A CRISIS IN ONTARIO ENGINEERING SCHOOLS

Purpose

There is a crisis in Ontario's engineering schools. Unless remedial action is taken, the decline in the quality of engineering education could jeopardize the economic security of our society. This paper outlines the nature of the problem, the grounds for corporate and government concern, and offers some concrete suggestions for maintaining Ontario's crucial strength in engineering and technology.

Introduction

The economic future of Canada and Ontario depends largely on technological performance. Our natural resources are no longer the key to growth and adequate employment, given the effects of recession, and the shift in national-industrial priorities world wide.

Canadian and Ontario jobs and revenues must rely on the successful development of the high-technology industries that can capture growing international markets in computers, microelectronics, telecommunications, biotechnology, and aerospace. Moreover, traditional industries (chemicals, metals, auto parts, appliances) will survive competition in domestic and export markets only if they improve productivity and profitability by applying technology to their operations.

Provincial initiatives such as BILD, and the IDEA Corporation with its technology centers, are laudable examples that Ontario recognizes the long-term benefits of investing in high-technology. But if such a high-tech thrust is to meet its potential, the province cannot ignore its human resources -- the people who are the key to the research and development that produces commercial competitiveness.

Ontario's universities, and especially its engineering schools, are crucial to the province's long-term economic health. It is therefore profoundly troubling that Ontario's engineering schools are not receiving the funding they must have to provide the number and quality of graduates needed by the province. Engineering, professional, and academic authorities confirm this situation exists.

The University Situation

Over the past decade, Ontario government funding to higher education has failed to keep pace with inflation. Provincial support per university student across all faculties has dropped 16.8 percent in constant dollars over 1971-1981.

This has placed constraints on all faculties. The operating budget per engineering student in Ontario is now about $1,100 less than the average for engineering students in the rest of Canada.

This figure does not mean universities themselves have discriminated unfairly against their engineering schools. The annual operating income to Ontario universities for all students is now some $1,000 less than the Canadian average. Given Ontario's policy of tieing funding to enrolment, and the university administrator's responsibility to the entire academic community at each school, it is understandable that engineering faculties have not won special dispensation from funding constraints.

However equitable the treatment of engineering schools by university budget managers, the reduced funding of engineering schools carries dangerous implications for Ontario. Even though the current recession has reduced the demand for engineers, economic recovery will see a renewed need for more and better trained engineering graduates. It is therefore unfortunate that the quality of provincial engineering education has been seriously eroded.

The Problem of Facilities

Responding to diminishing funds, Ontario engineering faculties have opted to protect academic staff by reducing spending on equipment. According to the Association of Professional Engineers of Ontario (APEO), equipment budgets at a number of engineering schools have now fallen to 20-to-30 percent of what is desirable.

Such cuts harm the quality of students now being trained. They are forced to work with increasingly obsolete equipment, while the amount of time spent in the laboratory itself is curtailed. With new technologies evolving at an unprecedented rate, this problem of obsolete facilities and restricted experience will become even more pronounced as university budgets continue to lag behind inflation.

It is ironic that university equipment restraints are growing just when the Ontario government has dedicated $120 million over the next five years to its new technology centers. These centres will utilize computer, robotic and other equipment that the universities cannot afford. If the province is to gain full benefit from these praiseworthy centres, surely a complementary effort is required to develop students' professional skills in the technology being developed.

The Problem of Staffing

The decline in engineering schools' physical plant is compounded by a growing crisis in staffing. Despite shifting a growing proportion of their funds to manpower, the schools still lack the resources to establish and maintain an acceptable ratio of students-to-faculty.

Currently, Ontario engineering schools have a student/staff ratio of about 20-to-1. A recent recommendation by the Institute of Electrical and Electronics Engineers suggests that a reasonable student/staff ratio should range from approximately 8-to-1, or less, for heavily research-oriented programs, to 16-to-1 for programs focused on general undergraduate teaching.

Over the past decade, as undergraduate enrolment grew steadily, engineering faculties have been unable to hire the new staff they need. They have faced a double-barrelled dilemma. The lure of high private-sector salaries has attracted students away from graduate training, thus restricting the supply of potential faculty. At the same time, the budget problems have prevented engineering schools from funding new staff positions even for those potential instructors who might be available.

Despite the deplorable student/faculty ratio, the quality of Ontario engineering graduates has not yet suffered demonstrably. This is due to the teaching success of highly qualified and committed senior staff. But without the addition of new junior faculty, the age distribution of this senior group continues to climb. The point is obviously coming when the combination of retirements and normal defections to private industry will find our schools unable to provide the basic quality and quantity of professional engineering instruction Ontario must have.

It is dangerous to assume the current recession offers some relief to this problem. As the global and Canadian economies begin to recover, the demand for engineers will accelerate. Industry will again compete with the academic sector for manpower - a competition that will extend beyond provincial and national boundaries. The American Electronics Association, for example, predicted that in 1985 U.S. universities will produce 15,000 new electrical and computer engineers in the face of an anticipated market demand for 51,000 such engineers.

Such shortfalls will occur in many sectors in the U.S. and Canada. Ontario engineering schools and industries will either pay a very high price for the engineering staff they need, or else do without. Neither option is acceptable or necessary.

The Need for Action

If action is not taken soon, the effect on Ontario's economic development may well be tragic. The consequences of inaction will include:

- A continued erosion of the quality of engineering education that will leave Ontario and Canada hopelessly obsolete in indigenous engineering skills.
- Almost total dependence on foreign sources for the high-technology R&D skills we will need to remain internationally competitive.
- An inability to develop the modern industrial base that can provide the jobs and investment opportunities the province desperately needs.

Suggested Remedies

The government and industry of Ontario must recognize their joint responsibility to ensure a continuous supply of high-quality engineering graduates from provincial universities. To achieve this vital goal, the following steps must be taken:

- The government of Ontario must recognize that the operating funds received by the engineering schools from their universities, based on funding from the Ministry of Colleges and Universities, is not providing the quality of engineering education that support the province's economic goals;

- An initial, complementary financial support program of $16 million per year (14,400 students x $1,100) should be created for the next five years, to bring the funding per engineering student in Ontario up to the national average. This would allow engineering faculties to improve laboratory facilities and equipment; to hire new faculty; and to enhance their research and development capability.

- Industry must be encouraged to play a wider role in educational upgrading. To this end, the Ontario government should provide more meaningful tax incentives for industrial contributions to university research, equipment donations, and donations of services. For instance, tax-deductible matching gifts for faculty development could provide a beneficial method of attracting potential junior faculty from industry back to university teaching and research.

A Call for Consultation

There are many other avenues open for government and industry support of general university education, and that of engineering in particular. Economic growth and development is intimately linked to higher education. It is therefore critical that industry and government start immediately to discuss strategies to reverse the present downturn in educational quality.

This paper has been drafted as a statement of industry's concern, and as a basis for such discussions. It is suggested that a few chief executive officers from industry meet with senior officials of the Ontario government in the very near future to consider the suggestions made here, and to develop the remedies the crisis in engineering education so badly needs.