenure, and from 62 to 75 percent of all tenure-track faculty). The number of women full-time faculty increased from 37 to 47. The distribution of faculty by ethnicity shifted slightly. While the absolute numbers of minority faculty remain small, the changes were significant. In Fall 1996, 78 percent of faculty were White Non-Hispanic compared to 81 percent in Fall 1992. The number of Black Non-Hispanic full-time faculty increased from 7 to 10, while the number of Hispanic faculty remained the same at 4. The number of Asian/Pacific Islander faculty increased by 17 percent from 54 to 63. In both Fall 1992 and Fall 1996, approximately 98 percent of all full-time faculty held the terminal degree in their fields.

3. Facilities

- **Seven major construction projects were completed between 1992 and 1996, increasing NJIT's square footage of usable space by 31 percent.**
- **A branch campus in Mount Laurel, New Jersey was opened.**

Between Fall 1991 and Fall 1996, the NJIT Newark campus and operations grew significantly. The total area of the Newark campus increased from 40 acres to 45 acres. The amount of usable square footage increased by 31 percent from 1,461,837 square feet to 1,908,742 square feet. Nine major construction projects were undertaken, of which the following have been completed:

1. A three-story addition to the electrical engineering building (dedicated in 1992)
2. Central Avenue Building (dedicated in 1992)
3. A 1330-space parking structure (opened January 1993)
4. Total renovation of the University Hall (re-opened January 1994)
5. Council for Higher Education in Newark (CHEN) Building, the first building in University Heights Science Park (opened September 1996).
6. Enterprise Development Center II (EDC II), the second University Heights Science Park building (opened September 1996).
7. The Student Mall which houses the Registrar's Office, Bursar, Financial Aid Office, Computer Store and Repair Facility, PC Labs, Academic Computing, and the Bookstore (opened December 1996).

The major projects started in 1996 and not yet completed are:

- A fourth residence hall with 300 beds (due to open in Fall 1997).

- A Building Sciences Complex to house the School of Architecture, the Department of Civil and Environmental Engineering, and new space for the Dean of Student Services (scheduled to be completed in late 1997).

In addition, in Fall 1995, NJIT, in cooperation with Burlington County College, opened a branch campus in southern New Jersey. This branch campus, called the *Technology and Engineering Center (TEC)*, is located in a new $11 million facility on a 125 acre site in Mount Laurel, New Jersey. This campus serves students seeking engineering and technical education in southern New Jersey.

The 1995 academic year marked the start of a $93.4 million facilities expansion and renovation program. The goal of this ambitious construction program is to provide instructional and student support facilities, modern laboratories, faculty offices, and space to nurture small businesses. Funding for the expansion program comes from a variety of sources including the 1988 Jobs, Education and Competitiveness Bond Act, the Higher Education Facilities Trust, the New Jersey Economic Development Authority, Renewal and Replacement funds from the State of New Jersey, NJIT revenue bonds, grants from New Jersey for compliance with the Americans with Disabilities Act, and private fund-raising.

4. Financial Condition

- **Both expenditures and revenues grew by a third.**

- **Approximately half of all expenditures continued to be salary expenditures (excluding fringe benefits). When fringe benefits are included, personnel costs increased slightly from 60 percent to 62 percent of all expenditures.**

- **Research expenditures from federal sources increased almost 250 percent.**

- **Grants and contracts revenue continued its steady growth.**

- **The endowment nearly tripled from a small base.**

Expenditures

The past five years have seen total expenditures grow by nearly 33 percent, from $108,124,000 to $144,240,000. Growth was seen in all major expenditure categories (e.g., instruction, research, public service). However, the most significant growth was in the expenditure category "Scholarships and Fellowships," a 134 percent increase supporting NJIT's decision to compete more aggressively for honors students. The percentage of all expenditures represented by Scholarships and Fellowships almost doubled (from 5 percent in FY'92 to 9 percent in FY'96). Salary expenditures (excluding fringe benefits) continue to represent approximately 49 percent of expenditures. Personnel expenditures (salary plus fringe benefits) increased slightly as a percentage of all expenditures from 60 percent to 62 percent of all expenditures. Faculty are receiving more outside funding for research. Between FY'92 and FY'96, these expenditures increased by 62 percent from $19,814,000 to $32,023,000. The federal government was the source of much of this funding. Expenditures of federal money increased from $5,778,000 to $20,561,000 (an increase of 256 percent).

Sources of Revenue

Total revenues grew by 32 percent from $109,823,000 in FY'92 to $145,334,000 in FY'96, including dramatic growth from certain sources. Between FY'92 and FY'96, revenues obtained from federal grants and contracts increased by 198 percent from $7,708,000 to $22,973,000 while revenues obtained from state grants and contracts increased by 95 percent from $6,408,000 to $12,522,000. These sources accounted for 24 percent of total revenues in FY'96 versus 13 percent in FY'92. Revenue from both tuition and state appropriations also increased by 23 percent and 15 percent respectively, but each declined slightly as a percentage of all revenue (28 percent in FY'92 versus 26 percent in FY'96 for tuition; 46 percent in FY'92 versus 40 percent in FY'96 for state appropriations).

Endowment

During the past five years, NJIT's total market value of endowment assets increased from $3.6 million in FY'92 to $13.5 in FY'96. If life income funds and irrevocable expectancies are added, the current figure stands at nearly $20 million. This growth occurred almost entirely because of new gifts rather than appreciation of assets or earnings on the endowment portfolio. Gifts and pledges to the university have become larger, on average, over the last

five years. A number of million-dollar gifts and pledges have been received in conjunction with the major fund-raising campaign in progress. Annual donations during the last five years from alumni and friends for purposes other than the Campaign for NJIT increased from approximately $150,000 to $450,000.

5. Economic Development

- **NJIT has started to receive income from royalties.**
- **The first Science Park buildings opened.**
- **Incubator firms have "graduated" from the Economic Development Center.**
- **The number and type of economic development initiatives increased in response to local, state, and national needs.**

Royalties

During the past five years there has also been a significant increase in faculty activity and research productivity. In addition to the increase in outside funding, more faculty were receiving national recognition. One faculty member was a member of the National Academy of Engineering, and four received 1996 Faculty Early Career Development awards from the National Science Foundation. Women faculty achieved the highest faculty ranks in greater numbers. Two were named Distinguished Professor, and 22 percent of tenure track women faculty are now full professors. The number of patents held by NJIT faculty grew to a cumulative total of 16 as of Spring 1996. For the first time, NJIT received income from royalties ($11,115).

Economic and Community Development Activities

Outcomes from NJIT's economic development activity have also accelerated over the last five years. The first Science Park buildings have been completed. One contains expanded space for NJIT's Economic Development Center (EDC). Thirty-eight incubator firms are now in residence. The near-term goal is to have 50 firms in residence. Eighteen firms have "graduated". In addition to Science Park, NJIT has many other economic development partnerships with business, industry, and government.

NJIT also contributes to economic development through its two Advanced Technology Centers (ATC's) – Hazardous Substance Management Research Center (HSMRC) and the Center for Manufacturing Systems (CMS). Each is highly leveraged with private funds. Each has financial and program support from companies that work with them and utilize the results of their research. The ATC's play an important role in stimulating new scientific discoveries, facilitating the creation of start-up companies, generating spin-off companies, helping established companies stay competitive, generating the basis for new commercial applications, and developing leadership positions for critical New Jersey industries. NJIT's

business and industry partnerships have also facilitated the transfer of technology to the marketplace. Increasing numbers of manufacturers are recognizing research universities as attractive hosts and partners for contract research in manufacturing processes and emerging technologies.

NJIT is also involved in joint economic development projects with other colleges and universities. A recent example of this is the 1996 approval by the Commission on Higher Education of a $10 million grant from the New Jersey Higher Education Facilities Trust Fund for the development of a Southern New Jersey Economic Development Network. Partners in the project are NJIT, Burlington County College, Cumberland County College, Georgian Court College, Ocean County College, Salem Community College, and the University of Medicine and Dentistry of New Jersey. The purpose of the grant is to stimulate regional economic development by providing underserved constituencies in Burlington, Cumberland, Ocean, and Salem counties with academic instruction, workforce training, and interactive video conferencing.

In 1995, NJIT received a $12-million grant from the National Institute of Standards and Technology (NIST), an agency of the U.S. Department of Commerce. This grant establishes the New Jersey Manufacturing Extension Partnership (NJMEP), a statewide core organization to which small manufacturers from all industrial sectors can turn for access to services. With a field staff of twenty to thirty statewide, NJMEP will offer services including direct technical and business assistance, seminars and focus groups, and training. The primary task of the field agents is to establish working relationships with manufacturers, developing an understanding of their business needs, and serving as a single point of contact to coordinate solutions to their problems.

Long Range Planning

As a guide to NJIT's plans for the future, the following sections summarize the university's long range goals and the current status of planning:

NJIT's Vision Statement: The Agenda for the Future

The Long Range Planning Process

Academic Planning

Enrollment Planning

Financial Condition and Planning

Facilities Planning and Financing

Information Resources and Services

Outcomes Assessment

NJIT's Vision Statement: The Agenda for the Future

The 1992 Middle States visiting team report included the following advice to NJIT:

> ***"It is suggested that some truly far-reaching goals be added to the strategic plan. Some of these may not be attainable, but it is important for the institution to dare to dream and to become more aggressive about its long-range vision."***

NJIT has taken the recommendation that it "dare to dream" quite literally. Over the past year, as part of its on-going strategic planning process, the university community has developed an entirely new "vision statement." It expresses ideals toward which the university will strive, and it sets forth an ambitious agenda of goals and operating principles that are intended to shape the next phase of the university's history.

A vision statement serves to validate a university's unity of purpose. NJIT's statement will do so by informing the next phase of the university's strategic plan and providing direction to its fund-raising efforts. In the years ahead, the university's Long-Range Planning Committee and its subcommittees will develop priorities and specific implementation strategies designed to effectuate the ideals and principles expressed in NJIT's vision statement.

The statement is reproduced here in full as a guide to NJIT's future.

NJIT Vision Statement

As NJIT looks to the future, its overarching goals are to be a forward-looking research university, operating at the boundary of change, leading the development of new programs and modes of delivery to meet the needs of constituents, and reaching new levels of institutional excellence in service to the people of our community, state, and nation.

The NJIT of the twenty-first century will be a globally-oriented research university widely known for its emphasis on the design, development, management, interpretation, and application of sustainable technology for the benefit of society. The concept of multi-lifecycle education will be an integrating theme for the university's programs.

NJIT's institutional culture will encourage and reward entrepreneurial initiatives on the part of students, faculty, and staff. Programs will place special emphasis on quality and productivity in the context of a global economy. Partnership with private corporations, public agencies, and other research universities, both here and abroad, will be a standard operating mode.

NJIT's campus community will reflect the complexity of a pluralistic society. Its diverse composition will enrich and enhance the educational and cultural dimensions of the entire learning experience.

NJIT's degree programs and curricula will prepare students to assume positions of leadership as professionals and entrepreneurs in a global economy. Its graduates will be engineers, scientists, architects, technologists, managers, social scientists, and policy-makers with a broad understanding of economic, social, and organizational issues; with excellent communication skills as well as specialized technical competence; with the interpersonal skills needed to work well in teams; with social awareness, ethical values, and moral integrity as underpinnings for personal growth and responsible citizenship; and with a record of both practical work experience and community service as components of their education.

NJIT's faculty, administrators, and staff will assist students to meet the university's rigorous academic standards, fully develop their talents, and make their education a life-transforming experience. All will view students' success as the measure of their own effectiveness.

NJIT's research programs will be increasingly interdisciplinary, paralleling its programs of instruction. The further growth of research will be built on a reputation for creativity and dependability in problem-solving. The application of technology to improvements in manufacturing, infrastructure, the environment, information sciences, communications, education, and health care will be the institution's hallmark. Research will be understood to encompass advanced development work leading to commercialization of products as well as more traditional modalities.

NJIT's role in stimulating job creation and economic development will grow and will be widely recognized. Through partnerships and educational programs the university will work to ensure that America's industry remains both economically competitive and environmentally responsible.

NJIT's commitment to the early development of learners who can succeed in a university environment will be manifested through partnerships with elementary and secondary schools and with community colleges.

NJIT's leadership in the development of the "virtual university" through application of distance learning technologies will place it in the forefront of institutions making education available on global information networks and through broadcast, cable, and satellite media.

NJIT's tuition and financial aid policies will enable the university to continue to offer education of the highest quality and provide the opportunity for upward economic and social mobility to individuals whose financial resources may be limited.

NJIT's campus, as well as its academic reputation, will make it an institution of choice for prospective students and faculty. Ample facilities will be built and current facilities will be redesigned to accommodate a broad range of academic, cultural, and social pursuits for both residential and commuting students within an aesthetically pleasing environment. Both instruction and research will make effective use of advanced technologies.

NJIT's academic and student life programs will be so stimulating and its campus so attractive that alumni will look back upon their student experience with affection and gratitude.

The Long-Range Planning Process

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1. *Committee Structure*
2. *"Strategic" Planning*

Rapid institutional development requires careful, thorough planning if it is to be rational and prudent. NJIT has a long tradition of being a planning-driven organization. Since the concept of a technological university was originally broached in 1972, the cycle of strategic planning, goal-setting, annual budgeting, assessing progress, revising goals, and up-dating long-range plans has gone through many iterations. That process continues today, reinvigorated by the successes and national recognition achieved in recent years.

NJIT also recognizes the value and utility of linking the accreditation and planning processes. The 1992 self-study prepared for the Middle States visiting team was also the then-current embodiment of the university's Master Plan. This Periodic Review Report can be viewed as an integral part of the on-going planning process. It includes not only a retrospective progress report, but also the university's most recent assessment of its needs and plans for the future in response to rapidly changing circumstances and new competitive factors.

The following sections, therefore, represent the beginning of a new phase of strategic planning at NJIT. They are based on the university's revised mission and new vision statements, a set of "stretch goals" derived from NJIT's benchmarking process, and discussion of implementation strategies by a number of planning subcommittees.

1. Committee Structure

The heart of the strategic planning process at NJIT is the Long-Range Planning Committee (LRPC), a large committee comprising the assembled academic and administrative leadership of the university as well as representatives from all constituencies of the university community. (See Appendix S for a complete list of members.) In preparing the 1992 self-study, a smaller group composed of LRPC members and chaired by a faculty member acted as a steering committee. The LRPC will provide overall guidance and counsel in the next phase of institutional planning, thus providing an essential element of continuity.

In 1995, the LRPC established the following set of new subcommittees: academic planning, enrollment planning, financial planning, facilities planning, information resources planning, and outcomes assessment. (See Appendix T for a complete list of subcommittee members.) Each subcommittee was asked to identify and formulate key issues and questions, model various alternative scenarios, and discuss their implications before reaching conclusions on a desirable approach. The products of this work are presented in the sections that follow. Some of the subcommittees' work is still in an embryonic stage. In other cases specific

alternatives and recommendations were developed. As the process moves forward, overall guidance will be provided by the LRPC, acting as a steering committee under the chairmanship of President Fenster.

As described elsewhere in this document, NJIT is in the midst of rethinking its undergraduate curricula. Various faculty committees have been formed to consider curricular changes and plan for their implementation. It was necessary to form ad hoc committees for these purposes because many of the changes require team teaching across college lines and integration of material currently presented in several courses. The ad hoc nature of the committees allows great flexibility in the short run. In the longer run, the university will consider institutionalizing one or more of them.

2. "Strategic" Planning

The process described above is considered "strategic" planning in the most literal sense. Its purpose is to define not only a new set of institutional objectives but also the specific means or "strategies" by which they can be achieved and the specific indicators by which progress can be measured.

The next phase of planning posits not merely incremental improvement but a large leap forward as adumbrated in the university's vision statement. Therefore the objectives are "stretch objectives;" that is, they set ambitious targets that challenge the entire university community to "stretch" beyond business-as-usual. Some of the targeted objectives may seem beyond immediate reach.

As a means of defining its objectives, NJIT is employing the technique of "benchmarking." (For a full description, see the section on "Outcomes Assessment," pp. 207-215 and Appendix P.) A benchmark is a quantitative measure of quality. It describes a specific objective and permits the measurement of progress in meeting the objective. This year NJIT expanded the list of benchmark measures and set new 5-year targets. The data will be updated annually. Using current conditions as a baseline, the system allows the university, and all its stakeholders, to assess progress and performance. NJIT's benchmarks include the following measures:

- graduation rate of undergraduate students (as reported to the federal government)
- student/faculty ratio
- number B.S. engineering degrees awarded to members of underrepresented minority groups annually
- number of B.S. engineering degrees awarded to women annually
- number of Ph.D.'s awarded annually

- number of full-time tenure track engineering faculty members
- number of engineering journal publications per full-time tenure track engineering faculty member annually
- federal dollars received annually for sponsored programs
- sponsored program expenditures per full-time engineering faculty member and research associate
- number of gross square feet of facilities on Newark campus
- number of patents held by university researchers (cumulative)
- value of research and development work under contract to industry
- revenues from royalties and licensing activities annually
- number of incubator firms in residence
- number of incubator firm graduates/start-ups (cumulative)
- endowment per full-time equivalent student

Accountability is an essential ingredient of NJIT's planning process. The university engages in the process of benchmarking and disclosure of results because the discipline required by this form of accountability ultimately benefits the university and its constituents.

Academic Planning

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1. *Enrollment*
2. *Stakeholder Satisfaction*
3. *Faculty*
4. *Academic and Research Programs*
5. *Educational Environment*
6. *Conclusion*

In 1995, an Academic Planning Subcommittee of the university's Long-Range Planning Committee was formed to plan for the next phase of institutional and programmatic development. This subcommittee decided to focus on five areas: Enrollment, Stakeholder Satisfaction, Faculty, Academic and Research Programs, and the Education Environment.

1. Enrollment

Over the long run, faculty strength must conform to student demand. In the short run, however, rapid changes in student demand can create temporary disjunctions. To make the problem even more complex, short-term changes in student demand may not accurately signal long-term trends.

At NJIT, the most significant change in student demand appears to be the rapid increase in demand for degree programs that fall into the broad category of "computing" (computer science, computer engineering, and information management). Applications for admission into "computing" majors indicate that the number of freshmen expressing a preference for these majors has nearly doubled during the past two years. These degree programs now attract approximately one third of the freshman class. Continuation of this trend will cause an increase in the faculty devoted to these programs. In the meantime, enrollment must be managed so as to produce the resources needed to respond to the need for faculty and to assure that all students receive a high quality education. Hence, enrollment plans for the next five years constitute the basis for an iterative academic plan. Possible enrollment levels must be combined with financial resources and faculty staffing patterns to develop plans at all levels.

Not all programs and student levels are equally costly. For example, the cost of master's level programs that do not require extensive laboratory facilities is lower than the cost of typical baccalaureate and doctoral programs. Further, programs with low class sizes can be expanded without significant marginal cost increases if additional students can be attracted to enroll in them. Hence, enrollment planning involves not only plans for marketing programs to potential students, but an understanding of the resources that student enrollment in a particular program will require.

For further details on enrollment planning (see pp. 157-170.)

2. Stakeholder Satisfaction

During the fall term of 1995, NJIT engaged a consulting group to conduct a student satisfaction inventory. The survey involved administration of a questionnaire to a representative sample of graduate and undergraduate students. The questions sought to discover the level of importance of and satisfaction with various aspects of the university. In addition to data on national norms for the questions, the consulting group provided some analysis of the data in terms of ethnicity and gender. In cases where there were large differences between the importance of an aspect of the university and students' current level of satisfaction with it, focus groups were formed to explore, in more detail, the specific aspects of a service or function that were not meeting student needs. The intention is to identify specific actions that can be taken to improve students' educational experience at NJIT.

Another extremely important stakeholder is the corporate community. A second consulting group was engaged to assess both the satisfaction of employers with the preparation of NJIT graduates for their first professional positions and the satisfaction of alumni themselves with their preparation for their first jobs. The results of this study are summarized below under "Outcomes Assessment" (see p. 211).

3. Faculty

Faculty currency is extremely important in any university. In the curricula of a technological university much of the subject matter changes more rapidly than in other fields of human knowledge. Further, student demand can change more rapidly than it typically does in a liberal arts college. The net result of these facts is that technological universities more than other institutions must develop ways to deal with faculty currency.

One method of doing this is to limit tenure to faculty whose long-term contribution to NJIT's curricula is relatively certain. While NJIT maintains a large number of temporary and part-time positions in its teaching staff, even this may be insufficient to allow the university to adapt to environmental and technological changes. Therefore, in addition to developing plans for the size and type of faculty needed in each college and program, NJIT is also exploring with its faculty union a new type of longer term non-tenure track teaching professional. The idea is to define positions that would be analogous to the "clinical professorship" that exists at many medical schools.

NJIT uses two methods of faculty development. Each department devotes considerable resources to allow new faculty members to develop as teachers and to establish their research reputation. Each semester the department chairperson meets with new faculty members and reviews their progress. If the chairperson believes a faculty member needs help to improve his/her teaching performance, the chairperson can assign a senior faculty

member whose teaching is known to be of high quality to work with the junior faculty member. The senior faculty member often attends the junior faculty member's classes and then discusses ways of improving teaching performance.

It is important for all faculty members who are on tenure track to remain current in their professions. For tenured faculty members, the chairperson might use methods similar to those used for junior faculty members. More often, however, NJIT relies on more traditional mechanisms to maintain and improve a tenured faculty member's overall performance. The basic method of renewal of these faculty members is through sabbatical leaves. NJIT's sabbatical leave policy allows a faculty member up to one sabbatical leave every 7 years. The terms of compensation are more generous than those offered by most universities, and as generous as those of any university of which we are aware. Faculty members who receive a year-long sabbatical leave receive 80% of their academic year salary. One semester leaves are compensated at full pay. High priority is given to a faculty member who intends to upgrade his/her professional skills by learning new methods of instruction or research at an institution recognized for leadership in the proposed area.

In addition to sabbatical leaves, faculty members can be given teaching release time to plan new courses or curricula. Finally, where appropriate, faculty members are encouraged to work in industry during summers so that they can remain current with industrial practices. In the case of faculty members in engineering technology, even greater stress is placed on such activities.

NJIT intends to determine the level of satisfaction of the faculty and staff with their positions. One survey of women staff members has been completed; however, a much broader investigation is needed.

4. Academic and Research Programs

The end of the Cold War has accentuated the need for technological universities to re-examine their curricula. NJIT seeks to be recognized as a leader in educational reform in engineering and engineering technology education. It has several million dollars of support from the National Science Foundation to support that effort (see pp. 46-47 for a detailed description). However, much more work needs to be done in this and other areas.

NJIT wishes to prepare its graduates to be "complete professionals," one characteristic of which is technical competence. In order to ensure the level of technical competence expected by employers, each student must be ready to pursue and successfully complete a rigorous university curriculum. For example, calculus is the first mathematics course required in every major offered at NJIT. Yet in reality many of our students receive a primary and secondary education that leaves them short of the starting point. Further, more than a third of NJIT's students are children of families in which English is not the native language. To assist students in bridging the gaps in their preparation, NJIT is

developing a "Pre-Professional Program." This program will have two parts: testing and diagnosing the student's deficit, and designing a curriculum to remove the deficit. The pre-professional curriculum will be tailored specifically so that each student can be "mainstreamed" within one year. Typically, this will require an intensive English language program that will bring the student's communication skills up to an appropriate level in one or two semesters. While nearly all of NJIT's students enter with superior mathematics ability, a number require intensive further preparation to begin the mathematically intensive majors that NJIT offers. The Pre-Professional Program builds on elements initiated at NJIT over the past decade. It differs from previous approaches only in the intensity of the remediation offered and the systematic nature of the follow-up on individual students' progress.

Computers and telecommunication are having a profound impact on all aspects of work and education. NJIT wishes to play an important role in both the development and implementation of the technologies that will deliver educational material in the future. However, while it is clear that multimedia, for example, will play a role in the education of young people, it is not yet clear what the specifics of that role will be. To address this and other questions, in 1996 NJIT established a research center devoted to multimedia with applications in education and learning. This center joins NJIT's long term commitment to the development of computer mediated communications through such vehicles as the Center for Computer Conferencing and Communication and the Electronic Information Exchange System (EIES). The multimedia center has initial funding of more than $1 million per year for 5 years from the New Jersey Commission on Science and Technology. The center will address such fundamental research topics as digital compression and hypermedia. It will also address how humans learn through the media and how to prepare materials to promote learning.

NJIT faculty developed EIES nearly two decades ago. As computing platforms changed, so did EIES. With the aid of grants from the Annenberg Foundation and the Sloan Foundation, EIES has evolved into a system which supports the Virtual Classroom (VC). The Virtual Classroom provides an asynchronous vehicle for the type of classroom discussion that has been found effective in promoting learning in a standard classroom. It allows teacher-to-student and student-to-student communications, testing, group work, and other features normally not available in distance education. Using EIES, VC, and standard video technology, NJIT now offers a complete undergraduate curriculum in Information Systems and a masters degree program in Computer Science. The next step in NJIT's technology and educational developments will be the creation of the "Virtual College," that is, the creation of a number of degree offerings though VC and video.

The globalization of markets and companies has had a profound impact on the nature of research and scholarship in technological universities. While it is likely that the federal government will continue to support the lion's share of university research into the next century, corporate funding will likely become ever more important. Over the past decade at least, federal funding sources such as the NSF have stressed the need for industrial ties and matching funds to leverage their funding. This trend is likely to accelerate. Further,

downsizing of companies is likely to create new opportunities for university-based research and development if universities can solve the problem of distilling academically sound research from product and process oriented research projects. Likewise, universities should be seeking commercial applications for more of their current academic research and development work. This effort is already well under way at NJIT.

5. Educational Environment

NJIT degree programs are aimed at the education of professionals. The nature of those professions is changing at a very rapid rate, and the plans of each constituent unit of the university reflects the faculty's plans to adapt the professional component of an NJIT education to these changes.

While these general themes for the development of technological professionals are clear, much work is needed on the broader question of providing an education that will prepare students for life in a world that is quite different from the one that existed when the majority of the faculty were being educated. What is the appropriate liberal arts component in the education of a technological professional? What is the appropriate emphasis on non-western cultures? What is the appropriate mix of courses designed to develop skills such as communications and critical thinking, and those designed to broaden the scope of a student's cultural experience and background? What is the role of a university in the education of students whose secondary education was incomplete? This last question is especially important for a university dedicated to providing opportunity for under-represented groups, many of whom are immigrants.

Furthermore, what role should the university play in economic development activities? In some ways this is the easiest question for NJIT to address because it has adopted economic development as a mission element. But there are many issues that must be addressed and no clear models to follow.

The attempts of the federal government to deal with its budget deficit may portend changes in the way research and graduate education is financed in American universities, and in the areas of research for which federal support will be available in the future. Industry still finances only a small fraction of university research, but may become an important source of support if universities can develop ways to maintain academic depth and integrity while addressing problems industry is willing to fund.

The academic programs NJIT offers must also be better tuned to the needs of the working professional. These programs include those designed for degree credit as well as non-credit. The changes in degree programs are likely to be more gradual than those in programs offered not-for-credit. NJIT's long-term reliance on experienced professionals on its faculty, both full- and part-time, should allow it to adapt quickly to the changes currently underway in the global economy. Nevertheless, the role of non-credit courses, who should teach such courses, and what kinds of rewards should be given for such teaching are among the issues NJIT must address.

6. Conclusion

The Academic Planning Subcommittee of the university's Long Range Planning Committee is currently engaged in the process of refining its statement of these issues and proposing possible solutions. After more study, the alternatives will be presented to the university's standing committees that deal with academic affairs and to the Long Range Planning Committee. NJIT's proposed solutions, and the progress achieved in implementing them, will be important components of the self-study to be prepared for the next Middle States team visit.

Enrollment Planning

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1. Policy Statement on Undergraduate Admissions

The undergraduate admissions policy of any college or university strives to match potential students' interests and abilities with the programs offered by the institution. The effectiveness of an admissions policy is demonstrated by such indicators as the numbers of students recruited, the rate at which they complete degree programs, and the extent to which they can pursue the professional careers of their choice.

As a public institution, NJIT strives to achieve three complementary and mutually reinforcing goals through its undergraduate admissions policies:

1. To attract highly talented students who are fully prepared for the university's rigorous curricular demands and can satisfy the highest academic standards
2. To enroll students from population groups that are under-represented in the professions, while providing the extra academic support they may need
3. To recruit and admit students who will successfully complete one of NJIT's curricula in numbers large enough to make a substantial contribution toward meeting state and national demands for technological and managerial professionals.

To achieve its admissions goals, NJIT uses multiple methods to determine an applicant's admissibility. No single measure is sufficient to predict success. Therefore, all of the following are considered: high school transcripts and rank-in-class data; teachers' recommendations; SAT scores; interviews of candidates seeking admission to the Honors College, conditional admission, or admission through the Educational Opportunity Program; and portfolios for candidates seeking admission to the School of Architecture.

The information gathered on applicants is used to support three special programmatic goals as well as the university's aggregate enrollment objectives each year. These three are:

> NJIT's Albert Dorman Honors College with a program specially designed to challenge students with a past record of exemplary academic accomplishment. The SAT profile of these students yields a composite average score of roughly 1320 (after score recentering by the Educational Testing Service).
>
> NJIT's outstanding Educational Opportunity Program, designed to serve individuals from demographic groups underrepresented in the fields that NJIT prepares students to enter. The success of NJIT's EOP graduates over a quarter century is further proof that multiple criteria should be used in determining who can benefit from the higher education experience.
>
> NJIT's program of "conditional admission," for students whose SAT scores do not seem to reflect adequately their success in high school or their potential for success in college. Typically these students have a high rank in their high school graduating class and a transcript that demonstrates academic success. The performance of this group at NJIT compares favorably to that of regularly admitted students.

NJIT is proud of its student body. Diversity in pursuit of opportunity is a hallmark of the NJIT campus community. As the state's public technological research university, NJIT admits individuals who want to study in the fields it offers, regardless of personal background or family finances. We select those who indicate a strong desire to succeed. For those who do succeed, the experience is life-transforming. We believe that is what a public university is all about in a democratic society.

2. Background

After years of decline in the number of students graduating from New Jersey's high schools, this number has recently begun to increase. This trend, combined with NJIT's growing reputation, is leading to an expansion in the number of First-Time Full-Time Freshmen. In Fall 1996, enrollment of FTFTF reached its highest point in more than a decade, and overall enrollment reached an all-time high. The number of applications from students residing outside New Jersey has increased to more than 22% of the

total. While the yield from out-of-state candidates has not risen to the same level as that from in-state applicants, we expect NJIT's student body to reflect much greater geographic diversity over the next several years.

The following pages provide an update on the university's progress toward meeting the enrollment-related goals stated in NJIT's 1992 Self Study/Strategic Plan. Two sets of undergraduate and graduate enrollment projections are included for the period up to and including the fall semester of 2002. One set offers a "steady state" scenario based on the arbitrary assumption that both internal and external environmental factors will remain relatively constant over this time period. The second set of enrollment projections is based on the assumption that resources to support more significant enrollment growth can be identified; this can be considered an optimal scenario.

3. The Organization of Enrollment Planning

In 1987 NJIT decided to engage more actively in enrollment management. This was a deliberate effort to strengthen university activities designed to influence public perception, to meet market demand for educational programs, to provide a positive institutional climate, and to strive for pricing competitiveness, both through tuition sensitivity analysis and financial aid strategies. Enrollment management is a major component of the university's long-term planning process.

Presently, the Office of Enrollment Planning area includes undergraduate and graduate admissions, registration and records, and financial aid. The Continuing Professional Education area was reorganized in response to a recommendation of the 1992 Middle States team. Both Enrollment Planning and Continuing Professional Education report to the Vice President for Academic and Student Services. This model enables NJIT to coordinate marketing and student recruitment activities across administrative and academic departments and thereby foster a strong institution-wide commitment to student recruitment and enrollment goals.

4. Progress toward Goals

The 1992 Self-Study/Strategic Plan included specific goals regarding undergraduate and graduate enrollment along with objectives to be met and strategies associated with each goal. Many of these strategies have been implemented, and NJIT has either met or made substantial progress toward each of the goals established for 1997. In some cases, the goals have been surpassed. The goals were clustered by student level and demography and are reviewed below in this fashion.

Undergraduate

The enrollment target was to *maintain an undergraduate student population of approximately 5,000 students with a minimum of 3,000 full-time undergraduates.* Since 1992 the total undergraduate student population has averaged 5,110 and full-

time undergraduate enrollment has averaged 3,370. Given this recent history, the enrollment planning subcommittee has recommended that this target be adjusted to maintain a minimum of 3,300 full time undergraduates.

A specific demographic objective was to *achieve a female undergraduate enrollment of 20% of all full-time undergraduate students.* The percentage of women full-time undergraduates continues to increase at the rate of roughly 0.9% per year (from 15.5% in Fall 1992 to 19.2% in Fall 1996). It is expected that the number of full-time undergraduate women will reach the 20% objective in Fall 1997.

A second demographic goal with respect to women was to *achieve a female undergraduate enrollment of 15% of Newark College of Engineering undergraduate students by 1997.* In Fall 1996 the actual level was 14.2%. It is expected that the goal will be reached in Fall 1997.

For the past four years, NJIT has been focusing on increasing its out-of-state undergraduate enrollment. A coordinated plan of expanded recruitment in the mid-Atlantic region including high school visits, college fairs, direct mail, and alumni recruiting is being implemented. In addition, national design competitions in architecture and engineering have been developed, on-campus residential capacity has been increased, and more scholarships have been made available. The Honors College has proved appealing to non-New Jersey students. The initial result was the enrollment of 34 out-of-state freshmen in Fall 1996. The goal is to increase this number gradually, to 46 in Fall 1997, and 70 by Fall 2000.

Graduate

The enrollment target was to maintain *a graduate student population of approximately 2,500.* Since 1992 the total graduate student population has averaged 2,630, mainly because of significant increases in the part-time graduate study body. The enrollment planning subcommittee has recommended that this target be adjusted to maintain a minimum of 2,600 graduate students.

Goals related to doctoral student enrollment and Ph.D. production included *increasing the number of enrolled Ph.D. students to 250 and the completion rate to a minimum of 25 doctoral degrees conferred annually by 1997.* Total doctoral enrollment grew rapidly from 223 in Fall 1992 to 303 in Fall 1996. The number of doctoral degrees awarded annually by NJIT over the same period increased from 15 to 40. Based on recent Ph.D. student enrollment and projections for degree completion, the enrollment planning subcommittee has recommended that this goal be adjusted to maintain a minimum enrollment of 300 Ph.D. students and raise the completion rate to a minimum of 50 doctoral degrees conferred annually by the year 2000.

A specific demographic objective was to *achieve an underrepresented minority graduate enrollment of 10% of full-time graduate students by 1997.* The percentage

of underrepresented minority full-time graduates has increased at a slow but steady rate, from 3.1% in Fall 1992 to 6.5% in Fall 1996. The 10% objective remains in place, and efforts continue to accelerate the rate of increase. However, attainment of the objective is unlikely in Fall 1997.

A second demographic goal with respect to graduate students was *to enroll additional U.S. nationals (citizens and permanent residents) as full-time graduate students so that they comprise 25% of the total by 1997.* In 1996 the actual level was 32.9%. The enrollment planning subcommittee has recommended that the goal be adjusted to reach a minimum of 35% of U.S. nationals (citizens and permanent residents) as full-time graduate students.

5. Enrollment Projections

Newark Campus and Extension Sites

The fall and spring enrollment projections included in this report are of two kinds: a "steady state" estimate and a "best case" scenario which assumes substantial new efforts to achieve stretch goals (see pp. 167-168). Also included are "steady state" and "best case" enrollment projections for the summer session (p. 169). Separate projections have been developed for the Technology and Engineering Center (p. 170).

Full-Time Undergraduates

The market for New Jersey students pursuing higher education continues to be very competitive. Nearly 40% of the state's high school graduates who attend college do so at out-of-state institutions. Out-migration is particularly prevalent among high achieving high school graduates. In 1993 NJIT established the Albert Dorman Honors College which is designed specifically to satisfy the programmatic demands and abilities of such students. Enrollment in the Honors College has grown substantially, and an enrollment target of 500 students by the year 2002 has been set.

NJIT's competitor mix has been changing slowly but steadily, indicating a positive shift in the perceptions of students and their families. Rutgers University and Stevens Institute of Technology continue to be high on the list of accepted freshmen who choose not to enroll at NJIT. Since Trenton State College (now known as The College of New Jersey) began offering an engineering program, applications now overlap more frequently. Data provided by The College Board indicate that NJIT's competitors include institutions that are more selective and more widely dispersed geographically than was the case just five years ago. In 1995, NJIT received a larger percentage of test score reports from students who also had their scores sent to institutions such as New York University, Boston University, and Georgia Tech. It is likely that NJIT's competitor list will include Columbia University's School of Engineering, Carnegie Mellon, and the University of Pennsylvania in the very near future.

The decision to seek a larger number of better qualified students meant that NJIT had to become more active in the merit scholarship arena. A substantial endowment will be required to help support an enlarged merit scholarship program, and this is a central goal of the fund-raising campaign. In 1994, a special "Honors Recruiter" position was created in the Undergraduate Admissions office, and the Enrollment Planning staff developed a merit-based scholarship strategy (based on high school rank in class and SAT scores) in order to attract high ability first-time, full-time freshmen. The initial results were the largest freshman cohort in the Honors College (94) and a significant increase in the SAT profile of the entire entering freshman class in Fall 1996. The strategy has been modified to reflect SAT recentering and continues to be utilized by the Undergraduate Admissions office.

The Undergraduate Admissions staff develop targets for first-time, full-time freshmen each year. These targets provide direction for the design of recruitment strategies and activities. Projections call for a moderate increase in the size of the entering freshman class (to 700 in Fall 2000), and they reflect the desire to continue recent progress toward a profile that reflects higher academic achievement and greater ethnic and geographic diversity in the freshman class.

The Educational Opportunity Program (EOP) continues to attract better-prepared students. Recruitment activities have been expanded so that NJIT now aggressively seeks EOP students statewide. The EOP and Undergraduate Admission staffs work together to coordinate recruiting and application processing activities. This operational change was achieved through a Total Quality Management project sponsored by the office of the Dean of Student Services. Additional cooperative activities are currently under discussion including the elimination of the separate EOP admissions application form.

Attracting a larger number of women has been a priority for many years. As indicated earlier, progress toward the 20% full-time undergraduate enrollment goal is encouraging, and the goal should be reached by Fall 1997. The opening of the Constance Murray Woman's Center, combined with other activities such as increasing the number of women faculty (both full-time and adjunct), developing an alumni mentoring program for female undergraduates, and sensitizing male faculty to women's issues and concerns especially as they relate to the classroom environment, should make it possible for NJIT to reach a level of 23% female, full-time undergraduates by the year 2002.

Transfer students from two and four-year colleges represented approximately 37% of NJIT's full-time undergraduate study body in Fall 1995. Most transfers come via the New Jersey community colleges. NJIT has developed joint admissions agreements with 6 of these institutions (Burlington, Essex, Mercer, Middlesex, Ocean, and Union), and agreements are being developed with other two year institutions both in New Jersey and New York. Assuming that more families will look for and find value and

quality in community colleges, especially those that have program-to-program articulation and joint admissions agreements with respected four-year institutions, it is expected that these colleges will continue to be an important source of undergraduate transfer students. NJIT's partnership with the community college sector is also illustrated by the opening of the Technology and Engineering Center in Mt. Laurel, operated jointly by NJIT and Burlington County College.

Further improvements in the quality of student life will also contribute to NJIT's enrollment objectives. With the opening of a fourth residence hall in September of 1997, NJIT will have the capacity to provide on-campus housing for approximately 35% of the full-time undergraduate student population. The movement toward a more residential student body requires further improvements in student life, additional student activities programming, and more interior spaces that foster student interaction. Enhancements of the dining setting and meal plan options for residential students are also being planned. Improvements underway in student life and campus appearance will facilitate the effort to attract more out-of-state students.

Steady State Projection: The steady state model calls for an increase of 30 full-time undergraduates per year as a result of increased recruitment activities and improved student retention.

Best Case Projection: The best case projection is the same as the steady state projection. Rather than attempting to grow faster, the subcommittee recommends that selectivity be increased by expanding the merit-based scholarship program when resources permit.

Part-Time Undergraduates

Enrollment of part-time undergraduates declined from 1989 to 1994. Competition for part-time evening students has become more intense as NJIT's tuition has increased and other four-year colleges in New Jersey have developed B.S. degree programs designed specifically for working students. The market for part-time, evening students taking one or two courses per semester on the Newark campus appears to be weakening, suggesting a need to reassess NJIT's position.

The enrollment planning subcommittee has recommended that NJIT consider offering a "winter session" in January between the fall and spring semesters. A three-week term would enable students to complete a course and thereby lighten their academic load during the regular semesters. A winter session would also appeal to students from other colleges who need to take a particular course while they are on winter break. This schedule might be attractive to students at Rutgers University-Newark as well as those who may want or need to take a course in an abbreviated time period. A 5-week term should also be explored since it would allow more courses to be offered in this foreshortened mode. Additional weekend programs should also be considered.

Steady State Projection: The steady state projection calls for stability in the headcount enrollment of part-time undergraduates.

Best Case Projection: The best case projection is based on the assumption that an additional 20 students per year can be attracted to NJIT as a result of distance learning programs, undergraduate courses offered at Extension Sites, and offering more undergraduate courses at times that would appeal to traditional and non-traditional students.

Full-Time Graduates

The recruitment of graduate students is a shared responsibility at NJIT. Full-time graduate students are recruited by the academic departments, research centers, the Graduate Studies office, and the Graduate Admissions office. Part-time graduate students are recruited by the academic departments, the Graduate Admissions office, the Extension Programs office, and the Distance Learning office. Publications, advertising, field recruitment, and direct mail activities are coordinated.

After declining in Fall 1993 and Fall 1994, the full-time graduate student population stabilized in Fall 1995. The aggregate numbers reflect a decline in full-time enrollments in master's programs, but mask the rapid growth that has taken place in the number of Ph.D. students. In Fall 1992 NJIT enrolled 1,041 full-time graduate students of whom 223 (21%) were full-time doctoral students. In Fall 1996 there were 303 full-time doctoral students, 29% of the total of 1,037 full-time graduate students. As a result of this shift, the proportion of Ph.D. students is reaching a more desirable level. The steady state model anticipates that the number of full-time graduate students will remain near current levels. It assumes an ability to continue to support graduate students, particularly the critical number of Ph.D. students needed to meet the goal of 50 degrees per year.

Steady State Projection: The steady state projection calls for stability in the headcount of full-time graduate students.

Best Case Projection: The best case projection reflects an annual increase of 15 full-time graduate students and is based on the assumption that additional resources would be obtained in order to provide financial support for doctoral students and master's level students who have the potential for doctoral study.

Part-Time Graduates

Part-time graduate students now represent the fastest growing segment of NJIT's student population. This is the result of restructuring the Continuing Professional Education area, the addition of new off-campus extension and corporate sites, the

development of graduate certificates tailored for working professionals, and new offerings of graduate courses, certificates, and a full master's degree program through distance learning.

Steady State Projection: The steady state projection calls for an additional 35 part-time graduate students per year.

Best Case Projection: The best case projection reflects 25 part-time students above the steady state projection to a total of 60 additional part-time graduate students each year. This projection is attainable if resources are available to acquire the equipment needed to significantly expand distance learning activities.

Summer Enrollment

Summer enrollment has fluctuated during the past several years, but the overall trend in headcount enrollment is positive. The increase is a result of offering summer graduate courses at NJIT branch campuses and extension sites and an increased demand for on-campus undergraduate courses. The enrollment planning subcommittee has recommended that NJIT take advantage of existing opportunities to expand the scope of its summer session programs.

Building on its success in offering graduate courses at branch campuses and extension sites, NJIT could expand its offerings to include undergraduate courses at locations more convenient to the many New Jersey college students who spend the summer at home. The university could also replicate its Summer Academy for High School Students at selected locations throughout the state. Distance learning courses should be marketed aggressively to college students throughout the region, thereby encouraging more students to take NJIT courses during the summer.

Increasing the on-campus enrollment could be accomplished in several ways. One is to provide students with a formal full-time option during the summer term combined with an attractively priced on-campus housing plan. Another is to increase the number of summer physical education camps for high school students, offering them the option of taking the camp/course as a one-credit physical education course. Finally, a Summer Intensive English Language Program should be developed.

Steady State Projection: The steady state projection calls for an additional 75 students per year.

Best Case Projection: The best case projection reflects 75 students above the steady state projection to a total of 150 additional students each year. This projection could be attained by increasing marketing activities and developing specialized programs that would appeal to prospective credit-course taking audiences during the summer.

The Technology and Engineering Center (TEC)

NJIT's branch campus in Mt. Laurel, which opened in 1995, is described on pp. 79-81 of this report. First-time, full time freshmen were admitted at the TEC in the fall semester of 1996. The joint B.S. degree program in Nursing, offered cooperatively by NJIT and the University of Medicine and Dentistry, was also launched at that time. The majority of students currently enrolled at the TEC are part-time. The emphasis on part-time enrollment will continue, but the number of full time undergraduate students will increase steadily over the next 4 years before reaching steady state. The establishment of a School of Engineering at Rowan College of New Jersey (in nearby Gloucester County) has intensified the competition for engineering students.

Additional degree and certificate programs will be introduced at the TEC based on market demand and our ability to staff these programs and provide appropriate administrative, academic, and student support services.

Steady State Projection: The steady state projection calls for an additional 80-90 students in each of the next three years, with somewhat slower growth thereafter, to reach a target enrollment of 745 in the fall semester of 2002. This assumes the availability of sufficient classroom and laboratory space.

Best Case Projection: The best case projection reflects accelerated growth beyond the steady state projection. The projected enrollment of 850 students could be attained through increased marketing activities, the introduction of high demand programs, and efforts to assist students in locating housing accommodations near the TEC campus.

NJIT: Main Campus & Extension Sites

Actual and Projected Enrollment

Fall Semesters: 1992-2002

Steady State Projection

Year	FTUG	PTUG	FTG	PTG	TOTAL
Actual 1992	3420	1643	1041	1593	7697
Actual 1993	3354	1603	981	1613	7551
Actual 1994	3444	1529	911	1620	7504
Actual 1995	3397	1645	1038	1805	7885
Actual 1996	3413	1594	1037	1793	7837
Projected 1997	3443	1594	1037	1828	7902
Projected 1998	3473	1594	1037	1863	7967
Projected 1999	3503	1594	1037	1898	8032
Projected 2000	3533	1594	1037	1933	8097
Projected 2001	3563	1594	1037	1968	8162
Projected 2002	3593	1594	1037	2003	8227

Best Case Projection

Year	FTUG	PTUG	FTG	PTG	TOTAL
Actual 1992	3420	1643	1041	1593	7697
Actual 1993	3354	1603	981	1613	7551
Actual 1994	3444	1529	911	1620	7504
Actual 1995	3397	1645	1038	1805	7885
Actual 1996	3413	1594	1037	1793	7837
Projected 1997	3443	1614	1052	1853	7962
Projected 1998	3473	1634	1067	1913	8087
Projected 1999	3503	1654	1082	1973	8212
Projected 2000	3533	1674	1097	2033	8337
Projected 2001	3563	1694	1112	2093	8462
Projected 2002	3593	1714	1127	2153	8587

Projections as of 3/1/97

NJIT: Main Campus & Extension Sites

Actual and Projected Enrollment

Spring Semesters: 1992-2002

Steady State Projection

Year	FTUG	PTUG	FTG	PTG	TOTAL
Actual 1992	3052	1602	965	1474	7093
Actual 1993	3154	1551	915	1549	7169
Actual 1994	3119	1489	908	1460	6976
Actual 1995	3220	1476	889	1588	7173
Actual 1996	3166	1510	996	1705	7377
Projected 1997	3196	1510	996	1740	7442
Projected 1998	3226	1510	996	1775	7507
Projected 1999	3256	1510	996	1810	7572
Projected 2000	3286	1510	996	1845	7637
Projected 2001	3316	1510	996	1880	7702
Projected 2002	3346	1510	996	1915	7767

Best Case Projection

Year	FTUG	PTUG	FTG	PTG	TOTAL
Actual 1992	3052	1602	965	1474	7093
Actual 1993	3154	1551	915	1549	7169
Actual 1994	3119	1489	908	1460	6976
Actual 1995	3220	1476	889	1588	7173
Actual 1996	3166	1510	996	1705	7377
Projected 1997	3196	1530	1011	1765	7502
Projected 1998	3226	1550	1026	1825	7627
Projected 1999	3256	1570	1041	1885	7752
Projected 2000	3286	1590	1056	1945	7877
Projected 2001	3316	1610	1071	2005	8002
Projected 2002	3346	1630	1086	2065	8127

Projections as of 3/1/97

NJIT: Main Campus & Extension Sites

Actual and Projected Enrollment

Summer Sessions: 1992-2002

Steady State Projection

Year	UG	G	TOTAL
Actual 1992	1936	495	2431
Actual 1993	2095	525	2620
Actual 1994	1902	395	2297
Actual 1995	2203	595	2798
Actual 1996	2120	699	2819
Projected 1997	2175	719	2894
Projected 1998	2230	739	2969
Projected 1999	2285	759	3044
Projected 2000	2340	779	3119
Projected 2001	2395	799	3194
Projected 2002	2450	819	3269

Best Case Projection

Year	UG	G	TOTAL
Actual 1992	1936	495	2431
Actual 1993	2095	525	2620
Actual 1994	1902	395	2297
Actual 1995	2203	595	2798
Actual 1996	2120	699	2819
Projected 1997	2230	739	2969
Projected 1998	2340	779	3119
Projected 1999	2450	819	3269
Projected 2000	2560	859	3419
Projected 2001	2670	899	3569
Projected 2002	2780	939	3719

Projections as of 3/1/97

NJIT: Technology and Engineering Center

Actual and Projected Enrollment

Fall Semesters: 1996-2002

Steady State Projection

Year	FTUG	PTUG	FTG**	PTG	TOTAL
Actual 1996	25	88	0	176	289
Projected 1997	63	100	13	200	376
Projected 1998*	90	125	15	230	460
Projected 1999	120	150	20	260	550
Projected 2000	150	175	20	290	635
Projected 2001	150	200	20	320	690
Projected 2002	150	225	20	350	745

Best Case Projection

Year	FTUG	PTUG	FTG**	PTG	TOTAL
Actual 1996	25	88	0	176	289
Projected 1997	63	100	13	200	376
Projected 1998*	100	130	15	240	485
Projected 1999	140	160	20	280	600
Projected 2000	180	190	20	320	710
Projected 2001	180	220	20	360	780
Projected 2002	180	250	20	400	850

* By 1998 we will begin to experience a shortage of classroom space.

** Includes Executive Management Program

Projections as of 3/1/97

Financial Condition and Planning

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1. *Current Financial Status*
2. *Five-Year Revenue and Expenditure History and Projections*
3. *The Outlook for Research Funding*
4. *Fund Raising: The Campaign for NJIT*
    - *Endowment*
    - *The Campaign for NJIT*
    - *Endowment and the Campaign*
    - *Capital Projects*
    - *Sources of Support*

NJIT has a history of sound financial planning and budgeting. Revenues and expenditures have remained in balance every year despite unanticipated last-minute changes in the revenues budgeted and appropriated by the State of New Jersey. The university's general financial strength is reflected in Standard & Poor's debt rating of A+ and Moody's rating of A, both issued in connection with NJIT's most recent borrowing of $33 million in October 1995 to cover capital projects. The total included funds to match a $12.9 million grant from the State of New Jersey and $12 million for a fourth residence hall. The university intends to remain faithful to a conservative philosophy in finance even as it pursues an ambitious academic agenda, builds a larger campus in Newark, and continues to expand the Technology and Engineering Center in Mount Laurel.

1. Current Financial Status

The university's working budget for FY'97 is in the neighborhood of $150 million. Based on current rates of revenue realization and actual expenditures, the year will end with a small surplus that will be expensed as a non-mandatory transfer. The fact that the budget is in balance this year despite the State's decision not to fund collectively bargained salary increases confirms the wisdom of prudent planning and careful control. Balance will be achieved this year by taking a number of steps including: increases in tuition and fees and maintenance of high enrollment levels, achievement of targeted levels of employee attrition and deferral of certain hiring programs, limitation of "other than personnel" expenditure budgets, and utility savings.

2. Five-Year Revenue and Expenditure History and Projections

Shown on the first page of Table I is a five year history of revenues, expenditures, and transfers based on the annual audits of the university and a five year projection for the same categories. The second page displays the assumptions on which the projections are based.

NEW JERSEY INSTITUTE OF TECHNOLOGY
FISCAL YEAR REVENUE & EXPENDITURE TRENDS FOR CURRENT FUNDS
($000'S)

$000'S REVENUE DISTRIBUTION	HISTORICAL TRENDS (SOURCE: ANNUAL FINANCIAL STATEMENTS) FY92 ACTUAL	FY93 ACTUAL	FY94 ACTUAL	FY95 ACTUAL	FY96 ACTUAL	FUTURE ESTIMATES FY97 ESTIMATED	FY98 ESTIMATED	FY99 ESTIMATED	FY2000 ESTIMATED	FY2001 ESTIMATED
ate Appropriations	50,315	49,319	52,137	57,487	58,085	57,324	57,979	64,060	66,315	68,648
uition & Fees	30,884	32,848	33,878	34,985	38,104	40,393	42,379	43,746	45,527	47,380
ederal Grants/Contracts	3,918	10,788	14,962	17,455	22,973	24,191	24,191	25,401	26,671	28,004
ate Grants/Contracts/Other	13,654	15,094	12,007	10,964	12,522	13,851	14,544	14,544	14,544	14,544
ivate Gifts, Grants, Contracts	5,164	3,080	6,034	4,180	5,940	4,641	5,221	5,874	6,461	7,107
ner Sources	950	1,551	1,471	2,928	3,005	4,089	4,212	4,338	4,468	4,602
xiliary Sources	4,938	3,985	4,211	4,457	4,705	4,861	5,411	6,414	6,625	6,845
TAL REVENUE SOURCES	109,823	116,665	124,700	132,456	145,334	149,350	153,910	164,350	170,584	177,130
% CHANGE	6.20%	6.23%	6.89%	6.22%	9.72%	2.76%	3.05%	6.78%	3.79%	3.84%
$000'S EXPENSE DISTRIBUTION										
truction	36,134	36,521	37,449	40,658	41,583	42,252	44,097	45,969	47,272	48,621
search	20,186	21,632	22,991	24,882	32,023	34,237	35,632	37,621	39,608	41,722
olic Service	1,160	1,144	1,481	1,217	810	1,000	1,050	1,100	1,150	1,200
demic Support	10,600	10,922	10,678	11,103	12,555	13,000	13,517	13,978	14,368	14,770
dent Services	5,714	5,340	5,753	6,131	6,383	6,400	6,645	6,871	7,053	7,241
olarships & Fellowships	5,832	11,520	12,112	12,728	13,625	15,400	16,391	17,111	18,033	19,001
tutional Support	12,837	12,249	13,871	14,758	15,350	15,500	16,116	16,647	17,118	17,604
sical Plant	9,117	9,253	9,553	10,985	13,359	11,500	12,218	12,790	13,430	14,099
Service/Transfers	3,305	4,099	6,601	5,537	4,941	5,200	2,831	5,848	5,925	6,026
iary Services	4,938	3,985	4,211	4,457	4,705	4,861	5,411	6,414	6,625	6,845
AL EXPENSES/TRANSFERS	109,823	116,665	124,700	132,456	145,334	149,350	153,910	164,349	170,583	177,130
variance	0	0	0	0	0	0	0	0	0	0
	6.20%	6.23%	6.89%	6.22%	9.72%	2.76%	3.05%	6.78%	3.79%	3.84%

INCOME ASSUMPTIONS

	ANNUAL CHANGE	FY98	FY99	FY2000	FY2001
STATE APPROPRIATIONS					
BASE($)	previous year value + salary prog	45,606	48,226	50,995	52,799
%SUPPORTED BY THE STATE		100.00%	100.00%	100.00%	100.00%
SALARY PROGRAM($)	BB-108 data	2,620	2,769	1,804	1,867
%SUPPORTED BY THE STATE		0.00%	100.00%	100.00%	100.00%
FRINGES($)	previous year value + 25% of sal prog	12,373	13,065	13,516	13,983
%SUPPORTED BY THE STATE		100.00%	100.00%	100.00%	100.00%
SUBTOTAL STATE APPROP.		57,979	64,060	66,315	68,648
BASE SALARIES(FROM BB-108)		46,149	48,768	51,538	52,342
SAL PROG AS % OF BASE		5.68%	5.68%	3.50%	3.50%
TUITION AND FEES					
	inflation +2% for FY98				
	future years - increase equals rate of inflation	5.00%	3.00%	4.00%	4.00%
	increase applied to tuition component only	84.00%	84.00%	84.00%	84.00%
	plus new students(60 per year)	60	60	60	60
	TUITION RATE	FY97 4,633	FY98 4,865	FY99 5,011	FY2000 5,211
FEDERAL GRANTS/ CONTRACTS	rate of growth is based on materials published in the 'Periodic Review Report..."	0.00%	5.00%	5.00%	5.00%
STATE GRANTS/ CONTRACTS/OTHER	rate of growth is based on materials published in the 'Periodic Review Report..."	5.00%	0.00%	0.00%	0.00%
PRIVATE GIFTS/ GRANTS/CONTRACTS	rate of growth is based on materials published in the 'Periodic Review Report..."	12.50%	12.50%	10.00%	10.00%
OTHER SOURCES	estimated rate of increase	3.00%	3.00%	3.00%	3.00%
AUXILIARY SOURCES	parking	750	750	750	750
	bookstore	160	160	160	160
	aldan dining	180	180	180	180
	vending machines	50	50	50	50
	subtotal other than resid. halls:	1,140	1,140	1,140	1,140
	residence halls				
	base	3,721	4,271	5,274	5,485
	new dorm full capacity	289	289	0	0
	new dorm % additional occupancy	30.00%	70.00%	0.00%	0.00%
	dorm rate adjusted for inflation	4.000	4.200	4.326	4.499
	add'l revenue from new dorm:	347	850	0	0
	base adjusted for new dorm:	4,068	5,121	5,274	5,485
	rate of increase equals inflation	5.00%	3.00%	4.00%	4.00%
	subtotal residence halls:	4,271	5,274	5,485	5,705
	TOTAL AUXILIARY SOURCES:	5,411	6,414	6,625	6,845

EXPENSE ASSUMPTIONS

	ANNUAL CHANGE	FY98	FY99	FY2000	FY2001
INSTRUCTION	previous year value + salary prog				
	total salary program(BB-108)	2,620	2,769	1,804	1,867
	% sal prog applicable to instruct	63.45%	63.45%	63.45%	63.45%
	total sal prog for instruct:	1,662	1,757	1,145	1,185
	O-T-P increases by the rate of inflation	5.00%	3.00%	4.00%	4.00%
	O-T-P as % of total expenses(FY96 data)	8.66%	8.66%	8.66%	8.66%
RESEARCH					
	increase in Fed/State/Private/Other revenues	1,395	1,989	1,988	2,114
PUBLIC SERVICE	previous year value + conservative growth of CPE	50	50	50	50
	programs				
ACAD SUPPORT	previous year value + salary prog				
	total salary program(BB-108)	2,620	2,769	1,804	1,867
	% sal prog applicable to acad supp	12.18%	12.18%	12.18%	12.18%
	total sal prog for acad supp.:	319	337	220	227
	O-T-P increases by the rate of inflation	5.00%	3.00%	4.00%	4.00%
	O-T-P as % of total expenses(FY96 data)	30.46%	30.46%	30.46%	30.46%
STUDENT SERV.	previous year value + salary prog				
	total salary program(BB-108)	2,620	2,769	1,804	1,867
	% sal prog applicable to stud serv	6.41%	6.41%	6.41%	6.41%
	total sal prog for stud serv.:	168	177	116	120
	O-T-P increases by the rate of inflation	5.00%	3.00%	4.00%	4.00%
	O-T-P as % of total expenses(FY96 data)	24.22%	24.22%	24.22%	24.22%
SCHOLARSHIPS/ FELLOWSHIPS	rate of growth equals the rate of tuition increase plus new awards at rates adjusted for tuit increase	5.00%	3.00%	4.00%	4.00%
	new undergraduate awards	25	25	25	25
	tuition rate	4.865	5.011	5.211	5.419
	new graduate awards	15	15	15	15
	tuition rate	6.657	6.857	7.131	7.416
INSTITUTIONAL SUPPORT	previous year value + salary prog				
	total salary program(BB-108)	2,620	2,769	1,804	1,867
	% sal prog applicable to inst supp	13.00%	13.00%	13.00%	13.00%
	total sal prog for inst supp.:	341	360	234	243
	O-T-P increases by the rate of inflation	5.00%	3.00%	4.00%	4.00%
	O-T-P as % of total expenses(FY96 data)	35.49%	35.49%	35.49%	35.49%
PHYSICAL PLANT	previous year value + salary prog				
	total salary program(BB-108)	2,620	2,769	1,804	1,867
	% sal prog applicable to phys plant	4.96%	4.96%	4.96%	4.96%
	total sal prog for phys plant.:	130	137	89	93
	increase in utilities equals the rate of increase of inflation (FY97 unitities eq. $3,000,00)	150 5.00%	155 3.00%	161 4.00%	167 4.00%
	total increase in phys. plant	280	292	250	260
	O-T-P increases by the rate of inflation	5.00%	3.00%	4.00%	4.00%
	O-T-P as % of total expenses(FY96 data)	76.26%	76.26%	76.26%	76.26%
AUXILIARY SERVICES	Auxiliary Direct Expenses(adjust for inflat)	3.00%	3.00%	4.00%	4.00%
	Parking	36	37	39	40
	Residence Halls	1,476	1,520	1,581	1,644
	Aldan Dining Services	29	30	31	32
	Bookstore	4	4	4	4
	Subtotal Auxiliary Direct Expenses	1,545	1,591	1,655	1,721
	Auxiliary Debt Serv(Aux Rev - Aux Dir Exp	3,866	4,823	4,970	5,124
	Total Auxiliary Services:	5,411	6,414	6,625	6,845
DEBT SERVICE/ TRANSFERS	Debt Service				
	Available from Auxiliary Net Revenue	3,866	4,823	4,970	5,124
	Required from Current Unrestrict. Fund	2,634	1,777	1,630	1,576
	Total Debt Service:	6,500	6,600	6,600	6,700
	Transfers to (from) Fund Balance	197	4071	4295	4450

While the model presented here projects no net surpluses, it should be noted that it includes non-mandatory transfers which provide flexibility within the budget. The assumptions are generally conservative in nature. However, as part of the planning process, various other sets of assumptions about enrollment, salaries, inflation, state support, and other variables have been tested in order to understand the potential effects of scenarios different from the one projected here.

The projections in Table I reflect the best thinking of a number of university offices and planning task forces. The tuition and fees revenue projections are partly a function of the enrollment projections developed by the Office of Enrollment Planning. In addition to moderate increases in per capita charges, they also reflect anticipated changes in the size of the entering class and improved retention rates. An enrollment planning module was used to project net revenue attributable to future enrollment increases. In addition to the normal costs of instruction, the model considers the cost of recruitment, the cost of providing a personal computer for each incoming full time freshman, financial aid requirements, and a contribution to the Deans' Fund. These are deducted from the gross tuition receipts to calculate the net tuition income (see Appendix L).

The budget planning effort includes other detailed modules. Projected revenues from grants and contracts were developed by the Office of Research and Sponsored Programs and a resulting estimate of net overhead revenue is included in the budget projections. Projected income from permanent endowment has been allocated to appropriate spending categories.

As a publicly supported research university, NJIT is dependent on the State of New Jersey for operating support. However, the university's entrepreneurial efforts have made it less dependent on the State in recent years. Over the last ten years the total budget has grown at a rate far exceeding the rate of growth of State support (see Table II). Presently, New Jersey is in the third year of operation under a new governance structure for higher education. As described elsewhere, the Office of the Chancellor, a Cabinet level position, and the State Department of Higher Education were eliminated in 1994. A Commission on Higher Education headed by an Executive Director was created to carry on certain functions, including advocacy. In the first two years under the new structure, overall funding for higher education grew modestly. For FY 1998, NJIT requested an appropriation of $51.6 million in the budget proposal it submitted to the Governor and State Legislature. The Executive Budget recommended $45.6 million, which is level with the current year's final adjusted appropriation. Final action by the Legislature is anticipated by July 1, 1997. NJIT has been an active participant in the new budget process. University representatives have served on several committees and task forces dealing with financing, new program review, and student assistance. The university will continue to assess its budget planning process as further changes occur.

The university is also continuing to refine its internal budget allocation process. During the 1995-96 academic year, an on-line system for reporting of faculty load was developed. The system is based on a set of uniform major categories to be used by all departments, with subcategories that may be defined by the various levels of academic management.

TABLE II

NEW JERSEY INSTITUTE OF TECHNOLOGY
ANNUAL STATE APPROPRIATIONS AND TOTAL BUDGET
BASE APPROPRIATION + STATE SUPPORTED FRINGE BENEFITS

FISCAL YEAR	BASE STATE APPROP	STATE FRINGE BENEFITS	TOTAL N J STATE SUPPORT	TOTAL OTHER SUPPORT	TOTAL BUDGET
FY88	$37,980	$3,856	$41,836	$41,493	$83,329
FY89	$41,179	$4,278	$45,457	$46,184	$91,641
FY 90	$42,023	$5,771	$47,794	$56,124	$103,918
FY 91	$38,308	$7,301	$45,609	$57,799	$103,408
FY 92	$41,383	$8,932	$50,315	$59,508	$109,823
FY 93	$40,835	$8,484	$49,319	$67,346	$116,665
FY 94	$41,890	$10,247	$52,137	$72,563	$124,700
FY 95	$44,461	$13,026	$57,487	$74,969	$132,456
FY96	$44,883	$13,202	$58,085	$87,249	$145,334
FY97	$45,606	$11,718	$57,324	$92,026	$149,350

1) **FY 88 TO FY 96 - Annual University & Foundation Audits.**

2) **FY 97 - Estimated Annual Budget at Midyear.**

Appendix N contains a sample report and a related set of terms and definitions. The new reporting system was used for the first time in the Fall 1996 semester across all departments.

The results of the faculty load reporting system will be compared with an Instruction and Departmental Research model which projects faculty lines and salaries based on enrollments. Appendix O contains a sample of this second kind of report. Faculty lines are the largest single element of the university's budget. It is expected that this process of comparing actual faculty load distribution to projected faculty needs will facilitate the academic planning process, particularly as the distribution of enrollment shifts among the four colleges that offer degree programs. In the past, the bulk of NJIT's enrollment was concentrated in the Newark College of Engineering; however, new and/or complementary programs have resulted in a more even distribution among the colleges.

Future fiscal planning will take into account changing technologies and modes of pedagogy. NJIT has an active and growing program of distance learning, computer mediated instruction, and multiple delivery sites for courses and programs, both for-credit and not-for-credit. In order to accommodate anticipated growth in this area, a sub-committee dealing with computing, networking, and the library has developed recommendations that will require funding. As an implementation plan emerges, it should become clearer how much can be funded by reallocating resources from existing activities and how much represents a need for incremental funding. The latter will, of course, be considered in the context of the overall university budget.

3. The Outlook for Research Funding

As sponsored research constitutes approximately 20% of the university's total revenues, including over $3 million in unrestricted indirect cost recovery, it has a major impact on financial planning.

The five year projections for grant funding are shown in Appendix M. The display includes research awards, research expenditures, and indirect cost recoveries. Generally, awards drive expenditures, and these in turn generate indirect cost recoveries. Historical data for Fiscal Years 1992-96 are included as a frame of reference in the formulation of grant funding projections.

Projecting the availability of federal and state research dollars five years hence is hardly an exact science. Shifts in the political and economic climate have significantly affected funding for the research sector in the past, and could do so again. The projections are based on the application of assumptions that are conservative as they relate to governmental support and more expansive as they relate to other sources.

Success in winning research awards depends upon an active faculty with the facilities needed to conduct their research. The projections assume that the total number of NJIT faculty will grow slightly, and that new faculty members hired to replace those who retire will be more

actively engaged in research. It is assumed further that facilities will be expanded or renovated at a rate sufficient to keep pace with the projected increases in research activity.

Federal research dollars awarded to NJIT over the period covering FY 1992-96 more than tripled, while total federal R&D budgets were essentially flat. (Source: NSF 95-352.) This rate of growth in federal awards cannot be expected to continue. Nevertheless, seed funding provided by the New Jersey Commission of Science and Technology (NJCST) in FY'97 for new centers at NJIT is expected to leverage some additional federal funding. Because of this, a modest 2% annual growth rate is projected for the first two years of the plan, with a more optimistic 5% growth rate in the outer years. It should be noted that the FY'97 projection includes $1.5 million from the award of the Manufacturing Extension Program (MEP) from the U.S. Department of Commerce.

Research awards from state sources are projected to increase in FY'97 because of the NJCST funding mentioned above. In 1996 the Commission began making awards on the basis of an R&D Excellence competition. NJIT did extremely well in the first round of competition, and we expect to continue to do well. Therefore, we project a 15% increase in FY'97 and a 5% increase in FY'98, followed by flat funding in the outer years as the future of the state funding remains uncertain.

In order to compensate for the anticipated difficulty of achieving substantial increases from public sources, the university will launch a concerted effort to increase industry support for research and development at NJIT starting in FY'97. This source is therefore projected to increase at an annual rate of 25% in FY'97 and FY'98 and at a rate of 10% annually in subsequent years. In order to realize this ambitious goal, the university will be committing significant resources, including hiring an individual to specialize in corporate marketing.

Research funding from other sources such as foundations, county and local governments, and others is projected to increase at an annual rate of 3%. This estimate is based on the sporadic nature of such support in the past. The previous two years have been sub-par, but we do not expect this trend to continue.

As the sum of these components, total research awards at NJIT are projected to increase at an annual rate of approximately 4% after a larger upward move in FY'97 caused by the awards to MEP and the new NJCST research centers.

The rate of growth in research expenditures has generally reflected the rate of growth in research awards after allowing for a one- to two-year lag between award and expenditure. Thus, the rate of increase projected for research expenditures closely resembles the rate of increase for research awards in each category: federal, state, industry, and other. Federal expenditures are expected to remain flat for FY'97 and FY'98 followed by a 5% annual increase in the outer years. As a result of NJIT's success in the competition for NJCST Excellence Awards, we project increases in state expenditures of 15% in FY'97 and 5% in FY'98, with no further increases in the outer years. For industrial research expenditures we

anticipate an annual increase of 12.5% in FY'97, '98, '99, followed by 10% growth in the outer years.

The annual rate of growth in indirect cost recoveries mirrors the rate of increase projected for federal research awards and expenditures since federal sources pay the most overhead. The projection also takes into consideration that NJIT will be converting to the Modified Total Direct Cost method of charging indirect costs on July 1, 1997. This should result in a modest ramping up of indirect cost recoveries beginning in FY'99, allowing for the time lag between the submission of grant proposals and receiving awards. Indirect cost recovery estimates therefore show 1% increases in FY'97 and FY'98, and 5% in the outer years.

4. Fund-Raising: The Campaign for NJIT

Endowment

The university has earned national recognition in a number of its fields of specialization, and now competes with some of the finest institutions in the country for both students and research funding. Further development and growth requires a substantially larger base of secure and dependable funding at a time when some traditional sources of support have leveled off. NJIT's endowment currently ranks in the bottom quartile among U.S. colleges and universities. In 1992, the Middle States team suggested an effort to increase the university's endowment. We agreed and have made this a top priority.

In the years since then, the university has focused on the goal of increasing its endowment, and it has indeed risen from about $5 million in FY'92 to a current figure of nearly $20 million, including life income funds and irrevocable expectancies. The number of scholarships NJIT is now able to offer is roughly double what it was, having moved from 122 in FY'92 to more than 240 this year. It is expected that a further amount of $1.7 million will be added to the endowment fund by the end of FY'97. While this progress is substantial, NJIT's needs have continued to grow even more rapidly. The university therefore plans to accelerate the rate of growth in order to reach or exceed an endowment goal of $60 million by the year 2001.

The Campaign for NJIT

In 1994, the university decided to embark upon a major fund raising campaign, subsequently dubbed "The Campaign for NJIT".

An initial feasibility study, conducted by external consultants, showed that NJIT's constituents understood and appreciated the need for a major campaign at this time, especially the need to build endowment, and that they would respond positively to an appeal. (See the "Case Statement", Appendix R1). This study was followed by a series of on-campus meetings with friends of the university, faculty, and staff. Presentations were made by senior staff members, deans, and department chairs. As a result of these dialogues, as well as confidential interviews with potential funding sources, campaign goals were established. The

plan is to raise $120 million in a comprehensive effort that includes private and governmental sources of support. It is anticipated that the campaign will be completed by the year 2001.

The so-called "quiet phase" of the Campaign for NJIT has been completed. A formal public announcement of the campaign took place in April 1997. Leadership is being provided by the president of NJIT and a campaign cabinet of 30 senior corporate executives, trustees, overseers, alumni, and deans who are concentrating their efforts on obtaining lead gifts.

A successful Campaign for NJIT will open doors to new opportunities and will permit NJIT to respond more amply to student needs -- financial, academic, and social.

Endowment and the Campaign

Achievement of many of the university's most ambitious objectives in the years ahead depends on new sources of revenue. Therefore, building a substantial endowment is a central goal of the Campaign for NJIT. Such an endowment is essential to NJIT's future ability to recruit talented students and distinguished faculty in order to create an even more exciting and challenging teaching and learning environment. Endowment funds will also afford NJIT the flexibility to capitalize on new opportunities and compete more aggressively for external grants that require a start-up investment or matching funds, to provide internal seed money to initiate new projects, and generally to improve and enhance current programs. Of the total campaign goal, $45 million will be dedicated to increasing endowment funds.

Capital Projects

Another campaign goal is to support a multi-phase building plan for the continued physical growth of the campus. New facilities will be funded through state bond initiatives supplemented by NJIT borrowings. The latter will be repaid through private contributions and facility-specific student fees.

Sources of Support

The campaign is seeking support from private and public sources. The private support component, designated "The Fund for the Future," is the responsibility of the campaign cabinet. The cabinet will give leadership to fund raising for endowment, scholarships, fellowships, chairs, and professorships.

A combination of public and private support will constitute "The Innovation Fund." This component will emphasize resources for instruction, research, and the continued development of the physical campus, including renovations of existing buildings, a new student residence, a new Building Sciences Complex to house the School of Architecture and the Department of Civil Engineering, a second business incubator, a new research facility, and a student services mall.

Leadership gifts pledged before public announcement of the campaign included the following highlights:

- AT&T made a $1 million pledge which focuses on Multi-Lifecycle Engineering. Victor Pelson '59, who chairs the Board of Trustees, and Laurence Seifert '63, were instrumental in securing the gift.

- National Starch and Chemical Company pledged $1 million to support scholarships and other endowment objectives. James A. Kennedy, the corporation's CEO, chairs the Board of Overseers.

- Panasonic Industrial Company pledged $500,000 to endow a new chair to be developed for the Multi-Lifecycle Engineering Center. Richard Kraft, a member of the NJIT Board of Overseers, is President and COO of Panasonic's parent company, Matsushita Electric Corporation. Mr. Kurt Kitadai, President of Panasonic Industrial Company, is a member of the Campaign Cabinet.

- Overseer Albert Dorman '45 funded a unitrust with approximately $1 million for the Honors College. He will assist in the development of a $10 million endowment for the college.

- The late inventor and businessman Kazuo Hashimoto gave over $1 million to provide a prize for an outstanding doctoral candidate and graduate level fellowships in electrical and computer engineering.

- Mandy Michaud established a revocable bequest valued at approximately $6 million in honor of J. Ray Michaud '41. The entire gift will go to endowment and will be used to support scholarships.

- The late Joseph A. Courter '36 established a trust which will provide $1 million for endowment. Courter was a Trustee and an Overseer.

Facilities Planning and Financing

Higher education is at its best when excellent curricula, students, faculty, and staff are complemented by facilities and an environment conducive to teaching and learning. At this point in NJIT's history, the purpose of facilities planning is clear: to provide a setting that supports the programs already in place and the ambitious new academic plans that are still under development. More specifically, the next iteration of the university's facilities master plan must envision a total environment -- sufficiently large in size, differentiated in function, and attractive in appearance -- to support the intellectual and social life of an able and active student body as well as the teaching and research activities of an engaged and entrepreneurial faculty.

Expansive, yet prudent, facilities plans have contributed materially to NJIT's emergence as a research university. Over the past thirty years, the university has had three comprehensive facilities plans that guided the development of the campus. The first, completed in the mid 1960's, led to a major expansion that was completed in the early 1970's. A review of the campus plan in 1980 led to a second plan which included facilities to accommodate a growing research agenda, new degree programs, increasing numbers of graduate students, and the presence of residential students for the first time in the university's history. In 1990, the Board of Trustees approved a third facilities plan, which was updated in 1996. When the planned projects are completed in the near future, the size of the Newark campus will reach 2 million square feet, with residence halls sufficient to house a total of 1,300 students, and new or renovated facilities for most academic departments.

The Master Plan now in place recognizes the need not only for new construction, but also for attention to the efficient utilization and maintenance of existing facilities. It therefore encompasses extensive renovations to the oldest buildings on campus, including major systems and building components (e.g., roofs, electric switch gear, and air conditioning plants) as well as projects that address current building code requirements, exploit energy conservation technology, and comply with the requirements of the Americans with Disabilities Act (ADA).

The following aspects of the current plan were either finished recently or will be completed in the near future:

- construction of a fourth residence hall, for occupancy by Fall 1997;
- a Building Sciences Complex that will serve as the new home of the School of Architecture, the Department of Civil and Environmental Engineering, and an array of student services functions;
- an upgrade to the first Enterprise Development Center;
- opening of a second Enterprise Development Center including a day care center;

- renovation of laboratories for the Department of Chemical Engineering, Chemistry and Environmental Science;

- new offices for the Department of Humanities and Social Sciences;

- a student services mall that houses academic computing, registrar, financial aid, and bursar functions as well as PC labs, the PC store, and the bookstore under a single roof;

- an upgrade of student areas in the Hazell Center including installation of additional elevators in compliance with requirements of the ADA.

Funding for the construction program is in place and includes some appropriations from the State of New Jersey, but primarily university funds set aside for this purpose including funds raised through the sale of tax-exempt bonds. Revenue sources to cover the debt service include an academic facilities fee charged to all students, usage fees for residential and parking facilities, and fund raising.

Funding to support on-going major maintenance projects and for reduction of the backlog of deferred maintenance projects should come from the State's capital budget. Because appropriations have been sporadic and usually insufficient, the university has sought alternative sources to fund certain projects in whole or in part. For example, a major modernization of the lighting in many buildings was accomplished using funds from a State Energy Bond Issue, the savings accrued from utility rebates, and the reallocation of operating funds made possible by energy savings.

As always, facilities planning is an iterative process. The next phase in the university's thinking about its physical environment will be evident by the time of the next Middle States site visit. It is our intent to develop a comprehensive new facilities master plan, based on an updated assessment of the university's needs for various types of physical space in light of enrollment and programmatic plans. The subcommittee on facilities planning and financing has been charged to formulate strategies that will move the university toward realization of its goals as expressed in the vision statement.

The subcommittee will consider growth and improvements from three important perspectives.

First, internal spaces in new and renovated buildings will be needed to support the formal aspects of the university community's academic activities. It is already clear that a significantly larger enrollment of Ph.D. students, actively engaged in research, will require additional academic facilities as well as faculty. In addition, intensified faculty research activity and the development of new sponsored research centers can occur only if appropriate specialized research facilities are provided. And, of course, current space deficits of all kinds should be addressed.

Second, as NJIT's reputation grows and more out-of-state students apply for admission, the facilities to support a significantly larger residential student body will be needed. Given a tentative target of 2,000 resident undergraduates, additional capacity must be planned in undergraduate student housing, food services, athletic facilities, and the student center. More space will be needed for theater, clubs, and other student activities. Housing for married graduate students must be provided for the first time. And the university must facilitate the development of a fraternity/sorority row in order to foster an alternative 24-hour learning and living environment for undergraduates.

Third, the next plan must encompass external spaces in the areas between and surrounding the buildings, spaces needed to support recreation and other informal aspects of student life. Additional green areas and landscaping are needed to enhance the aesthetic quality of the campus.

Sequence is an important aspect of a coordinated planning process. Although all aspects of planning at NJIT proceed concurrently, facilities planning cannot proceed independently of enrollment and academic planning. The facilities plan will therefore be subject to regular reality checks to assure that it remains "in sync", and it will be adjusted periodically to accommodate changes in the other areas as they take place.

As a means of defining specific objectives and measuring quality, NJIT will employ the technique of benchmarking in the area of facilities development as it does in other areas of its operations.

Among the specific needs that can already be foreseen and will be considered in the planning process are the following:

- continuation of the land acquisition program as opportunities arise in neighborhoods adjacent or in close proximity to the Newark campus;
- a substantial new conference facility;
- possible relationships with the Newark Performing Arts Center;
- laboratory and office space for new and expanded research activities;
- major expansion of the library's capacity to serve students located at branch campuses and extension sites as well as distance learners;
- new facilities for the School of Management;
- additional space for the Office of University Admissions;

- new office and laboratory space for the Department of Electrical and Computer Engineering;

- additional facilities for student activities on campus;

- additional parking space by building another floor on the parking deck and possibly a second parking structure; and

- additional "green" areas and recreational areas.

Implementation of many of these ideas will depend in part upon success in acquiring additional ground space, and in part upon a new approach to building "up" within the confines of the current acreage. Several of the buildings recently completed were designed to accommodate additional floors or extensions. While more land is essential in the long run, the need for additional facilities could be managed by building "up" in the short term.

The university's facilities needs will also be coordinated with the development of the University Heights Science Park located along what is now the western border of the campus. The concept for this public-private partnership includes housing, business incubators, and commercial development. Given the applied nature of much of the research conducted by the university community, the Science Park would be a logical location for at least part of the additional research space that will be needed.

The 1990 Facilities and Financing Master Plan and its 1995 update can be found in Appendix H.

Information Resources and Services

The Library

1. *Summary of Progress over the Past Five Years*
2. *Strategies for the Next Five Years*

Computing Resources

1. *Summary of Progress over the Past Five Years*
2. *The Changing Landscape of Information Technology*
3. *Basic Enabling Technology Plans*
4. *Funding the Plan*

The Library

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1. *Summary of Progress over the Past Five Years*
   - *Library Mission*
   - *The Robert Van Houten Library: A New, Enlarged Main Library*
   - *A New, Enlarged Architecture Library*
   - *Library Staffing*
   - *Same Library Hours/More Service*
   - *Improved User Satisfaction*
   - *Journals*
   - *Full Text Alternatives*
   - *Article Retrieval and Abstract and Index Databases*
   - *Books*
   - *Interlibrary Agreements*
   - *Funding*

2. *Strategies for the Next Five Years*
   - *Re-engineer the traditional library to achieve a modern learning organization*
   - *Stay Close to the University Community and Meet Users' Needs*
   - *Organize and Budget for Growth in Article Delivery*
   - *Buy More Books*
   - *Improve Knowledge of Library Users and Usage*
   - *Expand Abstract and Indexing Search Tools*
   - *Maintain a Core Group of Journals*
   - *Empower Staff and Users with Automation and Better Processes*
   - *Expand Library User Computing, Software, and Telecommunication Equipment*
   - *Expand Library Staff Computing, Software, and Telecommunication Equipment*
   - *Provide Remote Librarian Assistance*
   - *Digital Library-In-A-Box*
   - *Distance Learning*

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1. *Summary of Progress over the Past Five Years*

A number of significant improvements have been made in the library over the last five years. A new, vastly expanded Van Houten Library building has been constructed, furnished, equipped, and opened for operation. A new group of professional librarians with strong

subject domain knowledge has been recruited. A flattened, team oriented, organizational structure is in place. The first phase in the expansion of the architecture library is complete, and a second phase is planned. New article retrieval services, new databases (some of which can be searched remotely), and a Library Home Page, are now available.

The digital revolution, new article retrieval systems, the collapsing system of printed scholarly journals, major reorganization of staff, and the limitations of the library budget have greatly changed the NJIT library strategic plan and the library services over the last five years. In short, some of the quantifiable goals were not met and some were. In some cases, better service options presented themselves. Qualitative changes were made in the way users access and use library information and documents.

Library Mission

> *The mission of the Van Houten Library is to support the educational and research programs of NJIT by providing an academic environment and high quality, timely, cost effective services.*

The library's mission statement was written in 1993. It is now being reviewed and revised to reflect the university's mission and vision statements. The new statement is expected to be approved in Fall 1996 after further discussion by all parties.

The Robert Van Houten Library: A New, Enlarged Main Library

The enlarged Robert Van Houten Library opened in September of 1992 with 44,000 square feet of space compared with 29,040 square feet in the old library, an increase of 33%. There are 528 reader seats (37% more) in the new library compared to 385 reader seats in the old library. Book shelving capacity is 258,720 volumes (40% more) compared to 184,800 volumes in the old library. The new library has on-line catalogues on every floor compared to just the main floor in the old library.

There is a computer lab on the third floor of the new library with 9 PC's and 10 terminals with full Internet access. One PC has the only publicly available scanner on the campus. The other eight PC's are primarily intended for student word processing. The current Van Houten library has increased the number of group study spaces to 10 from the previous 5. Almost all carrels now have individual lighting and power outlets for laptop PC's. Public copiers have increased from 5 in the old building to 7 currently.

As students have expressed a strong preference for collaborative study working areas, the library hopes to convert some of the open table reading space to triple the number of group studies (to 30), including some two person group studies.

The new building is designed to be expanded to the east, if needed.

A New, Enlarged Architecture Library

The architecture library moved into its current larger, remodeled quarters on the fifth floor of Campbell Hall, in 1993. The current space is more than five times larger than the previous space with approximately 3,617 square feet and about 77 reader seats compared to an estimated 637 square feet and 12 readers seats in the previous architecture library. While the additional space has permitted moving most of the LC Class N books, periodicals, and reference books to the architecture library, the total square footage is already at or close to capacity. Plans have been developed to build a new architecture library of about 6,000 square feet and 150 reader seats as part of a new Building Sciences Complex that will house the entire School of Architecture.

Library Staffing

The library has increased the number of full time positions to 23 from 20, but it is short of the stated goal of 34 mentioned in the 1992 strategic plan. At the time of the last Middle States visit there were 20 full time staff, including 9 full time professional staff, no paraprofessional staff, and 11 clerical staff. Currently there are 10 professional positions, 1 paraprofessional position, and 12 clerical staff. The total number of full time staff is expected to remain about the same in the years ahead, but the shift to high knowledge positions from managerial positions will continue. The current staff are much more knowledgeable, proficient, and effective in the use of technologies.

The library has recruited talented and skilled technical reference librarians with special subject domain knowledge since the last Middle States report. All librarians have master's degrees in Library Science. They have been very successful in building relationships with the academic departments. Liaison duties include answering faculty members' library related questions, helping them select books and other materials appropriate to the department's curriculum and research, communicating library policies, seeking advice and input on changes in library policy or services, evaluating and solving problems, and otherwise trying to satisfy the library needs of the department's faculty, students, and staff. There are five reference librarian positions, all requiring MLS degrees and specialized education and knowledge to support the liaison role.

The NJIT library has flattened its administrative structure by eliminating the Manager of Reference position. The library has not had an Assistant University Librarian position for 15 years. The Library has kept only two manager positions reporting to the University Librarian, the Director of Collection Development (Circulation and Interlibrary Loan) and the Director of Technical Services.

Same Library Hours/More Service

The library hours for the Van Houten Library during the Fall and Spring semester remain exactly the same as they were in 1991 (90.5 hours + per week). However, now all circulation

and course reserve services are offered throughout the open hours, while in 1991 no such services were available between 7:30 a.m. and 8:00 a.m. each day (2.5 hours per week.)

Mon.-Thu.	7:30 a.m. - 11:00 p.m. (open to midnight for two weeks prior to and including exams.)
Fri.	7:30 a.m. - 8:00 p.m.
Sat.	10:00 a.m. - 6:00 p.m.
Sun.	1:00 p.m. - 9:00 p.m.

Improved User Satisfaction

In March, 1996, focus groups of undergraduates, graduate students, and faculty showed that the NJIT library was viewed as having excellent services. The library has achieved a higher satisfaction level by moving from a collections-building (just-in-case) strategy to an access (just-in-time) strategy, by improving services, and by strengthening the liaison relationships with academic departments.

Journals

Journal prices have continued to rise sharply, far in excess of the university budget's ability to keep up. As a result, some journal subscriptions were canceled. The price increases have been particularly high in science and technology, the heart of the NJIT collection. Similar cancellations have occurred at other universities over the last five years. In retrospect, the library's 5-Year Strategic Plan of 1991 was unrealistic and did not anticipate the full text options that can now be employed to compensate for canceled journal subscriptions.

The journals are now listed in the automated NJIT library catalogue, NJNEER. Previously they could only be searched by looking through a bound list. The journals are now placed in classification order rather than alphabetically by title so that they are located in proximity to other journals with related content. The on-line catalogue permits searching by title, subject, or key words for these journal titles.

The upward trend of journal subscription prices is likely to accelerate even further over the next five years. This will necessitate the cancellation of more journal titles. The library will continue to try to provide a core collection of hard copy journals while moving to additional and better article retrieval services.

Full Text Alternatives

The NJIT library has introduced two alternatives to hard copy journals. The alternatives have many advantages and a few disadvantages.

Since 1987, the NJIT library has subscribed to ABI Inform BPO (Business Periodicals On-disc) which includes the full text of articles from about 500 business journals. This is the

equivalent of subscribing to an additional 450 journal titles (about 50 titles are currently available in hard copy). ABI Inform provides two workstations so that users can search the index and then select the article. The system tells the user how to locate and install one of the several hundred CD-ROM's containing the full text of the article which can then be printed out. The system has greatly improved access to business material for students, faculty, and researchers and has been used heavily; it is estimated that 5,272 articles will be printed on demand in AY'96 alone from BPO.

BPO provides much faster access to the journal articles than the hard copy journal since all of the CD-ROM's are stored right where the user searches for the journals. The articles can be printed quickly rather than through the cumbersome process of taking bound journals to the copier machine. Frequently-used hard copy journal articles are prone to being ripped out of bound journals or stolen from the library, while the BPO articles are much more likely to be available. Unfortunately, BPO includes articles in black and white only -- no half tones or color, fax grade resolution is far lower than the printed hard copy, and it is available in the library to only two users at a time.

Beginning in 1995, the NJIT library has also provided a search and article delivery system called UnCover from CARL Inc. which permits any user to search from among 16,000 journal titles, select an article, and have it faxed free-of-charge to the NJIT library (or department office) for pick up. It has proven to be very popular with faculty and students alike and has helped to compensate for the loss of journal subscriptions. All students and faculty are eligible for a free account. The system can be searched from anywhere on campus or from home. Over 70% of the articles are faxed within 24 hours. The university library absorbs the cost of retrieving these articles. Reasonable limits/controls on the volume of free articles which should not diminish the usefulness of this service are expected to be added in the future. About 2,412 articles are expected to be retrieved in AY'96.

Like BPO, UnCover greatly increases the likelihood of retrieving the article wanted, the number of titles from which articles can be retrieved is over fifteen times larger than the NJIT library's current journal subscriptions. The articles do take longer to retrieve than hard copy when available on NJIT's shelves, do not have half tones or color, and have the limited resolution of facsimile.

The NJIT library is studying the possibility of adding another full text product called IEL from IEEE (The Institute of Electrical and Electronics Engineers). This is a CD-ROM product similar to BPO and contains the full text articles from all IEEE journals and conference proceedings.

It is expected that other full text products and article retrieval services will be introduced as resources permit.

Article Retrieval and Abstract and Index Databases

At the time of the last Middle States visit, Dialog searching was the principal internal and external abstract and index database available to NJIT library users. Dialog supplemented the library maintained printed abstracts. Dialog required a librarian to perform the search. Dialog and STN are commercial databases that require a librarian's searching skills and have been used for research and to complement the in-house databases.

This has changed. While Dialog still requires a librarian to conduct the search, the library has acquired a large number of in-house automated databases that users can search themselves, greatly reducing the need for Dialog searches.

OCLC and CISTI are 2 commercial systems that have been used extensively. OCLC is for interlibrary loan of books and articles from other libraries; it now has a reduced average waiting time of 7 to 9 working days. CISTI is for document delivery of articles and has an average waiting time of less than 2 days.

(http://www.njit.edu/njit/welcome/library.html) is the address of the library's World Wide Web home page which can be accessed by all NJIT users. Links that provide information useful in research have been highlighted to help users navigate the Internet with greater ease.

First Search (500 searches) is another source that is currently in the test phase. It is controlled but not mediated and provides access to indexes.

Books

The library has purchased 7,346 books over the last five years but has not met the target set in 1991 of purchasing 8,725 books per year because the available book budget has been insufficient. There are no alternative formats/services to compensate for the lack of books today. Interlibrary loan has been used but is not an adequate replacement for a local book collection. Many books are not available at all, while it takes 7 to 9 work days to retrieve others.

In order to maintain a total collection of about 100,000 book titles with an average half life of 20 years, a library must purchase about 5,000 books per year. The university has nearly 5,500 FTE students. In order to purchase one book for each FTE student per year at an average cost of $65 per book, the university would need to spend about $353,000 per year on books alone. Last year the library spent about $86,800 on new books. This year the library's book budget is about $150,000 which should purchase about 2,250 books.

1991 actual vols./student (from 1991 library strategic plan)	26
5-year goal vols./student (from 1991 strategic plan)	36

current physical volumes:	180,948
total FTE students enrolled	5,453
current physical volumes per student	33
book volumes only	120,667 (excluding journals)
total FTE students	5,453
book volumes per student	22

Interlibrary Agreements

The library staff is meeting with staff of Rutgers-Newark in the hope of developing better working relationships and perhaps ultimately an articulated library agreement. The libraries already permit some interinstitutional usage which coincides with some of the articulated academic agreements. Other interlibrary agreements which were in place in 1992, such as NJALN, are still in place.

Funding

Funding for the library has improved over the last five years. However, while the budget for materials has increased, it has not kept pace with the rate of increase in the cost of library books and materials. The total library budget, at about 1.3% of NJIT's total E&G budget, is still low compared to other universities.

2. *Strategies for the Next Five Years*

Re-engineer the traditional library to achieve a modern learning organization

The library staff and administration will work with the academic departments, administrators, and others to find ways to improve NJIT as a "learning organization." The goal of the "learning organization" is to achieve significant increases in productivity by providing cross-functional processes and tools that increase faculty, staff, and student learning curves and communication. Such activities might include the development of a plan for indexing, cataloguing, searching, browsing, and retrieving university documents that would enable the removal of current labor intensive steps, the development of an information/document plan, standards for the easy reuse of work done by other NJIT faculty, and training in core NJIT information/document retrieval competencies. Such improvements will require more integration of processes across functions, a higher degree of work coordination, and clearer organizational structures and intellectual property agreements than in the past.

Stay Close to the University Community and Meet Users' Needs

The library has conducted and will conduct annual focus groups of undergraduate students, graduate students, and faculty including users of the Architecture library. The library has initiated a Total Quality Improvement plan emphasizing a strong department liaison program and a team organizational structure focused on library users.

Organize and Budget for Growth in Article Delivery

NJIT users need more comprehensive and faster access to articles, patents, conference papers, and other reproduced documents. NJIT users want to be able to search for articles and conference papers and have them retrieved immediately to their desktop or to the point-of-use. Library automation and process efforts in the future are directed toward retrieving documents when and where they are needed. Document delivery has and will continue to increase in order to compensate for additional expected journal subscription cancellations as well as to meet the increased needs of students in the new and planned M.S. and Ph.D. programs. The library will explore and implement every feasible document delivery alternative.

Buy More Books

NJIT users, particularly students, have requested more books in their respective disciplines. Book buying in the last five years was less than what the library had targeted in the 1992 Middle States self-study. The book budget in AY'96 is larger than in AY'92 and AY'93.

Improve Knowledge of Library Users and Usage

As part of the library's strategy of staying close to users, the library plans to collect and analyze far more data on how users take advantage of library services. The library uses a host-based integrated library system that does not use standard full MARC records and is not capable of producing the reports needed by our users and staff. Hence, library usage is not currently measured. In the future we will study our services more intensively in order to know how to improve them.

Expand Abstract and Indexing Search Tools

As with article delivery, the library will extend and expand on-line abstract and indexing of journals, conference proceedings, patents, theses, and dissertations so that users have access and can search for material from anywhere, preferably over the Internet using common search techniques. This should include better, more seamless linkage between the search tools, the user's workflow, and the article retrieval systems and processes.

Maintain a Core Group of Journals

Some additional journal subscriptions will be canceled over the next five years because subscription prices are expected to increase further. However, a core group of journals must be maintained because they are heavily used, frequently browsed, and incorporate a great deal of color and high resolution material that cannot be made available through article delivery. Article delivery, Internet access to information, and the proposed digital library-in-a-box (see below) are expected to compensate for the loss of some journal titles, but such initiatives cannot replace all current journals in the next five years.

Empower Staff and Users with Automation and Better Processes

The library is moving to a team, customer-oriented, flattened hierarchy in order to make faster decisions, empower staff to provide better services, and assist users. Such teams can greatly improve productivity if they are well coordinated and have the knowledge and information needed to make quick and effective decisions. Such well coordinated processes will require better information technology.

Expand Library User Computing, Software, and Telecommunication Equipment

Library users need access to computers physically located in the library so that they can search the Internet using powerful browsers, search CD-ROM's on the network, and search other local databases. Currently the library has four CD-ROM networked computers, one architecture CD-ROM stand alone PC, two stand alone ABI Inform BPO PC's and NO PC's available for users to have browsing access to the web or for article (image) retrieval. The main library currently has 9 ASCII terminals, and an additional 6 of these terminals are located in the architecture library. The library must replace each of these terminals with a powerful networked PC and large color monitor, make every PC capable of getting access to all library databases and services, provide database access on every floor and area in the library, integrate library information with personal or departmental workflow making it seamless and easy for users, and coordinate library technology with all student labs, remote users, and the faculty desktops. The plan is also to create a full-scale computer lab/instructional area adjacent to the reference desk in the library of at least 20 computers that can perform these functions and permit the library staff to assist users. There is a smaller but similar computer lab plan for the architecture library. The library is hiring a new Systems Librarian to lead this initiative.

Expand Library Staff Computing, Software, and Telecommunication Equipment

The library infrastructure should provide every staff member powerful (image document handling) access to computers, software, and telecommunications/networking. Currently less than half the staff have such access. In addition, the library needs its own server to begin storing information needed by users. Scanners, printers, and other appropriate peripheral equipment are also needed.

Provide Remote Librarian Assistance

Users need remote librarian assistance as they attempt to search and retrieve documents from their own desktops. Such remote assistance will extend to NJIT documents as well as published documents and must permit both a user and the librarian to see the same interactive search simultaneously on their screens with control being passed back and forth between them as needed.

Digital Library-In-A-Box

There is need, even in the networked library world, for a local "collection" of digital documents, those which are most needed or have highest usage, together with a system that incorporates the processes that are performed in the library. The library has been working with the Computer and Information Science Department in their Electronic Enterprise Engineering program to design such a system, which has been called the Digital Library-In-A-Box (DLB). It is hoped that the DLB will be designed and built collaboratively with other universities over the next five years.

Distance Learning

The library will work more closely with NJIT's Continuing Professional Education unit to ensure that graduate certificate, extension, and distance learning students have access to library services. An Interactive Learning Center, located in the new library building lobby, provides video viewing and is a first step toward such cooperation.

Computing Resources

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1. Summary of Progress over the Past Five Years

In 1983, NJIT embarked on an ambitious plan to become a "computing intensive" university. The 1992 Self-Study and Strategic Plan summarized the progress achieved to date:

> *The use of new technologies has become ubiquitous at NJIT. Special emphasis has been placed on the development of a computing intensive campus, with microcomputers distributed to all incoming freshmen, full networking, and the integration of computing across the curriculum. Advanced computing programs are also available to facilitate library use and registration*[1].

During the later half of the 1980's and into the early 1990's the university invested heavily in computing equipment with the aim of placing the university on the forefront of computing intensity in higher education. In 1992 the university recognized the challenge this investment presented:

> *The challenge now is to increase the use of equipment in a creative and effective manner to derive the greatest educational benefit for the students, and to foster a rich and diverse intellectual environment in which faculty can make the maximum contribution to their fields. Toward these ends, multiple interconnected networks,*

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[1] *Educating Professionals for Leadership in a Global Economy: Self-Study and Strategic Plan*, 1992.

linking all users to the hardware and software needed to perform desired computing activities, with access to voice, image, and video transmission capabilities are being developed[2].

In the ensuing years significant progress has taken place in advancing the use of information technology resources. From the network and hardware perspective:

- The campus computer network has been significantly expanded to include five new buildings and all three residence halls. In addition, the backbone has been upgraded to ATM protocol, increasing the bandwidth by 15 times and thus facilitating high bandwidth data transmission and simultaneous two way video between many points on campus.[3]

- All student dorm rooms now have direct access to all campus and Internet services.[3]

- A bank of 128 high speed modems with a built-in authentication server has been installed permitting relatively seamless connectivity for commuting students and professional staff when off campus. In addition, a nationwide dial up service is available with a low per minute rate for traveling faculty and staff.

- Two new workstation-based Computer Aided Design laboratories and a new visualization laboratory have been added. These and an existing workstation-based Computer Aided Design lab have been rearranged and retrofitted as interactive classrooms.[3]

- An integrated security and file management system with new compute and file servers has been installed in these and other workstation laboratories across the campus giving students and faculty access to their data and all campus resources from any node on campus.

- The two mainframes that supported administrative and general purpose student time-share computing have been replaced with a distributed system of eight processors, each with 2.5 times the computing power of the replaced systems. Of the eight, three support administrative data processing, two student time-sharing, one the on-line library catalogue, and one the MIS department programming. There is one installed spare/overflow processor.

- To support increasing demands for UNIX time sharing services, a new central computer with sixteen times the processing capacity of the previous system was installed. This system now supports more than 4,100 active accounts.[3]

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[2] *Ibid.*

[3] Funded by the State of New Jersey through its Equipment Leasing Fund (ELF).

- The NJIT developed Electronic Information Exchange System (EIES) and Virtual Classroom (VC) central computer was also upgraded. The new EIES/VC system supports more than 3,300 active accounts.[3]

- The Computer and Information Sciences Department's entire network has been replaced with three new high capacity servers and thirty separate Ethernet links to labs, research areas and faculty offices. Substantial upgrades have also been accomplished in Mathematics, Civil, Mechanical, and Electrical and Computer Engineering.[3]

- The PC labs have been upgraded to Pentium processors and configured so that students may choose DOS, Windows 3.11, or Windows 95 when they initiate a session.[3]

- A workstation-based UNIX and computer aided design lab and a Pentium PC lab have been installed at NJIT's southern New Jersey campus (Technology and Engineering Center). A private intranet link (T1) has been established between the two campuses facilitating two way video and high speed data connectivity.

From the software and services perspective:

- An on-line, self registration system has been developed allowing students to register for classes from any place at any time, 24 hours a day. Students are able to view on-line transcripts, course outlines, select courses, and sections.

- A LAN-based Financial Aid subsystem has been installed allowing students to apply for student loans directly to the Federal Government.

- An interactive World Wide Web-based application for admission has been developed to allow prospective students to submit their applications via the Internet.

- A $715,000 grant from the Alfred P. Sloan foundation has enabled NJIT to develop a complete four year undergraduate Computer Science degree program utilizing a combination of televised lectures and the Virtual Classroom. This distance learning format enables students to complete an undergraduate program without attending any traditional classes.

- As a member of the National Science Foundation's Gateway Coalition, NJIT has initiated a program for all freshman engineering majors to complete a Freshman Engineering Design course. It utilizes two of the new CAD labs described above and teaches students to design objects and not simply learn electronic drafting. In another coalition effort, WWW-based multi-media has been used in Industrial Engineering courses to supplement class notes with interactive robotics and process control simulations.

- The EIES/VC system has been upgraded to utilize standard Web browsers so that multi-media presentations can be made available to distance education students.

Many of the past five years' varied accomplishments were facilitated and expedited by an important Educational Leasing Fund grant from the State of New Jersey. The challenge before the university now is to build on this foundation and complete the deployment of a high speed, interactive, multi-media network to all points on the campus. Much of NJIT's present computing infrastructure is still based on the assumptions of the 1983 master plan. In the intervening years tremendous changes and paradigm shifts have taken place in the nature and use of information technology in organizations. Higher education has not been exempt from these changes. A recent publication of the Society for College and University Planning states:

> *Society is undergoing a fundamental transformation from the Industrial Age to the Information Age. This is a global phenomenon with very significant local implications. All people, organizations, societies, and nations are affected, although not at the same pace or to the same degree. Those who realign their practices most effectively to Information Age standards will reap substantial benefits. Those who do not will be replaced or diminished by more nimble competitors.*[4]

The following outlines some of the basic changes in the use of information technology that are relevant for NJIT, and presents a plan for meeting the challenges outlined in 1992 and for realigning the practices of the university to the needs of the Information Age.

2. *The Changing Landscape of Information Technology*

The landscape of information technology is ever evolving. A number of basic trends in the use of information technology resources provide a basis for NJIT's vision as a computing-intensive university, and define a set of new challenges to the university.

Trend #1: The Plummeting Price-Performance Ratio of Microprocessors

In the 1960's, it was postulated that microprocessor performance would double every two years. However, by the start of the 1990's technology had progressed even faster than the most optimistic projections. Recent projections of the growth of PC-servers have all but eliminated the distinction between what were once called mainframes and microcomputers. Table 1 illustrates these rapid changes in computing technology:

[4] Dolence, Michael G and Norris, Donald M., (1995) *Transforming Higher Education: A Vision for Learning in the 21st Century,* Society for College and University Planning, Ann Arbor, MI.

Table 1: PC Server Hardware Directions[5]

Performance Area	1989	1993	1997 (est.)
Database Performance	45 tps	350 tps	2,000 tps
File I/O	200 I/Ops	1,500 I/Ops	6,000 I/Ops
Storage	2 GB	50-100 GB	up to 1 TB
List Price	$25,000	$20,000	$15,000

This ever declining price-performance ratio makes feasible new applications of technology that were cost-prohibitive only a few short years earlier. It also has serious budgeting ramifications for a university striving to keep current with technology in the classroom, the dorm room, the research laboratory, and the business office. A PC issued to an undergraduate student at the start of the freshman year is obsolete before graduation.

Challenge: To upgrade and/or replace equipment on a cycle of no longer than every three years.

Trend #2: The Shift from Personal Computing to Work-Group Computing

Personal computers have a pervasive influence throughout the university. NJIT issues them to students, makes them available in laboratories, and places them on the desks of faculty and staff. However, their impact has yet to be fully realized since most of these PC's are stand alone rather than networked. In most instances, the PC is used as a simple terminal, without communication capability.

Challenge: To move toward a model of work-group computing that assumes the importance of work-groups or teams as the cornerstone of any organizational unit. Work-group computing provides personal and work-group tools, information, and capabilities to directly support all categories of users at the university, at any campus of the university, in the classroom, laboratory, office, residence hall, or home.

The support of work-group computing requires a network-centered computing environment. In such an environment all information services appear to be standard network services originating from a single source. The network performs as an essential utility, much like the telephone, and the on-going maintenance and enhancement of the network must be budgeted as are other basic campus utilities.

Trend #3: Information as Opposed to Automation

Like most other universities, NJIT uses information technology to help manage the institution and control costs. The emphasis has been on automating basic operational business transactions (e.g., student registration, payroll, purchasing, inventory, alumni solicitation).

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[5] Source: Compaq Computer as referenced in Currid, Cheryl & Company (1996), *Computing Strategies for Reengineering Your Organization*, Prima Publishing.

The current administrative information systems have generally done a good job of automating the university's basic operational business processes. The information for these processes is largely internal: well-defined, narrow in scope, detailed, highly current, and frequently changing.

However, the current systems fall short of providing readily available, cross-functional information for planning. Information needed for strategic planning purposes often involves external information that is wide in scope, aggregated at many levels, and historical in nature. Strategic information is needed by various university work-groups (e.g., department chairs, deans, special programs, university committees).

Challenge: To develop strategic information systems which are cross-functional, and work with the basic data collected in its core business processes.

Trend #4: From Internal to Inter-Enterprise Computing

The growth and popularization of the Internet, the World Wide Web (WWW), and other communication technologies are changing the way all organizations do business. Higher Education is no exception. The new technologies enable the university to establish new relationships with current, prospective, and former students; with research sponsors, financial institutions, and suppliers; and with various state and federal agencies of government. These technologies offer new and expanded ways to promote the university, to re-engineer the entire suite of student services communications (e.g., admissions, registration, billing, payments). Federal agencies increasingly provide information only in an electronic data interchange (EDI) format, and require that it be submitted in the same format. The growth of distance learning at the university supports a new paradigm of learning with an underlying technological support.

Communication technologies are also fostering the development of "network scholarship." The network can serve as a research lab, a forum for debate, and a new venue for testing and disseminating ideas. Discovery research, collaboration, and synthesis of new knowledge will be done increasingly on-line. Network scholarship increases the bandwidth of information that can be synthesized by an individual and shortens the time frame.

Challenge: To undertake an assessment of how the university communicates and does business with its stakeholders. Communication modes and patterns are apt to change drastically with the opportunities of new communication technologies. The introduction of new technologies in this arena will require on-going training and support to facilitate the transition.

3. Basic Enabling Technology Plans

Three basic infrastructure changes are necessary to meet the challenges described above and support new developments.

Enabling Technology #1: Enhanced Network Communication

Much of the computing infrastructure currently in place was designed for "host-based" computing, i.e., mainframes with attached terminals. The campus abounds with Pentium class machines attached to the network with terminal servers and communicating with antiquated terminal emulation programs. This is the communications technology of the mid 1980's. The following steps must be taken for provision of enhanced network communications:

- Although a number of faculty and researchers have direct network access with individual workstations, the majority of faculty and staff PC's are attached to the network via terminal servers. Terminal server connectivity must be phased out and replaced with full network connectivity. Faculty and staff PC workstations should be connected to individual building and/or departmental servers for basic file and printing services. Such connectivity would make it possible to share files among work groups, provide access to other specialized application servers on the NJIT network, provide direct Netscape access to the Internet, and provide for controlled and efficient distribution of desk-top software upgrades.

- A "Universal ID" system must be developed and implemented to provide authentication of NJIT users and provide access to authorized services anywhere on the NJIT network.

Enabling Technology #2: Capable Desktop With Appropriate Tool Suite

Once the network enhancement is in place, faculty and staff workstations would be equipped with software that provides the appropriate set of "tools" to increase productivity. The "capable desktop" would consist of the following general configurations:

- As a minimum a 486DX2/100 PC with at least 16 MB of memory and 1 GB of local disk storage is required. The PC would have an Ethernet card for network connectivity, and a Windows 95 or Windows NT operating system. However, because of the rapid obsolescence of PC hardware, a 586/133 PC with the same specifications would be preferable and would cost only about $200 more than the 486 PC.

- At a minimum the PC would be connected to a Local Area Network (LAN) where basic file and print services would be available. File Transfer Protocol (FTP) services would allow authorized transfers of files from other workstations, LAN's, and major university computing systems (e.g. Tesla, Admin, Hertz).

- An enhanced mail service must be instituted. This would allow mail messages with full file attachments to be sent and received directly at the desktop.

- The current version of the Microsoft Office (Word, Excel, Powerpoint, Access) suite of applications should be made available.

- Netscape should be universally available to provide Web and Internet access to all NJIT Web servers.

- Appropriate tools for access to Library databases and archives of University documents should be provided.

Users who need specialized tools should have them at their desk-top. The following examples illustrate some of the specialized tools that could be made available:

- A PC version of a 'Data Mining' software product for administrative users which would allow them to easily extract data from institutional data stored on either the Admin systems or from specialized report servers established for historical reporting or data warehousing.

- Spooling of administrative production reports to specialized servers where administrative users could browse daily processing reports and print out pages requiring detailed review.

- Tools to browse data archived on CD-ROM servers or other media for specialized applications.

- Tools which present data using a "graphical user interface" (GUI) for casual users of the FRS and SIS systems.

Enabling Technology #3: Training and Facilitation

The benefits of significant investments in technology for enhanced network communication and a capable desk-top are never fully realized unless people know how to use these tools efficiently and effectively. On-going training programs are essential to enhanced productivity with the tool suites described earlier. Programs for beginners and for intermediate and advanced users are needed on a wide range of topics. Windows, Word, Excel, Powerpoint, E-Mail, Netscape, Browsing the Web, Creating Web Pages and Focus are among the most widely used applications.

Users need a single point of contact for all problem reporting, information services, support, training, and documentation. It is intolerable for problems to be "bounced" among departments under the Computing Services organization while a user waits endlessly for its resolution. This single point of contact should include a professionally managed and staffed technology *Help Desk*, providing phone and on-line support for all standard applications. The planned co-location of the PC Store and Computer Maintenance Facility in the new Student Mall facility should help provide improved services in these areas as well.

4. Funding the Plan

Without another funding infusion like the ELF program, funding the first two of the basic infrastructure changes will be a slow process which will best be accomplished incrementally in accordance with the university's priorities.

Enhanced Network Communication

A detailed cost estimate has been developed to expand the entire NJIT network to provide LAN connectivity to all existing laboratories and offices. The present cost is estimated to be $435,000. A phased installation of the required servers and repeaters should be accomplished on a building and floor basis in order to maximize utilization and minimize short term costs.

Capable Desktop With Appropriate Tool Suite

Approximately 500 Pentium (586) PCs are required. The cost would range from $1,500 for an office machine to $2,500 or more for a fully capable multi-media machine. At an average cost of $2,000 each, a total of $1,000,000 is required.

Training and Facilitation

Every individual receiving a new PC and a LAN connection should participate in a minimum of 10 half-day training sessions, five on Windows 95 and LAN usage, and five on Beginners Microsoft Word. Five additional half day sessions would be required for Intermediate and Advanced Word, Excel, Powerpoint, Access, and WEB publishing software, as appropriate. The materials required for these courses are either inexpensive ($200 for a video tape series) or already on hand. However, there is a need for two full-time training professionals for two years to afford all employees the opportunity to upgrade their skills to the point where they can take full advantage of the technology. If each of the 500 or so employees took an average of only 4 five-day half sessions and then applied their instruction for the remaining half day, forty-eight person years of effort would be expended to accomplish this goal. This would cost the university nearly $2,000,000 in salary and benefits.

Outcomes Assessment

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1. *The Framework for Outcomes Assessment at NJIT*
2. *Outcomes Assessment by Mission Component*
3. *Preparing Students for Productive Careers, and for Life Long Personal and Professional Growth*
4. *Conducting Multi-Disciplinary Research*
5. *Contributing to the State's Economic Development*
6. *Delivering Services To Local Communities, the State, and the Nation*
7. *Conclusion*

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1. The Framework for Outcomes Assessment at NJIT

NJIT's 1992 Self-Study/Strategic Plan presented a framework for outcomes assessment at NJIT. Implementation of that framework continues to evolve with an important new emphasis on benchmarking.

The current system of outcomes assessment involves data collection, analysis, evaluation, and decision-making based on two kinds of benchmarking. One involves inter-institutional comparisons, the other measurement of intra-institutional progress.

For purposes of inter-institutional benchmarking, a set of "peer" institutions has been chosen. The term "peer" is used to indicate other universities with missions and programmatic offerings similar to NJIT's. The institutions were chosen because they are generally considered to be models of leadership and because their performance can be viewed as the standard for technological universities nationally. They include such out-of-state institutions as Georgia Institute of Technology, Carnegie Mellon University, Rensselaer Polytechnic Institute, Case Western Reserve University, Texas A & M University, North Carolina State University, Purdue University, and Polytechnic University as well as two New Jersey institutions, Rutgers University and Stevens Institute of Technology. For NJIT, the point of inter-institutional benchmarking is to identify appropriate indicators of institutional quality, to set quantitative performance objectives for itself based on the actual experience of institutions generally accepted as pace-setters, and to "stretch" to achieve comparable performance.

Sometimes valid comparisons between institutions cannot be made because comparable data are not available. In other cases, NJIT's performance may exceed that of the peer institutions. In both instances, NJIT uses intra-institutional trend analysis over time as the best measure of institutional progress. Once again, quantitative performance objectives are established. Planning and priority-setting decisions are influenced by an analysis of what is needed to achieve the objectives. The bar is raised when it becomes evident that a more ambitious objective is appropriate.

NJIT's commitment to continuous improvement is demonstrated through the disciplines of publicly declaring its performance objectives, self-analysis of progress based on both external and internal benchmarks, and taking corrective action wherever progress is found to be less than satisfactory. The president annually reports to the Board of Trustees and the Board of Overseers on the progress achieved toward NJIT's performance objectives. (See Appendix P for the information included in the president's most recent presentation.) An extensive "Excellence and Accountability" report is submitted to the New Jersey Commission on Higher Education annually.

Over the past five years, outcomes data have been used, both formatively and summatively, with particular application to strategic planning and curriculum revision. The university's mission and its goals and objectives have been modified since 1992 as a result of an on-going strategic planning process. Curricula have been revised, a new college developed, student service and degree programs established, retention plans developed, enrollment managed, facilities planned and opened, research programs initiated, and both academic and administrative functions reorganized. In addition, outcomes data serve as measures of accountability to stakeholders including government, the scientific and technological professions, industry, professional accrediting boards, and students and their parents.

The NJIT Outcomes Assessment Framework (see table) lists the respective evaluation activities that are being implemented for each of the university's key mission elements. The university focuses on the continuous pursuit of excellence in:

- preparing students for productive careers and life-long personal and professional growth;
- conducting multi-disciplinary research;
- contributing to the state's economic development; and
- delivering services to local communities, the state, and the nation.

Using multiple measures based on both qualitative and quantitative data, the various evaluation activities are conducted either on a university-wide basis or by individual departments or colleges.

2. *Outcomes Assessment by Mission Component*

"Pursuit of Excellence In....."

Preparing Students for Productive Careers, Life-Long Personal and Professional Growth

- Post Graduation Outcomes (Employment, Career Advancement, Graduate School Enrollment)
- Accrediting Board Reviews
- New Course/Program Evaluations
- Course Assessments
- Departmental Assessments
- Capstone Course Assessments
- Architecture Jury Evaluations
- CO-OP Evaluations
- Graduate Program Reviews
- Industrial Advisory Boards Feedback
- Parents Advisory Council Feedback
- Enrollment/Retention/Graduation Analyses
- EOP, CAP, Honors Programmatic Analyses
- Faculty Evaluations
- Student Satisfaction Surveys
- Student Services Evaluations
- Student Awards
- Dean of Students Forums
- Employer Satisfaction Surveys
- Alumni Satisfaction Surveys
- Professional Engineer Licensing Exam (EIT) Results
- Architecture Registrations

Conducting Multi-Disciplinary Research

- Research Center Reviews
- Annual Research Outcomes Reports
- Grant Reviews & Evaluation Reports
- Industrial Advisory Boards Reviews
- NJ Science/Tech Commission Reviews & Evaluations
- Research Awards Received
- Sponsored Research/Research Expenditures
- Scholarly Publications
- Doctoral Degrees Awarded

Contributing to the State's Economic Development

- Patents Awarded
- Technology Transfer to Government and Business
- Incubator Business Start-Ups
- Multiplier Effect of Research on Economic Development
- Development of Scientific/Technological Labor Pool
- Technical Assistance to Businesses/Industries
- Contracted Corporate Training Outcomes
- Continuing Education Course Evaluations

Delivering Services to the Local Communities, State and Nation

- Pre-College Program Evaluations
- Service Corps Evaluations
- Community Service Program & Product Evaluations
- Science Park Development
- Faculty, Student and Staff Public Service
- Commissioned Work by Federal, State and Local Government Agencies
- Use of Campus Facilities by External Groups
- Cultural, Social & Athletic Campus Events

3. Preparing Students for Productive Careers, and for Life Long Personal and Professional Growth

NJIT assesses how well it prepares students beginning with its recruitment processes and ending with the employment of its graduates.

The university seeks to enroll a diverse student population, including members of groups historically underrepresented in the science and technology disciplines, and students who qualify for admission to the Honors College. In order to achieve its enrollment targets, specific recruiting tactics are designed and implemented, and the results are analyzed annually.

Comprehensive placement tests are administered prior to students' initial course registration to assess their level of preparedness. The testing and placement process is reviewed annually through means that include faculty input and post-course exams of students who were placed in remedial courses. This assessment loop typically validates the testing and placement decisions.

An early intervention monitoring process using classroom performance data is applied to all entering students. This has resulted in an increase in retention of over 5% from the freshman to the sophomore year over the past three years to a current figure of 85%.

The freshman Fundamentals of Engineering course, the Humanities/Social Science (HSS) curriculum, and changes in Physics and Mathematics courses are a few examples of curriculum changes that have been initiated as a result of cognitive and pedagogical research, changing needs in the professions, and input from NJIT's Industrial Advisory Boards. The university routinely evaluates the effectiveness of significant curriculum changes.

Course assessment continues to improve based upon emerging assessment techniques. NJIT has historically used performance assessment in capstone courses and studio performance. Because these feedback strategies have been found to be effective, they have been expanded to include student teams' oral and written presentations, holistic assessment of final papers, portfolio assessment, and hands-on community service projects. These improvements have been introduced through the efforts of faculty members, in some instances with the support of grants from the National Science Foundation.

Graduate programs are reviewed through the oversight of a university committee, the use of external reviewers, and the Council of Graduate Schools Questionnaire for self-assessment. Two programs have undergone an external review since 1994 and eight have completed the questionnaire for self-assessment.

In response to professional and industry feedback, over 20 graduate degree programs have been initiated during the past decade. Several are offered in partnership with other universities: Rutgers, the University of Medicine and Dentistry of New Jersey, and SUNY-New York School of Optometry. The number of BS/MS opportunities have been increased

for NJIT students, and jointly with several of the state colleges (Kean, Ramapo, and William Paterson). Resource sharing increases the benefits to students and makes possible the achievement of efficiencies resulting from avoidance of unnecessary program duplication.

In order to periodically assess the overall climate for students, NJIT has used forums led by administrators. The forums led by the Dean of Student Services have increased in frequency; others have been convened by the college deans. Deans and department chairs have also convened focus groups in order to receive program and course feedback from students. A comprehensive survey of student satisfaction using the Noel-Levitz instrument has been completed and analyzed. Focus groups have been organized to determine programs and practices that should be implemented in response to the identified student needs.

Based upon previously received student feedback, financial aid awards have been made in more timely fashion, and NJIT has become a direct loan institution; library and dining services hours have been expanded; a sand volleyball court has been built on the campus green; faculty have been reminded that students are to receive feedback about their performance by the fifth week of the semester; and an undergraduate research program has been initiated.

NJIT is benchmarking those summative outcomes for which there is public accountability including: student diversity in the science, engineering, and mathematics professions; student retention and graduation; number of degrees awarded by level; professional licensing exam passing rates; student loan default rates; number of job offers students receive; starting salary upon graduation; and employer satisfaction. NJIT continues to graduate underrepresented minority engineers in numbers that rank it among the top 10% of U.S. universities. Members of the graduating class of 1994 had an average of 1.22 job offers and a reported starting salary of $34,015. Female undergraduate enrollment is approaching twenty percent. Ph.D. production has resulted in NJIT being classified as a Doctoral II university.

To assess employer and alumni satisfaction, and to assess NJIT's processes for career development and employment, a comprehensive study was commissioned and carried out by the Eagleton Institute of Politics at Rutgers in 1996. In-person interviews were conducted with personnel officers and others in 35 firms that employ and recruit NJIT graduates, and nearly 100 similar telephone interviews were conducted. In addition, 400 recent NJIT alumni were contacted and surveyed. The analysis revealed that more than nine in ten respondents who have hired NJIT graduates in the last several years are either very satisfied or satisfied with their performance on the job. The median starting salary of all NJIT graduates surveyed was $32,000, and 94% of the NJIT alumni respondents view their NJIT education positively. Nearly nine in ten were either very satisfied or satisfied with their jobs, and over 80 percent were very satisfied or satisfied with their starting salaries. Employers recommended a number of ways to improve students' preparation for the workplace and actions NJIT could take to improve the recruitment process. In response, NJIT will go back to those who had specific suggestions, clarify the substance of their perceptions, and follow up with appropriate action wherever possible.

The Engineer in Training (EIT) examination is the first step in the process of becoming a licensed professional engineer. Based upon the results of the small number of NJIT students who have taken the exam, it is apparent that more students should be encouraged to participate in the licensing process and their exam performance should improve. The Dean of Engineering is working with departments to achieve these results by conducting more in-depth analyses of student performance data and by increasing the emphasis placed on review courses. The EIT Board has agreed to allow students to take the exam starting their junior year.

A number of formative outcomes are also benchmarked; for example: student-faculty ratio, endowment per FTE student, time to degree completion. In addition, NJIT since 1992 has been participating in the National Association of College University and Business Officers Benchmarking Project. Thirty-five functional areas of the university are examined for service and cost levels. The results are fed back to the respective departments.

Finally, NJIT conducts comprehensive self-evaluations as part of the Middle States and professional accrediting board processes. In addition to Middle States accreditation of the university as a whole, the individual units and programs are accredited by the corresponding specialized accrediting agencies: the Accreditation Board for Engineering and Technology (ABET), the National Architectural Accrediting Board (NAAB), the American Association for Collegiate Schools of Business (AACSB), and the Computer Science Accreditation Board (CSAB). In March 1997 an accreditation team for the National League for Nursing (NLN) recommended full accreditation for the Bachelor of Science in Nursing degree program; a final decision on accreditation of the program is expected by early summer. The self-studies prepared for all these accrediting boards and their on-site reviews provide an important incentive to assess the university's effectiveness at the level of its constituent colleges and departments.

4. Conducting Multi-Disciplinary Research

Research is a critically important element of NJIT's mission. Total externally funded research expenditures now total roughly $30 million annually, double the $15 million expenditure level of five years ago. Funding comes largely from state and federal government agency grants and from contracts with industrial and commercial corporations. The individual research centers have been monitored and evaluated; some have been changed as a result. Administration of the intercollege, interinstitutional research centers has been centralized under the leadership of the Provost and Senior Vice President for Academic Affairs, while the centers internal to a single college report to their respective deans.

The research conducted at NJIT is typically applied, focusing on solutions to pressing contemporary problems such as protecting the environment while stimulating economic development; designing and constructing effective and efficient infrastructure; developing elements of the built environment for populations with special needs; developing integrated manufacturing systems; and the management of technology. The research is typically conducted by interdisciplinary teams of investigators. The research often includes other

universities and corporate partners; for example, researchers at the Center for Environmental Engineering and Science work in collaboration with colleagues at approximately 30 corporate partners and 10 other universities.

In addition to measuring growth in terms of the number of research centers, annual research expenditures, sponsored research revenues, number of research projects, and number of faculty engaged in research, average scholarly publications per FTE faculty, and number of funded chairs, NJIT also uses the benchmarking technique to compare itself to other selected technological universities.

The research effort is also evaluated in terms of the number of students participating, from baccalaureate candidates through Ph.D. students. Summative outcomes include the number of doctorates awarded; 40 Ph.D.'s were conferred in AY'96 compared to 15 in AY'92. The instructional and technical research is integrated back into the curriculum as evidenced by student participation in the funded research centers, curriculum revisions, and the use of research in the classroom. For example, the Zero Avoidable Pollution (ZAP) decision-making tool, developed for use in a corporate environment, is also used in NJIT's freshman chemistry course.

Special recognition awards are another indicator of the expanded research effort. During 1994, NJIT earned the international university award of the Computer Automated Systems Association of the Society of Manufacturing Engineers in recognition of faculty "leadership and excellence in the application and development" of computer integrated manufacturing. During 1996, four faculty members received the highly competitive NSF Faculty Early Career Development (CAREER) Program Awards.

5. Contributing to the State's Economic Development

NJIT considers economic development an essential element of its mission. Congruence with the job market and economic development needs was a founding principle of NJIT in its earliest days, and continues to influence the university's activities. Degree programs and continuing education programs alike prepare and develop the work force. Six of the twenty-two research and service centers are specifically charged to deliver business assistance. Patents, licensing agreements, and technology transfer are involved in translating the results of research into viable commercial products.

Among the outcomes assessed are: time to employment upon graduation, number of job offers, starting salaries, and alumni and employer job satisfaction. These indicators are also used to assess graduate programs. Repeat corporate sponsorships of internships and cooperative education opportunities is also used as an indicator for graduate and continuing education.

Frequently integrated into graduate and undergraduate course instruction are opportunities for students to engage in cooperative education (CO-OP) experiences and internships in industry. Effective measures of students' work include supervisor and faculty evaluations, a

repeat CO-OP at the same site or additional student assignments, and employment at the CO-OP or internship site upon graduation.

The Division of Continuing Professional Education (CPE) also delivers corporate customized training, generally in partnership with the New Jersey Department of Labor. The number of customized training programs continues to grow; over 50 were delivered this past year. The number of corporate extension sites (e.g., AT&T, Bell Atlantic, Merrill Lynch), courses, and participants are tracked annually as is client evaluative feedback. These multiple measures indicate positive results. Over the past two years, CPE has packaged graduate courses into 12 credit certificates in skills that are in high demand by industry, e.g., C++ and Object Oriented Design. Analysis of enrollment, course evaluation, and course completion data has resulted in an increased number of certificate programs.

There is much testimony to NJIT's excellent work force development track record from multiple government, legislative, and regulatory agencies. For example, in 1994 the Department of Defense, in anticipation of base closings, requested that NJIT develop an environmental education and training program for the potentially unemployed.

The six business centers, focusing on assistance to small and medium sized business are measured formatively on quantity and quality of services as well as summative outcomes of business start-ups, profitability, regulatory compliance, improved effectiveness/ efficiency of operations through technology, and the commercialization of NJIT research.

The on-going assessment of NJIT's economic development partnerships with business and government indicates growth in the leveraging of research dollars. Two of the Advanced Technology Centers, the Hazardous Substance Management Research Center and the Center for Manufacturing Systems, are highly leveraged with private funds from companies that work with them and utilize the results of their research. These private industry relationships, the university and its corporate partners share expertise, facilities, and equipment. The growth of private industry partnerships is indicated by the number of NJIT programs (e.g., Honors College, Minority Engineering Scholarship Program, Career Awareness Program, Multi-Life Cycle Engineering) that enjoy corporate support and sponsorship.

6. Delivering Services To Local Communities, the State, and the Nation

Looking beyond economic development, the scope of the university's service to local communities includes pre-college education for approximately 4,500 students in grades K-12 and their teachers; community service to public sector agencies and organizations (e.g., Habitat for Humanity, food banks, family shelters, civic associations and government); community development (e.g., Science Park, Newark movie theater, science/technology high school); and work commissioned by governmental agencies.

The formative assessment and indicators of these services include: quantity and value of public service contributed by faculty, student, and staff; the extent to which NJIT facilities and campus resources are used; community participation in campus cultural, social, and

athletic events; the number of pre-college students and teachers who participate in program evaluations; resources generated (grant and fundraising) for public service programs and projects; commissioned and/or funded programs (e.g., Service Corp., Housing Scholars); and project evaluations.

The summative assessment and indicators of these services include: number of pre-college students who enroll in college, particularly those who are historically underprepared and/or underrepresented in scientific and technological majors; new and improved instructional programs and practices that are adopted in the K-12 schools; quantity and quality (user feedback) of products, e.g., software program for hospital patient records or number of "Habitat for Humanity" residences constructed; and the extent to which the results of commissioned work are actually applied.

Finally, as part of the effort to provide a high level of service from university support operations, NJIT is participating in a satisfaction survey conducted as part of the National Association of College and University Business Officers (NACUBO) Benchmarking for Process Improvement in Higher Education Study. Employees have been asked to respond to a confidential survey that solicits their assessment of the level of service provided by selected functional areas of the university administration. The resulting data will serve as a foundation for service improvements. It is anticipated that such surveys will be conducted on an annual basis to track progress and identify areas for continued improvement.

7. Conclusion

NJIT has a comprehensive framework of outcomes assessment. The framework is necessarily dynamic as the environmental context within which the university functions and the work that it does continue to change.

New assessment activities have been initiated. New indicators have been introduced, and the methods used for data collection, analysis, and reporting processes for formative and summative evaluation continue to improve. NJIT has made better use of evaluative data in order to assess curricular changes and the quality of program delivery, student services, facilities, and research. Once analyzed, the data have been looped back to inform programmatic and organizational changes. Accountability to the university's stakeholders and institutional credibility have become stronger as a result of the outcomes assessment program.

Looking ahead, technology should be applied to data collection, analysis, and reporting (internally and externally) to an even greater extent. The objective is to further improve the timeliness and completeness of outcomes assessment, and ultimately to enhance the quality of NJIT's programs and services.