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SYNOPSIS

Computing Science Program - Faculty of Science

Background Data

A. What were the forces that gave emphasis to the development of the proposal?

Computers and computer techniques are having profound impact on modern society. They have revolutionized the approach to a wide variety of disciplines. They have a profound sociological, economic and scientific implication. No branch of science and technology can be predicted to have a quicker growth rate or greater impact or greater potential for the next decade. This potential is recognized by students. There is a great demand in universities across the country for courses and programs in Computing Science. The graduates of such programs are eminently successful in obtaining new positions. The growth rate, in terms of computers and computer technology, is exponential with no immediate end in sight.

There is a correspondingly rapid development in the sophistication of computer techniques and in the development of Computing Science as an established discipline with many broad ramifications. These include such diverse topics as "artificial intelligence" and "integrated information systems".

The Faculty of Science, in selecting a program in Computing Science as its number one priority, recognized the broad need within the university community. It took into account the high demand from students and ranked Computing Science as its first choice in program priorities.

B. Objectives of Program

To provide a sound undergraduate program leading to a degree with a major in Computing Science as part of course offerings in the Faculty of Science. This is, in itself, a recognition of the importance and emergence of Computing Science as a significant field of study.

C. Discipline Oriented

D. Immediate Undergraduate Long-Term Undergraduate and Graduate

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E. Organizational Structure

Immediate, within the Department of Mathematics.
Long-term possibility of a separate Department.

F. It will fit within the regular university structure, and will be part of the Mathematics Department.

Curriculum appended.

G. Curriculum appended.

H. Program Requirements appended.

I. Recognition of Competence

Bachelor of Science Degree recommended by the Department of Mathematics, through the Faculty of Science.

J. Need for the Program

Computing Science programs now exist at other Canadian Universities including our neighbouring universities - the University of British Columbia, the University of Alberta, and the University of Toronto. The most highly developed program is at the University of Waterloo. The organizational structure is usually within a separate department of Computing Science, but this varies from one institution to another. There is an identifiable demand amongst our current students and this is reflected in the high enrollments in Computing Science 106-3.

The choice is actually between the institution of a program in Computing Science and between the offering of courses in Computing Science. Development of the subject has been so rapid and so many disciplines now require it as part of a basic training or education, that it will be impossible for this or any other university to maintain viable programs without offering Computing Science courses in the decade ahead. For example, I cannot foresee long-term development in economics, commerce, business administration, psychology, sociology, let alone the physical sciences and mathematics continuing without the use of "service courses" in computing science. However, a mounting of such service courses within the Department or organized in an uncoordinated and an unplanned way could be more expensive for the university and far less profitable in its academic potential than the mounting of a planned and organized

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program in Computing Science. The choice is actually between these alternatives rather than between a program in Computing Science, or no program.

K. Student Demand for the Program

There is an identifiable demand amongst current students for service courses in Computing Science. Furthermore, a comparison with the growth of Computing Science programs in other universities shows that this is now a program of choice for very large numbers of students interested in Mathematics and Science as a whole. It is also a very much required "service" course for students in subjects such as Economics and Quantitative, Social, Biological and Physical Sciences.

The projected enrollment is given in Faculty of Science paper 17-F and our original program proposal. It would be expected that the program would be as large as any currently in the Faculty of Science and could graduate 30 to 50 students per year.

L. Utilization of Graduates of the Program

The graduates of the program would easily find job opportunities within the province and within Canada. The projected demands for those skilled in Computing Science, other than at the purely mechanical level, are extremely high.

The projected five year operating budget is included in our original submission.

My current estimate of the implementation of the program is included in my presentation "Patterns of Development in the Faculty of Science", prepared in January of 1970. I enclose the pertinent pages 2 & 3 of this to indicate the buildup of the program as foreseen at the present time.

The library requirements in this field are minimal. The University already subscribes to many of the pertinent publications and purchases the books required. There is no extensive back literature of periodicals in the subject and the cost of back issues would be relatively small.

M. Teaching Space

No increase in teaching space is foreseen. We will have to provide offices for faculty members but the present lecture facilities will be adequate for the new program.

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N. Research Space - Faculty

No special faculty research space need be provided. The computer is essentially the laboratory of the computing scientist.

O. Implementation

A Computing Science program is not completely new for this University. Some individual courses in computing are taught within the Department of Mathematics. There was a temptation to increase this type of offering by small increments.

However, such an approach would not ensure a program of high quality. Instead, it is our intention to press for a program which will be planned carefully in advance and which will be under the general direction of eminent experts in Computing Science.

The general Computing Science program, which we have proposed in its core form, is based on recommended programs at the undergraduate level in leading universities in North America. There is no doubt that a senior academic appointment in Computing Science will be necessary to provide the leadership in professional competence to implement a first rate undergraduate program. The computing groups will then be in a position to polish the program and to refine the actual core structure.

The general pattern of development is viewed as proceeding in three phases:

PHASE I - initiation of 100 and 200 level courses in Computing Science.

PHASE II- initiation of 300 and 400 level courses.

PHASE III- initiation of a complete major program in Computing Science.

PHASE IV - the establishment of new branches and choices within the Computing Science elective and the establishment of choices in the graduate program.

The essential first three phases will probably have the following budgetary implications:

1970-71 - number of new faculty - 3; annual rate of salary - $45,000; actual salary commitment - $30,000; operating expense - $45,000.

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1971-72 - number of new faculty - 2; annual rate of salary - $70,000; actual expenditure - $60,000; operating expense - $90,000.

1972-73 - number of new faculty - 3; annual rate of expenditure - $110,000; actual expenditure - $90,000; operating expense - $135,000.

Computing Science Program - Faculty of Science

Issues and/or Questions Raised by the Academic Planning Committee

1. Will there be an adequate demand for the program? Dean Funt indicated that there would be more than adequate demand for the program. He noted that up until five years ago, there was no complete computer science program in Canada. The University of British Columbia started a computer science program a year ago but as yet it remains in the formative stages. The Committee would direct Senate's attention to the comments of Mr. T. R. Jewell, Director, Computing Centre regarding the proposed program. Mr. Jewell's memo to Dr. John Chase, Academic Planner is attached as an appendix to the Computing Science proposal. Mr. Jewell comments that: "with respect to these course offerings providing the basis of a major in computing science they would probably be adequate if all we are interested in producing are students whose aim is to go on to graduate school to continue their study of computer science, or who plan to seek specialized employment in industry. In the latter case, they would be confronted with a limited number of opportunities primarily with computer manufacturers in a sales support role or, possibly, in a research environment." He further notes: "I would think that the computer science programs which already exist in Canadian universities today are more than adequate to supply the demand for the 'programmer' of the future, but they will fall far short of meeting the demand for the systems specialist if present curricula continue unchanged."

2. Per Mr. Jewell's comments, ought the University to be considering a program in computing sciences at the undergraduate level, or one in computer administration at the graduate level? Dean Funt responded by indicating that he felt that a computer administration program at the graduate level would be complementary to the program proposed at the undergraduate level. That program, at least initially, will be intended to train in computer techniques students who are majoring in other disciplines including the social sciences, physical sciences, management sciences, etc. Because the courses will be intended to serve a broad spectrum of students from across the University, and because of the need to train students in computer techniques, the proposed program will fill a need largely on that at this University. The graduate program in computer administration referred to by Mr. Jewell is intended to meet more specialized needs which might well serve as a logical extension of the proposed undergraduate program.

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3. Is this an interdisciplinary program? The program proposed is a disciplinary program in its own right although it is intended to serve interdisciplinary interests. Originally, the program was conceived of as filling a need for training in computer techniques those students who were majoring in other science disciplines, but now there is recognition of the need for the program to serve a much broader spectrum of students including those in the Arts and Education Faculties.

4. Should the initial organization home for the program be in the math department? There are differences of opinion with regard to possible models for the implementation of new programs. One is to establish the program initially within the department with which it is most closely identified. The second is to establish it as a program directly under the dean of the faculty with which it is most closely identified. Third is to establish it as a new department. Fourth to establish it as a University program not tied to any particular department of faculty but reporting possibly to the Vice-President, Academic. The proposal recommends that the initial "organizational home" for the program would be the math department. The program proposed was left in core form on the assumption that the senior academic appointed to head up the program should have considerable discretion in polishing the program and refining the actual course structure. The Committee was concerned on several counts with this proposed procedure. First, the program is intended to serve a wide variety of interdisciplinary interests. If the program is housed in the math department with the responsibility of selecting the senior academic to head the program left with either the math department or the Faculty of Science, the Committee questioned whether all the disciplines in the University to be served by the program would be considered. Second, the individual appointed to head the program would be identified with the math department. Presumably, a math department selection committee would be responsible for recommending the appointment of other individuals to be identified with the program. Again, the Committee wondered whether the needs of the entire University would be considered if the appointment recommendations emerged from one department. Third, the Committee recognized that there was a tendency in the past to identify computing science programs with math departments. However, for the reasons enumerated above, there appears to be a growing feeling that math departments are not the logical home for such programs and an organization home should be found which more adequately reflects the interdisciplinary demand for such programs. For

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these reasons, the Committee would urge that consideration be given to the following:

1. the selection of the senior academic appointed to develop the computing science program be undertaken by an inter-faculty committee and that this procedure also holds true for subsequent appointments to the program,

2. that organizationally, consideration be given to having the staff appointed to the program report either to the Dean of Science, or to whatever structure is established for the organization and administration of interdisciplinary programs.

5. Should the program offer both majors and minors? Dean Funt noted that computer sciences are a subject of study in themselves but that it is intended that in addition, the program provide a service function to other departments. There was unanimous agreement on the Committee that the program ought to be structured so as to provide a broad opportunity for students in all departments to obtain a minor in computing science. Given the comments of Mr. Jewell regarding demand in Canada for graduates of an undergraduate program in computing science, there is some question in the Committee's mind as to whether or not a major in computing sciences ought to be offered at this university. The Committee has no recommendation to make on this particular issue.