For Information

SIMON FRASER UNIVERSITY

OFFICE OF THE VICE-PRESIDENT, ACADEMIC

MEMORANDUM

S.92-58

To: Senate

From: J.M. Munro, Vice-President, Academic

Subject: External Review - School of Computing Science

Date: 16 October, 1992

Attached for the information of Senate is the executive summary of the external review of Computing Science which was carried out in February 1992. The report and the response of the School were reviewed by the Senate Committee on Academic Planning at its meeting on 14 October, and the Committee approved a motion to receive the report. The full report and the response by the School are available from the Secretary of Senate for senators to review.

The review team had the following membership:

Chair: Dr. Derek Corneil
Associate Vice-President, Research,
University of Toronto
(former Chair of Computing Science)

Members: Dr. Eshrat Arjomandi
Visiting Scientist,
IBM Toronto,
former Chair of Computing Science
York University

Dr. Paul Sorenson
Chair of Computing Science
University of Alberta.

J.M. Munro

8 APPENDIX A: Recommendations

Undergraduate Program

2.1 The School should renew its efforts to assess the current course offerings in relation to the recently released Computing Curriculum 1991, Report of the ACM/IEEE-CS Joint Curriculum Task Force. This process may be helpful in revealing any shortcomings or excesses with the current course offerings.

2.2 The School should consider reducing the number of required computing science courses and thereby allowing more elective courses for a student to establish greater subject concentration in areas other than computer science or more variety in their course selection.

2.3 In response to concerns of the undergraduates, some faculty and the Co-op employers, the School should seriously consider developing a new (seventh) area of concentration in software engineering.

2.4 Mechanisms should be explored for computing science students to have access to engineering science courses.

2.5 Unless absolutely necessary, no new lecturers should be hired. Furthermore, as there is attrition in the ranks of lectures, every effort should be made to have some of the lecturers replaced by research faculty.

2.6 Every core course or group of core courses should be assigned a "champion" from amongst the research faculty. It will be his or her job to monitor the evolution of the course, report the necessary changes to the undergraduate committee, and to serve as a contact for new course instructors.

2.7 Consideration should be given to an idea proposed by one of the undergraduate students, namely, of guest lectures in the lower core courses by research faculty members.

2.8 The School should continue its recent policy of monitoring the English capabilities of new tutors.

2.9 The School should consider instituting a mentorship program or some other mechanism whereby the undergraduate students have more interaction with research faculty.

2.10 Within six months there should be an internal review of the staff resources to maintain the undergraduate teaching labs. In particular, the effect of the MTS/UNIX decisions must be monitored. Such a review should be in the context of a strategic plan for the evolution of the various teaching labs.

The Graduate Program

3.1 The issue of 700 courses and their relationship with 400 courses should be examined.

3.2 There should be more flexibility in the requirements that each Masters student take three courses at the 700 level and three at the 800 level. Students with a strong background in computer science should be allowed to take fewer 700-level courses; students with a weak background should be required to take more at the 700 level.

3.3 Continued emphasis should be placed on the recruiting of excellent graduate students and resources available from the Dean should be utilised.

3.4 The School should seriously consider adopting the model whereby students start their preliminary research reading as soon as they arrive at the School. Under such a model, the students would be assigned a permanent research advisor upon entrance.

3.5 The research seminars should continue with the faculty encouraged to give more general, lower level talks.

3.6 The monitoring of the drop-out and completion statistics should be continued.

3.7 The expectations of Masters theses must be closely monitored.

3.8 Discussions should be held with the School of Engineering Science regarding the closer involvement of the hardware area of computing science. This could involve the development of a shared graduate program in hardware and/or co-supervision of graduate students by faculty across the two schools.

3.9 Careful consideration should be given to the justification for six rather than five graduate courses for the MSc degree.

3.10 If the School decides to follow the model of students starting on research as soon as they arrive, then the students must be allowed to take some of their courses in the second year of Masters study.

3.11 If the School continues the policy of assigning incoming students to temporary advisors and having these students use workstations in common areas, then it seems that more such workstations are needed. The School may also want to review the policy of who may use the research labs.

3.12 The mending of fences with the graduate students must start immediately. Graduate student evaluations and proposals prepared for the review should be given careful consideration by the School. We applaud the initiative taken during our visit of arranging

a meeting with graduate students and various School administrators.

Research

4.1 Strong emphasis is needed for many faculty members to improve their funding from NSERC.

4.2 Every effort should be made to commit start-up funding to new junior faculty in advance, as part of the hiring negotiations with the candidate.
4.3 The School must realise the benefits of the two Chairs. One benefit, of course, is the possibility of attracting two outstanding scholars. The other point is that the School must at all costs avoid the repercussions of not being able to fill these Chairs.

4.4 The Dean of Applied Science must immediately get the three major players working closely together. To avoid a "turf battle" between the two schools, one possible solution is for the Dean to consider immediately announcing that, regardless of the ultimate School affiliation of the two Chairs, each School will be considered to have allocated one tenure stream position towards the two Chairs.

4.5 We also recommend that the Senior Chair holder be recruited and given his or her choice as to the appropriate affiliation with the two schools. The Junior Chair can then be recruited in order to balance the affiliation chosen by the Senior Chair.

4.6 Research faculty members should be encouraged to pool grant funds in order to hire appropriate systems people for their individual and/or group research needs.

Personnel/Management

5.1 The School should develop a plan for ongoing discussions and programs to encourage a higher participation of women.

5.2 The School should develop a 5 year strategic plan. This plan should include space and equipment requirements.

5.3 In order to provide even minimal secretarial service to the faculty, the position of the half-time Undergraduate Affairs secretary (present occupant: B. Ringham's) should be reinstated; furthermore, one new full time secretary must be hired. It is essential that this extra help must go to providing secretarial support to the faculty.

5.4 We recommend that there be a reorganization of the management of the School and

that an Associate Director be appointed. His/her responsibilities could include the graduate program.

5.5 Every effort should be made to ensure continuity of the undergraduate and graduate director positions.

5.6 Notification should be given to members of the School when minutes of meetings become available. This can be accomplished easily by e-mail and news groups.

Linkages

6.1 The team conducting the forthcoming review of CSS must be well aware of the dependence of the School of Computing Science on CSS, and must understand fully the ramifications on the school of any changes to the CSS programs.

6.2 The Director of Computing Science must work closely with the Director of Engineering Science to deal with the three problems of hardware architecture and VLSI for research and graduate students, the accessibility of engineering science undergraduate courses to computing science students and the issue of the NSERC Chairs.

6.3 We recommend that the Directors of CSS and the School of Computing Science meet on a regular basis to discuss openly the relationship between the two units. CSS must be made aware of the perception problems from which the School suffers. The School on the other hand, should make a greater effort to promote its strengths, a major one of which is its connection to CSS. The two Directors must also work very closely in the solution of the NSERC Chairs issue.

Concluding Remarks

7.1 Simon Fraser University should keep the School of Computing Science as a high priority and should make every effort to provide the resources for the implementation of the recommendations made throughout this report.

SCAP 92 - 31

Review of the School of Computing Science

Simon Fraser University

February 24 - 26, 1992

Eshrat Arjomandi, York University
Derek Corneil, University of Toronto (Chair)
Paul Sorenson, University of Alberta
Thomas Perry, Internal Assessor

Executive Summary

The School, for the most part, is in a healthy state. It has a traditional strength in its undergraduate program, especially the Co-op program as well as a growing reputation in research and graduate studies. It currently ranks solidly in the second tier of Canadian computer science departments; thus it has a solid national reputation with international recognition in a few areas but falls behind the two departments that are internationally recognized. Furthermore, the School provides an amiable and well run surroundings for all members.

There are, however, some areas of concern that must be addressed in the near future. The most pressing of these are the recruitment for the NSERC chairs, provision of appropriate secretarial support for the faculty, increased involvement of research faculty in the undergraduate program, improvement of relations with the graduate students and the development of a strategic plan. Other minor concerns are raised in the report.

1 Preamble

The School of Computing Science at Simon Fraser University is a fairly young but nonetheless well-respected national centre for computer science undergraduate and graduate teaching as well as research. We regard the School to be solidly in the second tier of Canadian computer science departments; thus it has a solid national reputation with international recognition in a few areas but falls behind the two departments that have strong international reputations. We find the School, for the most part, to be in a healthy condition and the concerns that we mention throughout the report are relatively minor. Although the School is young, it is maturing well and has established a management structure that is working well. Furthermore, the Director has the full respect of all members of the School. We do, however, note that the School seems to lack a focus and a vision of where it wants to be five years from now. For example, the internal review was very much a commentary on the past and present situation rather than a view to the future. As part of the maturation process, the School should now develop a five year strategic plan.

The Review Committee visited the School on February 24, 25 and 26, 1992 and had access to various documents before the visit. During the visit we met with all faculty members and all support staff as well as representatives of the undergraduate students, the graduate students and the university administration. Since the charge to the Committee did not lend itself to a coherent organization of the report, we have chosen to organize the report into the following sections: Undergraduate Program, Graduate Program, Research, Personnel/Management, Linkages, and Concluding Remarks. Each section contains recommendations appropriate to that section; all recommendations are gathered in Appendix A. The Charge to the Committee appears in Appendix B together with pointers to the report where the various charges are covered.

2 Undergraduate Program

The undergraduate Computer Science program at Simon Fraser University, especially the Co-op program, is a traditional strength. The program is still very strong, although there are some minor problems that will be covered later in this section. The drop in undergraduate computer science student enrolments experienced at Simon Fraser University in the late 1980s is normal across North America; however, as an indication of the strength of the program at SFU, the drop seems to be slightly less than average. Furthermore, we note a recent increase in the number of computer science undergraduate students. It is, however, too soon to tell whether this is a trend or an anomaly. Nonetheless, the numbers themselves underline the overall strength of the program and its popularity with high school students. It is also clear that the undergraduate students are positive about the program, enjoy a close interaction with the School Administration and receive excellent personal advising by the staff. We did note, however, that lower level undergraduate students have very little, if any, contact with the research faculty either in the way of teaching or advising.

2.1 Structure and Organization of the Program

The School offers many undergraduate programs with either an honours or majors emphasis in computing science. These include: Honours BSc, Honours BA, Major BSc, Major BA, Major BBA (in conjunction with the Faculty of Business Administration), Major BEd (in conjunction with the Faculty of Education), Honours BSc (Digital Systems Design), Honours BSc (Mathematics and Computing Science). In addition, the School also offers Minor and Post Baccalaureate Diploma programs in computing science and participates in an Honours and Majors program in cognitive science along with linguistics, philosophy and psychology. This is certainly among the greatest selection of program offerings of any computer science department in Canada.

The last major re-organization of the curriculum was in 1986. The School has endeavoured to keep the curriculum current be yearly reviews and minor modifications. We do not sense that the curriculum needs a major re-organization; however, it is advisable that the Undergraduate Curriculum Committee assess its current offerings in relation to the recently released Computing Curriculum 1991, Report of the ACM/IEEE-CS Joint Curriculum Task Force. This assessment process, which we understand was initiated but not completed in 1990-91, may reveal some shortcomings or excesses with the current set of course offerings. Our general impression is that the School offers a large number of undergraduate courses (63 in the 1991-92 calendar) which provides students with an excellent choice of courses. Some of the course offerings are of a highly specialized nature (e.g., CMPT 340-3, 350-3, 402-3, 411-3, 413-3 and 414-3) and perhaps could be offered in alternating years or as more advanced topics at the graduate level.

One area where the current curriculum differs significantly from most is in the number of required computing science courses for Major and Honours Programs. The Majors Program requires a minimum of 59 out of 120 semester hours courses in computing science. The Honours Program requires a minimum of 70 out of 120 semester hours courses in computing science. In both programs, the number of required computing science courses is high and does not leave much room to develop specializations in other areas, with the possible exception of mathematics. Computer science course requirements (expressed in equivalent semester hours) from a selection of programs in Canadian universities are as follows:

	Majors	Honours
Univerity of Alberta	42	48
York University	42	54
University of Saskatchewan	30	39
University of Toronto	30	39
University of Victoria	48	60
University of Waterloo	27	36
SFU	59	70

As indicated in the overview comments, the Co-op Program is extremely successful. The students we met were very positive about the program and felt that often their work terms would get them beyond the material covered in courses. This is a positive sign. Approximately 80% of students were involved in Co-op with approximately 50% completing all four work terms. We were told that, in spite of the difficult economic times, it was still relatively easy to find work placement for the students. It should be noted that other Co-op programs in Canada are having difficulty in finding appropriate placements.

The students and some of the faculty did, however, raise concerns about the lack of software engineering courses. This concern has also been noted by some of the co-operative education employers. In response to these concerns the School could develop a new area of concentration in software engineering. This may be difficult to do because there is little projected growth in the school and few, if any, retirements in Computing Science in the near future. In addition, it may be difficult to recruit appropriate faculty because there is currently a shortage of PhD graduates in this area. One possible strategy is to provide short-term course relief for some of the Lecturers to allow them to establish the necessary expertise to support this new area of concentration.

The students also noted that they did not have access to courses in the School of Engineering Science, which seemed odd particularly since the two Schools belong to the same Faculty.

Recommendations

2.1 The School should renew its efforts to assess the current course offerings in relation to the recently released Computing Curriculum 1991, Report of the ACM/IEEE-CS Joint Curriculum Task Force. This process may be helpful in revealing any shortcomings or excesses with the current course offerings.

2.2 The School should consider reducing the number of required computing science courses and thereby allowing more elective courses for a student to establish greater subject concentration in areas other than computer science or more variety in their course selection.

2.3 In response to concerns of the undergraduates, some faculty and the Co-op employers, the School should seriously consider developing a new (seventh) area of concentration in software engineering.

2.4 Mechanisms should be explored for computing science students to have access to engineering science courses.

2.2 Teaching

We were surprised to discover that a significant part of the teaching load is borne by lecturers. In our opinion, this dependency on lecturers and sessional instructors is one of the highest in any computer science department in Canada. The teaching load for research faculty of 3 courses per year is close to, but slightly below, the national average. It is, however, an appropriate teaching load for faculty members involved in graduate supervision and research. Nonetheless, with the current arrangement, the undergraduate students see very few, if any, research faculty until their third year. In our relatively brief visit to the School, we detected a lack of concern or, perhaps, enthusiasm by some of the research faculty for the undergraduate program. We emphasise that the comments about lack of low level teaching by research faculty should not be construed as a criticism against the lecturers. There is a strong feeling that as individuals they range from "great to not-so-great", but as a group they are doing a fine job. The heavy dependence on non-research faculty has, however, caused a problem with regard to course content. Many times we heard the comment that the curriculum "tends to bend" and that the content of a particular course offering depends on the individual teaching it. A good start has been made with the compilation of course outlines; however, we sense that many of the core courses or group of core courses do not have a "champion" amongst the research faculty. Concern was also raised about English problems with some of the tutors; however, we applaud the School's new policy of not giving an immediate tutorial assignment to newly arrived graduate students whose mother language is not English.

Recommendations

2.5 Unless absolutely necessary, no new lecturers should be hired. Furthermore, as there is attrition in the ranks of lectures, every effort should be made to have some of the lecturers replaced by research faculty.

2.6 Every core course or group of core courses should be assigned a "champion" from amongst the research faculty. It will be his or her job to monitor the evolution of the course, report the necessary changes to the undergraduate committee, and to serve as a contact for new course instructors.

2.7 Consideration should be given to an idea proposed by one of the undergraduate students, namely, of guest lectures in the lower core courses by research faculty members.

2.8 The School should continue its recent policy of monitoring the English capabilities of new tutors.

2.3 Advising

The undergraduate students' strong approval of their program is greatly influenced by the high calibre of advising they are getting from the School. This advising comes from both the Co-op staff as well as staff in the School itself. The students truly feel an integral part of the department. Concern was raised, however, that the students have very little opportunity to get advice from the research faculty, especially in such areas as graduate school and detailed course content of high level courses. Other computer science departments have developed a successful mentorship program in which each faculty member who volunteers is assigned approximately 25 students. These students may, if they wish, contact the faculty members regarding the issues mentioned above as well as personal matters. We note that in other universities, this program has not been abused and the mentorship program has involved a slight increase in workload for the faculty.

Recommendation

2.9 The School should consider instituting a mentorship program or some other mechanism whereby the undergraduate students have more interaction with research faculty.

2.4 Resources

In our opinion, the labs for undergraduate teaching are average to above average across the country. In many ways the timing of our review was inappropriate to provide an adequate critique of the undergraduate labs. Because of the recent termination of the

MTS system and the conversion to UNIX, the staff has been heavily involved in these changes. Until the situation settles down, it is difficult and, perhaps inadvisable to judge the adequacy of the resources. We did note, however, that the students were relatively pleased with the undergraduate labs and with the staff servicing these labs. Because of the shortness of our visit, we did not get an opportunity to examine the library resources; however, we note that no complaints were raised to us. This comment about library resources also applies to the areas of research and graduate studies.

Recommendation

2.10 Within six months there should be an internal review of the staff resources to maintain the undergraduate teaching labs. In particular, the effect of the MTS/UNIX decisions must be monitored. Such a review should be in the context of a strategic plan for the evolution of the various teaching labs.

3 The Graduate Program

A healthy and viable graduate program is the lifeblood of a department's research program. The graduate program in the School of Computing Science is relatively young and has grown quickly. As one person pointed out "it has grown faster than the resources". The graduate students were pleased with the attitude of the research faculty and felt that they were regarded as "junior colleagues in research". There is a very interesting comparison with the undergraduates here. The undergraduates, as indicated above, feel cut off from the research faculty, whereas the graduate students have appropriate close bonds with the research faculty. On the other hand the undergraduates feel that they are part of the School whereas the graduate students were concerned about their place in the School. As discussed below, considerable concern has also been raised about the completion rates and drop-out rates.

3.1 Structure and Organization of the Program

Graduate courses are divided into 700 and 800 level courses. It is our feeling that some of the 700 level courses, for example Computational Complexity and Artificial Intelligence are in effect 400 level courses. It may be appropriate to follow the example of other universities and merge, via cross-listings, the 4th year undergraduate courses and the graduate breadth courses. We also note that, not surprisingly, there is a slight bias in the 800 level courses towards Theory and Artificial Intelligence.

The MSc requirements are six graduate courses plus a thesis. The six courses must constitute three at the 700 level and three at the 800 level. As discussed in Section 3.4, the requirement of six courses is slightly above the average across Canada. The PhD program seems to have achieved a reasonable balance between comprehensive requirements and

research although, as mentioned below, we are concerned with the length of time until a graduate student is assigned a permanent advisor.

Recommendations

3.1 The issue of 700 courses and their relationship with 400 courses should be examined.

3.2 There should be more flexibility in the requirements that each Masters student take three courses at the 700 level and three at the 800 level. Students with a strong background in computer science should be allowed to take fewer 700 level courses; students with a weak background should be required to take more at the 700 level.

3.2 Recruiting

It is clear that the quality of the incoming students is improving; however, there is still room for improvement. The Dean of Graduate Studies advised us of resources that are available to help in the recruitment of graduate students.

Recommendation

3.3 Continued emphasis should be placed on the recruiting of excellent graduate students and resources available from the Dean should be utilised.

3.3 Thesis Supervision

Currently the School employs the philosophy that their graduate students should complete their course work before starting their thesis work. In this regard, an incoming student is assigned a temporary advisor until the research area is chosen and the permanent advisor is assigned. In many cases it seems as though the temporary advisor has little contact with the student and does not feel a responsibility towards the student. In our opinion, this has at least partially contributed to the high drop-out rates from the graduate program, as well as the length of time it is taking many students to finish. We well understand the difficulty in trying to draw trends from the statistics of a young graduate program. Nonetheless, the detailed information provided by the Dean does indicate that trends are appearing. According to his statistics, there are currently 32 Masters and 9 PhD students without supervisors, and some of these students started in the program in 1989 or 1990. We are well aware that Simon Fraser has the admirable philosophy of admitting non-traditional students and thus there is a difficulty in assigning these students to permanent advisors. Nonetheless, we are concerned that many of these students are drifting. The statistics on drop-out rates seems to confirm these concerns. We note

that of the 39 students who have dropped out, 21 were without a permanent supervisor.

We also are concerned about the length of time the students are taking to complete their thesis. Some supervisors do have good records in this regard; however, there are many students, especially in the Masters program, who are taking too long. Part of this, of course, is explained by the non-traditional background of some of the students as well as initial conservatism in any new graduate program. This tendency of expecting "too much" in a Masters thesis is common amongst many new graduate departments. Furthermore, some faculty members take pride in the fact that some of the Masters theses that they have supervised are almost at the level of a PhD thesis. In our opinion this is inexcusable. If a student is to do PhD level work, he or she must be awarded the PhD degree and not be bogged down at the Masters level. This tendency, it should be noted, also applies to faculty members in well-established major graduate programs. We also note, with some surprise, that the students do not seem to be overly concerned about the completion times. They should be! At the PhD level, the job market will often dictate that a student is better to take an extra year in a graduate program. This, however, does not apply at the MSc level.

One of the mechanisms in place to help students choose a research advisor is the research seminar. These seminars receive mixed reviews from the students. As with any research lecture, some people feel that the coverage is too deep, others that it is too broad. Nonetheless, based on our discussions with the graduate students, we feel that the purpose of this program is excellent and should be continued with minor modifications.

A number of times we heard strong concern about the difficulty in attracting graduate students into the hardware area. Some of this is not surprising since many students who wish to pursue research in hardware will naturally apply to engineering programs rather than computing science. We do, however, feel it is appropriate for hardware to be included in the graduate program at Simon Fraser. As indicated in the recommendations, we feel that in this area closer contact must be made with the School of Engineering Science.

Recommendations

3.4 The School should seriously consider adopting the model whereby students start their preliminary research reading as soon as they arrive at the School. Under such a model, the students would be assigned a permanent research advisor upon entrance.

3.5 The research seminars should continue with the faculty encouraged to give more general, lower level talks.

3.6 The monitoring of the drop-out and completion statistics should be continued.

3.7 The expectations of Masters theses must be closely monitored.

3.8 Discussions should be held with the School of Engineering Science regarding the closer involvement of the hardware area of computing science. This could involve the development of a shared graduate program in hardware and/or co-supervision of graduate students by faculty across the two schools.

3.4 Workload of Students

The current demand of six courses plus a thesis for the Masters degree is on the surface heavier than most Canadian universities. Without a thorough understanding of the expectations in both courses and theses, the numbers in themselves are meaningless. We have not had an opportunity to do this thorough analysis; however, we are concerned about the workload for Masters students. Many students indicated to us that doing three courses in one term as well as a full tutoring load is almost impossible to achieve. This workload would also make it impossible for any thesis work to be done.

Recommendations

3.9 Careful consideration should be given to the justification for six rather than five graduate courses for the MSc degree.

3.10 If the School decides to follow the model of students starting on research as soon as they arrive, then the students must be allowed to take some of their courses in the second year of Masters study.

3.5 Resources

As with most computer science departments in Canada, there is a growing concern whether all students can be funded. We note that the level of pay for tutors is relatively low but that the recent negotiations will improve the situation.

Students who have not been assigned a permanent advisor, do their computing on workstations in the common pools. It is not until the student has been assigned a permanent advisor that he or she may use facilities in the labs. No concern was raised about the computing resources in the labs; however, we heard complaint about the insufficient number of workstations in the common pools.

Recommendation

3.11 If the School continues the policy of assigning incoming students to temporary advisors and having these students use workstations in common areas, then it seems that

more such workstations are needed. The School may also want to review the policy of who may use the research labs.

3.6 Administration of the Graduate Program

As indicated in the introductory comments on the graduate program, there is a feeling of alienation of the graduate students towards the School administration. Furthermore, there is a perception amongst the students that they are "second class citizens" and "not trusted" by members of the office staff. It is our feeling that the Director and the staff are, in fact, very concerned about the graduate program; nonetheless, the perception of second class citizenship is there and must be dealt with immediately. We also note that there has been a rapid turnover in the directorship of the graduate program.

Recommendation

3.12 The mending of fences with the graduate students must start immediately. Graduate student evaluations and proposals prepared for the review should be given careful consideration by the School. We applaud the initiative taken during our visit of arranging a meeting with graduate students and various School administrators.

4 Research

The overall research environment is healthy. There is strong respect and friendship amongst researchers. This is clear from the comments we heard as well as from the large number of joint papers amongst the research faculty. As with most departments, there are some areas that are larger and enjoy a stronger international reputation than others. Such larger groups often form a magnet that attracts people from small, less viable groups. At SFU, Theory is one such example. This group has a strong reputation and seems to seduce the research interests of faculty in other areas. Another major area of strength is Applied Artificial Intelligence. At Simon Fraser there is considerable concern as to whether too much emphasis has already been given to Artificial Intelligence. As discussed below, this is a very crucial issue, especially in light of the recent NSERC Industrial Chairs in Expert Systems.

4.1 Research Funding

With regard to NSERC operating grant funding, the most notable and positive aspect is the high participation level of the research faculty. The School also boasts two "superstars", namely people who are at the very high end of NSERC funding and two well-established researchers with international reputations. There are, however, a handful of researchers who are being funded at a rate that is below normal for their experience. The analysis of the NSERC funding data seems to support one concern mentioned to us,

namely that some faculty "tend to rest on their past achievements".

A great deal of the non-NSERC research funding and research infrastructure comes from CSS. The relationship of the School with CSS is covered in considerable detail in Section 6. Nonetheless, it is clear that this funding plays an important role in the research environment for the School's research faculty. We do, however, have some concern with start up money for new faculty members. We were told that this money, the bulk of which comes from CSS, can only be arranged once the new recruit is on faculty. This, of course, makes it difficult for beginning faculty members and for the School to do first-class recruiting.

Recommendations

4.1 Strong emphasis is needed for many faculty members to improve their funding from NSERC.

4.2 Every effort should be made to commit start-up funding to new junior faculty in advance, as part of the hiring negotiations with the candidate.

4.2 NSERC Industrial Chairs

Through a great deal of work, primarily by CSS, the University has been awarded two NSERC Industrial Chairs (one junior) in the area of Applied Artificial Intelligence. This is a very important achievement for the School and the people involved in arranging these Chairs should be congratulated. We are worried, however, about the lack of enthusiasm generated by these Chairs. This, to a great extent, results from the debate mentioned in the introductory remarks of this section about hiring in Artificial Intelligence. Nonetheless, it must be clearly realised that the NSERC Chairs HAVE BEEN AWARDED and that there would be an enormous loss of reputation if Simon Fraser were not able to live up to its end of the bargain by hiring two top notch people into these Chairs. It is essential that CSS, the School of Computing Science, and the School of Engineering Science, must cooperate fully in the hiring for these Chairs. Although we did not talk with representatives from the School of Engineering Science, we were told that the enthusiasm for the Chairs in that School is also quite low. We are concerned that at this stage, the two schools may feel that from the perspective of long term faculty allotments, each school may be better served by having the Chairs take up faculty slots in the other school. As indicated in the recommendations below, we feel that the Dean must bring the principle participants together and immediately resolve the issue. Quite simply, there is too much at stake.

Recommendations

4.3 The School must realise the importance of the two Chairs. The major benefit, of course, is the possibility of attracting two outstanding scholars. The School must at all costs avoid the repercussions of not being able to fill these Chairs.

4.4 The Dean of Applied Science must immediately get the three major players working closely together. To avoid a "turf battle" between the two schools, one possible solution is for the Dean to consider immediately announcing that, regardless of the ultimate School affiliation of the two Chairs, each School will be considered to have allocated one tenure stream position towards the two Chairs.

4.5 We also recommend that the Senior Chair holder be recruited and given his or her choice as to the appropriate affiliation with the two schools. The Junior Chair can then be recruited in order to balance the affiliation chosen by the Senior Chair.

4.3 Research Infrastructure

As discussed in Section 6, much of the network infrastructure for research is provided through CSS. In discussing the research environment with research faculty members, we came away with the impression that many researchers do not know how well off they are, especially with respect to the situation at other Canadian universities. One aspect that was mentioned, is that CSS does not provide personnel resources for the mounting and maintenance of individual software packages. We were somewhat surprised to hear that there is little, if any, pooling of NSERC operating funds in order to hire appropriate software systems people. There seems instead to be an attitude that CSS is to provide the entire research infrastructure.

Recommendation

4.6 Research faculty members should be encouraged to pool grant funds in order to hire appropriate systems people for their individual and/or group research needs.

5 Personnel/Management

With very few exceptions, all students, staff, and faculty in the School get along very well. This camaraderie does not happen by accident; people who have been and are in positions of management are to be congratulated on the excellent working environment that has been created. There are, of course, minor personal problems but we are favourably impressed with how few the problems are and how they are resolved.

5.1 Faculty

The number of faculty is appropriate for the size of the various programs offered by the School. As with many computer science departments, the relative newness and rapidly evolving nature of the discipline have lead to a number of non-traditional areas being covered at SFU. The background of the faculty is typical of that in most computer science departments.

As indicated previously, the research faculty interact well, both professionally and socially. One university-wide problem which is felt acutely in Computing Science is the asymmetry of the two year staff review. Furthermore, many faculty feel that they are receiving a mixed message from the University administration regarding the relative importance of teaching and research. In our questioning of senior university administrators, we received a similar mixed message. Clearly the University is in the process of redefining its mission.

All computer science departments, and for that matter all science departments, are grappling with the issue of under-representation of women. Through our limited contact with the School, we feel that the School of Computing Science is in a similar position to most Canadian computer science departments. There is a small number of female faculty and graduate students. Most male colleagues are sensitive to the pressure their female colleagues feel, and are committed to creating a proper environment. A handful of males, however, are seemingly indifferent to this issue and are unaware of the sensitivity of their female colleagues. As with all science departments, there is a need for ongoing discussions and programs to encourage a higher number of women throughout the School.

In our discussion with the lecturers, we were pleased to see that there is little feeling of second-class citizenship in their relationship with researchers and staff. This is a problem that occurs in many departments that employ a large number of lecturers. In our conversation with researchers, we certainly discovered a strong respect for their teaching colleagues.

We also sense a reluctance of some research faculty to be involved in the administration of the School. Furthermore, as mentioned previously, we sense that a stronger, clearer vision is needed of where the school should be five years from now. As examples of this, we note that there was very little discussion of the School's future space or equipment needs. Although the School seems to have an adequate space allotment at present, various new endeavours such as the NSERC chairs and growth in the graduate program will most likely create space demands that can not be met with the current allotment.

Recommendations

5.1 The School should develop a plan for ongoing discussions and programs to encourage a higher participation of women.

5.2 The School should develop a 5 year strategic plan. This plan should include space and equipment requirements.

5.2 Secretarial Staff

The School of Computing Science at Simon Fraser University has a cohesive and friendly administrative support group. It is also clear, however, that this group is heavily worked and is not able to provide the services that faculty members should expect. As one staff member commented, "SFU is in the process of distributing the workload, but NOT the people resources to do it". In our view, the secretarial service available for the research faculty is abysmal and amongst the lowest in computer science departments in Canada. As an indication of their frustration, a few people commented that the undergraduate students had better service from the support staff than did the faculty. At no point, however, did we hear any complaint about the friendliness of the staff or their willingness to help in the case of an emergency. Presently, the faculty has to do almost all secretarial work related to courses (eg typing exam papers and assignments, reproducing lecture material, etc.) as well as routine research needs (eg helping with research/refereeing correspondence, technical typing, etc.). Clearly this is an inappropriate use of highly trained personnel.

Recommendation

5.3 In order to provide even minimal secretarial service to the faculty, the position of the half-time Undergraduate Affairs secretary (present occupant: B. Ringham's) should be reinstated; furthermore, one new full time secretary must be hired. It is essential that this extra help must go to provide secretarial support to the faculty.

5.3 Technical Staff

As indicated in Section 2.4, the staff is very busy now and we are not able to say whether further staff complement is necessary. Recommendations regarding this group are contained in Section 2.4

5.4 Management of the School

The School is being run very well. An academic unit as complex as this only achieves such efficient management through strong leadership. The faculty felt that they were well consulted and had a universally high regard for the Director. We do, however, sense some maturation problems with the School. In particular, we feel that some of the researchers are naive about the running of a relatively large academic unit. Some people expected to be consulted on all issues, except very minor decisions and yet we heard complaints about "too much administration". As the School has grown, it has become more and more necessary for a great deal of decision making to be placed in the hands of committees. We are also concerned about the rapid turnover that has taken place in the directorships of both the undergraduate and graduate programs. Continuity in these positions would help greatly to solve the problems that we have previously mentioned. One possible way, and one we recommend, is for an academic to be appointed Associate Director. He or she could also have responsibility for the graduate program. As a minor comment, some lecturers complained of a lack of communication regarding decisions made by various committees.

Recommendations

5.4 We recommend that there be a reorganization of the management of the School and that an Associate Director be appointed. His/her responsibilities could include the graduate program.

5.5 Every effort should be made to ensure continuity of the undergraduate and graduate director positions.

5.6 Notification should be given to members of the School when minutes of meetings become available. This can be accomplished easily by e-mail and news groups.

6 Linkages

Here we detected a bit of an identity crisis. Many of the linkages enjoyed by the School have been to a great extent developed through CSS. This heavy reliance on CSS is both good and bad news. On the one hand, the School benefits greatly from the research infrastructure, grants program, and interdisciplinary initiatives of CSS. On the other hand, the School has not been successful in building the strong national reputation that it deserves. Furthermore, from the point of view of publicity, it seems to be very much in the shadow of CSS. In examining linkages, we will deal with linkages within the School, within SFU, and outside the University.

6.1 Within the School

Many faculty members were not aware that the last 7 tenure stream positions have been funded through CSS. Furthermore, they are benefiting from an enviable research infrastructure in which they are not charged for their "vanilla" computing. Some faculty also indicated that collaborative research inside the School has resulted from various CSS initiatives. Regarding the CSS strategic grants program, we received mixed reviews. Those who have received funding from the program strongly support it; others feel it is a waste of money. We are concerned, however, with the inevitable mixed loyalties that the benefits of the CSS program instill in many faculty members. Clearly this is a difficult and inevitable problem. The School of Computing Science has benefited greatly from the programs offered by CSS; however, as we shall see in section 6.3, a price has been paid.

Recommendation

6.1 The team conducting the forthcoming review of CSS must be well aware of the dependence of the School of Computing Science on CSS, and must understand fully the ramifications on the school of any changes to the CSS programs.

6.2 Within Simon Fraser University

Unfortunately, we did not have an opportunity to talk with the Chair of the Mathematics Department or the Director of the School of Engineering Science. It is our perception nonetheless that there is a healthy relationship with Mathematics especially in the area of Combinatorics and Discrete Mathematics. As mentioned previously, we feel that there are three major areas in which Computing Science must work closely with Engineering Science. These areas are Hardware Architecture and VLSI for research and graduate students, the accessibility of engineering science undergraduate courses to computing science students, and, most importantly, the issue of NSERC Chairs. It also should be noted that CSS plays a major role in fostering interdisciplinary research throughout the University.

Recommendation

6.2 The Director of Computing Science must work closely with the Director of Engineering Science to deal with the three problems of Hardware Architecture and VLSI for research and graduate students, the accessibility of engineering science undergraduate courses to computing science students and the issue of the NSERC Chairs.

6.3 Outside the University

It is in this area that the School's identity crisis becomes most apparent. There was certainly some insecurity about the School's national status and the perceived appreciation

of the School. This is exacerbated by the major recruiting and growth that has taken place in the Department of Computer Science at UBC. The perceived lack of appreciation of the School is, we believe, accurate and is also to some extent caused by the fine external publicity done by CSS. In many ways, the School is in the shadow of CSS when it comes to external visibility. Again we have a good news/bad news situation. Some faculty told us of the help that CSS has provided in building contacts with colleagues at other universities. Furthermore, a great deal of the industrial contact enjoyed by various members of the School has been facilitated and supported by CSS.

The price of decreased visibility for the School has, however, been paid. In examining the relationships with BC industry, a task we had very little time to perform, we note that BC industry in computing science is very different than Ontario industry. Thus the types of interaction in existence at universities such as Waterloo and Toronto, cannot be duplicated with the more resource-based industry in BC. Unfortunately, we did not meet with any industrial representatives and did not have an opportunity to explore this issue further. We do, however, point out the importance of using the very healthy Co-op program to help build research opportunities with industry.

Recommendation

6.3 We recommend that the Directors of CSS and the School of Computing Science meet on a regular basis to discuss openly the relationship between the two units. CSS must be made aware of the perception problems from which the School suffers. The School on the other hand, should make a greater effort to promote its strengths, a major one of which is its connection to CSS. The two Directors must also work very closely in the solution of the NSERC Chairs issue.

7 Concluding Remarks

As indicated throughout the report, we found the School to be in a healthy situation. The problems we have discussed above are relatively minor. We are favourably impressed with the School's ability to solve problems and to provide a very harmonious and productive workplace.

During our visit we received some comments about new initiatives or possibilities. Although we have not had an opportunity to explore these issues completely, we would like nonetheless to offer our comments on them. The first deals with the debate as to whether or not undergraduates should be admitted directly to the School of Computing Science. Although we support the admission of students to the Faculty of Applied Science, we heard very little convincing argument in favour of admission to the School. Furthermore, we feel that any advantages would be greatly outweighed by the disadvantage of a premature focus imposed on entering undergraduate students. As pointed out in section 2.1,

the School already requires too many computer science courses and does not allow the students enough room to explore other areas of interest. We also heard of the ranking of departments and schools as A or B level depending on their size and complexity. Although we do not have comparative data, it is our belief that the School of Computing Science warrants being treated as an A level department, a position it would enjoy at most other Canadian universities. This leads to our final recommendation.

Recommendation

7.1 Simon Fraser University should keep the School of Computing Science as a high priority and should make every effort to provide the resources for the implementation of the recommendations made throughout this report.

8 APPENDIX A: Recommendations

Undergraduate Program

2.1 The School should renew its efforts to assess the current course offerings in relation to the recently released Computing Curriculum 1991, Report of the ACM/IEEE-CS Joint Curriculum Task Force. This process may be helpful in revealing any shortcomings or excesses with the current course offerings.

2.2 The School should consider reducing the number of required computing science courses and thereby allowing more elective courses for a student to establish greater subject concentration in areas other than computer science or more variety in their course selection.

2.3 In response to concerns of the undergraduates, some faculty and the Co-op employers, the School should seriously consider developing a new (seventh) area of concentration in software engineering.

2.4 Mechanisms should be explored for computing science students to have access to engineering science courses.

2.5 Unless absolutely necessary, no new lecturers should be hired. Furthermore, as there is attrition in the ranks of lectures, every effort should be made to have some of the lecturers replaced by research faculty.

2.6 Every core course or group of core courses should be assigned a "champion" from amongst the research faculty. It will be his or her job to monitor the evolution of the course, report the necessary changes to the undergraduate committee, and to serve as a contact for new course instructors.

2.7 Consideration should be given to an idea proposed by one of the undergraduate students, namely, of guest lectures in the lower core courses by research faculty members.

2.8 The School should continue its recent policy of monitoring the English capabilities of new tutors.

2.9 The School should consider instituting a mentorship program or some other mechanism whereby the undergraduate students have more interaction with research faculty.

2.10 Within six months there should be an internal review of the staff resources to maintain the undergraduate teaching labs. In particular, the effect of the MTS/UNIX decisions must be monitored. Such a review should be in the context of a strategic plan for the evolution of the various teaching labs.

The Graduate Program

3.1 The issue of 700 courses and their relationship with 400 courses should be examined.

3.2 There should be more flexibility in the requirements that each Masters student take three courses at the 700 level and three at the 800 level. Students with a strong background in computer science should be allowed to take fewer 700 level courses; students with a weak background should be required to take more at the 700 level.

3.3 Continued emphasis should be placed on the recruiting of excellent graduate students and resources available from the Dean should be utilised.

3.4 The School should seriously consider adopting the model whereby students start their preliminary research reading as soon as they arrive at the School. Under such a model, the students would be assigned a permanent research advisor upon entrance.

3.5 The research seminars should continue with the faculty encouraged to give more general, lower level talks.

3.6 The monitoring of the drop-out and completion statistics should be continued.

3.7 The expectations of Masters theses must be closely monitored.

3.8 Discussions should be held with the School of Engineering Science regarding the closer involvement of the hardware area of computing science. This could involve the development of a shared graduate program in hardware and/or co-supervision of graduate students by faculty across the two schools.

3.9 Careful consideration should be given to the justification for six rather than five graduate courses for the MSc degree.

3.10 If the School decides to follow the model of students starting on research as soon as they arrive, then the students must be allowed to take some of their courses in the second year of Masters study.

3.11 If the School continues the policy of assigning incoming students to temporary advisors and having these students use workstations in common areas, then it seems that more such workstations are needed. The School may also want to review the policy of who may use the research labs.

3.12 The mending of fences with the graduate students must start immediately. Graduate student evaluations and proposals prepared for the review should be given careful consideration by the School. We applaud the initiative taken during our visit of arranging

a meeting with graduate students and various School administrators.

Research

4.1 Strong emphasis is needed for many faculty members to improve their funding from NSERC.

4.2 Every effort should be made to commit start-up funding to new junior faculty in advance, as part of the hiring negotiations with the candidate.
4.3 The School must realise the benefits of the two Chairs. One benefit, of course, is the possibility of attracting two outstanding scholars. The other point is that the School must at all costs avoid the repercussions of not being able to fill these Chairs.

4.4 The Dean of Applied Science must immediately get the three major players working closely together. To avoid a "turf battle" between the two schools, one possible solution is for the Dean to consider immediately announcing that, regardless of the ultimate School affiliation of the two Chairs, each School will be considered to have allocated one tenure stream position towards the two Chairs.

4.5 We also recommend that the Senior Chair holder be recruited and given his or her choice as to the appropriate affiliation with the two schools. The Junior Chair can then be recruited in order to balance the affiliation chosen by the Senior Chair.

4.6 Research faculty members should be encouraged to pool grant funds in order to hire appropriate systems people for their individual and/or group research needs.

Personnel/Management

5.1 The School should develop a plan for ongoing discussions and programs to encourage a higher participation of women.

5.2 The School should develop a 5 year strategic plan. This plan should include space and equipment requirements.

5.3 In order to provide even minimal secretarial service to the faculty, the position of the half-time Undergraduate Affairs secretary (present occupant: B. Ringham's) should be reinstated; furthermore, one new full time secretary must be hired. It is essential that this extra help must go to providing secretarial support to the faculty.

5.4 We recommend that there be a reorganization of the management of the School and

that an Associate Director be appointed. His/her responsibilities could include the graduate program.

5.5 Every effort should be made to ensure continuity of the undergraduate and graduate director positions.

5.6 Notification should be given to members of the School when minutes of meetings become available. This can be accomplished easily by e-mail and news groups.

Linkages

6.1 The team conducting the forthcoming review of CSS must be well aware of the dependence of the School of Computing Science on CSS, and must understand fully the ramifications on the school of any changes to the CSS programs.

6.2 The Director of Computing Science must work closely with the Director of Engineering Science to deal with the three problems of hardware architecture and VLSI for research and graduate students, the accessibility of engineering science undergraduate courses to computing science students and the issue of the NSERC Chairs.

6.3 We recommend that the Directors of CSS and the School of Computing Science meet on a regular basis to discuss openly the relationship between the two units. CSS must be made aware of the perception problems from which the School suffers. The School on the other hand, should make a greater effort to promote its strengths, a major one of which is its connection to CSS. The two Directors must also work very closely in the solution of the NSERC Chairs issue.

Concluding Remarks

7.1 Simon Fraser University should keep the School of Computing Science as a high priority and should make every effort to provide the resources for the implementation of the recommendations made throughout this report.

9 APPENDIX B: Charge to the Computing Science Review Committee

The task of the Computing Science Review Committee is to examine the School, report on the following existing conditions and comment on opportunities for improvement.

1. The strengths and weaknesses of the undergraduate program, including the Co-op program, in terms of structure, breadth, orientation and other factors; [section 2]
2. The strengths and weaknesses of the graduate program; [section 3]
3. The adequacy of support for graduate students and the rate of progress of students through the graduate program; [section 3.3]
4. The size and background of the faculty complement in relation to the School's responsibilities and workload; [section 5.1]
5. The research and teaching contributions of faculty members, including the level of external research support. [section 4]
6. The size of the administrative, secretarial and technical support staff complement; [sections 5.2 and 2.4]
7. The adequacy of resources provided to support teaching and research, including computing and library resources; [sections 2.4, 3.5 and 4.3]
8. The provision of office space and laboratory facilities; [section 5.1]
9. The effectiveness of the administration of the unit; [section 5.4]
10. Linkage between the School and the Centre for Systems Science; [section 6]
11. The relations of the School with others within the University; [section 6.2]
12. The relations of the School with business, industry and other universities; [section 6.3]

Review Response

School of Computing Science
Simon Fraser University
Burnaby, B.C. V5A 1S6, Canada

July 27, 1992

The School of Computing Science is pleased to offer the following response to the recommendations contained in the report of the external reviewers. The School appreciates the efforts of the reviewers and takes their comments seriously. The review will be a basis for continued improvement within the School.

We comment on each recommendation separately:

Undergraduate Program

Recommendation 2.1 *The School should renew its efforts to assess the current course offerings in relation to the recently released Computing Curriculum 1991, Report of the ACM/IEEE-CS Joint Curriculum Task Force. This process may be helpful in revealing any shortcomings or excesses with the current course offerings.*

The School is planning a review of the undergraduate curriculum during the coming year. The ACM/IEEE report will be a useful document to consider during the review.

Recommendation 2.2 *The School should consider reducing the number of required computing science courses and thereby allowing more elective courses for a student to establish greater subject concentration in areas other than computer science or more variety in their course selection.*

This will be a topic considered during the planned review of the undergraduate curriculum. However, some members of the School feel that it is a strength of our program that our students have taken more computing than their contemporaries in other institutions. They feel that this probably contributes to their ability to contribute at an earlier stage to their co-op employers and may be a significant factor in the success of our co-op program.

Recommendation 2.3 *In response to concerns of the undergraduates, some faculty and the Co-op employers, the School should seriously consider developing a new (seventh) area of concentration in software engineering.*

The area of software engineering is of considerable interest to industry. Since software engineering degrees are almost non-existent, we agree that Computing Science departments should offer a spectrum of both the academic and the practical. Although we do this fairly well, we agree that an increased emphasis on software engineering is warranted. The School expects to propose an expansion in this area as a part of the School's strategic plan. (See also Recommendation 5.2.)

Having said that, we are not convinced that this may best be done by adding a seventh area of concentration. We are concerned that our undergraduate breadth/depth requirements built upon the six area structure is too complicated already. We thus will likely be modifying our breadth/depth requirements

system during the next year.

Furthermore, we must decide whether the interest in software engineering is primarily on the undergraduate instructional side or whether we wish to expand into this area on the research side as well. This will be more clear once we have composed our strategic plan.

However, there is no reason that an increased emphasis at the undergraduate level couldn't be started soon. This would require only a few course changes/additions, and one or two new faculty champions (Recommendation 2.6). Three new courses might be proposed: Object-Oriented Software Development (our correspondence course in the Smalltalk language could identified as a somewhat weak response to this new area), Software Quality Assurance (including reviews, metrics, security, reliability and safety), and Software Project Management (including budgeting and scheduling with metrics). We feel these new offerings would strengthen our Co-op program, our evening course offerings (partially supported by Continuing Studies) for working students, and our relations with industry. The Dean and the undergraduate curriculum committee will be approached for support on these matters.

Recommendation 2.4 *Mechanisms should be explored for computing science students to have access to engineering science courses.*

Computing Science students in the Digital Systems Design Honors Program can currently take two Engineering Science courses (ENSC 125 and 222) Each year five spaces in each of these courses are reserved for Digital Systems students.

For other students, and for other ENSC courses, the following Engineering Science policy applies: "Non-engineering science students must obtain permission from the ENSC Director and the Course Instructor to register in ENSC courses. The following conditions should be met in approving these requests:

1. The course should fill a clear need in the student's program.
2. The student must meet ENSC performance standard (minimum CGPA of 3.00) and have the appropriate prerequisites.
3. Registration should be recommended by the student's home department.
4. Space availability in the course."

Recommendation 2.5 *Unless absolutely necessary, no new lecturers should be hired. Furthermore, as there is attrition in the ranks of lecturers, every effort should be made to have some of the lecturers replaced by research faculty.*

We disagree with the reviewers on this point. Our lecturers are extremely valuable to us. They are skilled instructors and make significant contributions to the administration of the School. In addition, they tend to have industrial experience and can offer different insights than some of the tenure-track faculty. As the reviewers themselves point out, we may be able to use lecturers to expand and enhance our offerings in the area of software engineering.

Recommendation 2.6 *Every core course or group of core courses should be assigned a "champion" from amongst the research faculty. It will be his or her job to monitor the evolution of the course, report the necessary changes to the undergraduate committee, and to serve as a contact for new course instructors.*

In fact, this idea was proposed by our Curriculum Standardization committee last year, using the word "owner" rather than "champion". Although we have not implemented it yet, we agree that this is a good idea and will adopt it. (We prefer the word "champion".) We also feel that in some cases Lecturers might be the most appropriate "champions".

Recommendation 2.7 *Consideration should be given to an idea proposed by one of the undergraduate students, namely, of guest lectures in the lower core courses by research faculty members.*

This is an interesting suggestion which will be considered during the review of the undergraduate curriculum. These lectures could be on advanced topics related to the course content rather than as simply a continuation of course material. This would provide an opportunity to motivate the students to pursue further courses in the area.

Recommendation 2.8 *The School should continue its recent policy of monitoring the English capabilities of new tutors.*

Teaching will always be an area that we stringently monitor and zealously oversee to ensure that we are fulfilling our obligations to our students. One of our lecturers developed a guide "How to be a Great TA" which is being considered for adoption by the University. We will certainly continue this policy.

Recommendation 2.9 *The School should consider instituting a mentorship program or some other mechanism whereby the undergraduate students have more interaction with research faculty.*

This is an valuable suggestion which will be considered during the review of the undergraduate curriculum.

Recommendation 2.10 *Within six months there should be an internal review of the staff resources to maintain the undergraduate teaching labs. In particular, the effect of the MTS/UNIX decisions must be monitored. Such a review should be in the context of a strategic plan for the evolution of the various teaching labs.*

We plan to do such a review of staff resources. This is also related to the strategic plan (see Recommendation 5.2.) We recognize that the ongoing changes in Academic Computing Services will continue to have a significant effect on us and will monitor the situation.

The Graduate Program

Recommendation 3.1 *The issue of 700 courses and their relationship with 400 courses should be examined.*

We agree. This point is closely related to Recommendation 3.2.

Recommendation 3.2 *There should be more flexibility in the requirements that each Masters student take three courses at the 700 level and three at the 800 level. Students with a strong background in computer science should be allowed to take fewer 700 level courses; students with a weak background should be required to take more at the 700 level.*

This seems reasonable. Further, we may consider a similar change in the Ph.D. program. It might be possible to modify the breadth requirement of the Ph.D. program to allow specific 800 level courses to be substituted for the 700 level course in the same area, subject to approval.

Recommendation 3.3 *Continued emphasis should be placed on the recruiting of excellent graduate students and resources available from the Dean should be utilized.*

This is already being done. Unfortunately, funds available to lure excellent students (e.g. NSERC top-ups) are not competitive with funds currently being offered by our sister institutions, particularly by UBC. We intend to make efforts to better utilize available scholarships and fellowships. However, the University must increase the funds available for this purpose.

Recommendation 3.4 *The School should seriously consider adopting the model whereby students start their preliminary research reading as soon as they arrive at the School. Under such a model, the students would be assigned a permanent research advisor upon entrance.*

This is being considered by our Graduate Program Committee. Our current system allows faculty and

students to make a better informed decision, but may add to the average time to complete a degree. We feel that a compromise may offer the best solution. Our current plan is to find a way to facilitate the process of finding a supervisor and to introduce some incentives for students to find a supervisor quickly.

Recommendation 3.5 *The research seminars should continue with the faculty encouraged to give more general, lower level talks.*

We agree. The intent of the research seminars is to present general talks. In the recent past some of the faculty have given talks at an inappropriate level.

Recommendation 3.6 *The monitoring of the drop-out and completion statistics should be continued.*

We plan to continue the monitoring. We are also considering other methods of obtaining useful information (such as exit interviews or questionnaires).

Recommendation 3.7 *The expectations of Masters theses must be closely monitored.*

This is a difficult issue to deal with. In particular, it is difficult to reach a consensus among the faculty on the appropriate level of a Masters thesis. However, we agree that such monitoring is important.

Recommendation 3.8 *Discussions should be held with the School of Engineering Science regarding the closer involvement of the hardware area of computing science. This could involve the development of a shared graduate program in hardware and/or co-supervision of graduate students by faculty across the two schools.*

Some co-supervision has been done in the past. However, the idea of a shared graduate program is very interesting and will be considered. The faculty research interests in the two Schools are complementary. Taken together, the faculty from Computing Science and Engineering Science could offer an excellent graduate program concentrated in digital hardware design, IC design and fabrication, and computer architecture. A joint program would allow faculty in this area to achieve the critical mass necessary for an active, growing program.

Recommendation 3.9 *Careful consideration should be given to the justification for six rather than five graduate courses for the MSc degree.*

The Graduate Program Committee has discussed this and believes that there is merit in reducing the

MSc course requirement to five courses.

Recommendation 3.10 *If the School decides to follow the model of students starting on research as soon as they arrive, then the students must be allowed to take some of their courses in the second year of Masters study.*

It is already existing practice to allow students to start on their thesis work once they have a permanent supervisor and to continue to take courses in the second year.

Recommendation 3.11 *If the School continues the policy of assigning incoming students to temporary advisors and having these students use workstations in common areas, then it seems that more such workstations are needed. The School may also want to review the policy of who may use the research labs.*

Our first request in this year's capital budget is for additional workstations for the graduate students. Generally equipment in research labs is used by those students who are supervised by the faculty affiliated with the lab which we feel should encourage students to choose their supervisors early.

Recommendation 3.12 *The mending of fences with the graduate students must start immediately. Graduate student evaluations and proposals prepared for the review should be given careful consideration by the School. We applaud the initiative taken during our visit of arranging a meeting with graduate students and various School administrators.*

This is already being done. The Director, the Administrative Assistant, and the Director of the Graduate Programs have instituted a series of regular meetings with graduate student representatives to discuss issues of concern. The manager of the technical staff has met several times with large groups of grad students to discuss network security, availability of resources and other topics of interest.

Research

Recommendation 4.1 *Strong emphasis is needed for many faculty members to improve their funding from NSERC.*

The individual faculty members in the School have continued to improve their funding from NSERC. This year (since the figures stated in the review) 6 faculty members have had their NSERC grants renewed with an average 29% increase (during a year in which 39% of renewals resulted in decreases). In recent years, the School has consistently ranked among the top few departments at SFU in research funding.

The School fully intends to continue to increase its research funding, particularly in the area of NSERC strategic and collaborative grants. We also intend to continue to pursue funding from other agencies.

Recommendation 4.2 *Every effort should be made to commit start-up funding to new junior faculty in advance, as part of the hiring negotiations with the candidate.*

This request has been made to the Dean of the Faculty of Applied Sciences. Such funds have been requested repeatedly in recent years. The Centre for Systems Science has provided some funding in recent years as a grant for which the candidate needed to apply. We recognize that Computing Science departments at other institutions are able to make substantial commitments to start-up funding for new faculty. We are unable to be competitive at this time.

In recent cases we have lost top quality faculty candidates to other Universities (in particular, to UBC) due at least in part to the low level of startup support available. It is essential that more support is made available in this area.

Recommendation 4.3 *The School must realize the benefits of the two Chairs. One benefit, of course, is the possibility of attracting two outstanding scholars. The other point is that the School must at all costs avoid the repercussions of not being able to fill these Chairs.*

The School recognizes these benefits. We have begun the search process.

Recommendation 4.4 *The Dean of Applied Science must immediately get the three major players working closely together. To avoid a "turf battle" between the two schools, one possible solution is for the Dean to consider immediately announcing that, regardless of the ultimate School affiliation of the two Chairs, each School will be considered to have allocated one tenure stream position towards the two Chairs.*

This issue has been discussed and the advertisement is being sent out. It is hoped that one appointment can be made to each School but the details of the appointments will not be known until the candidates for the positions have been identified.

Recommendation 4.5 *We also recommend that the Senior Chair holder be recruited and given his or her choice as to the appropriate affiliation with the two schools. The Junior Chair can then be recruited in order to balance the affiliation chosen by the Senior Chair.*

Our ad makes it clear that the Senior Chair will be recruited first and will have a say in the appointment of the Junior Chair. It is our intention to try to balance the appointments.

Recommendation 4.6 *Research faculty members should be encouraged to pool grant funds in order to hire appropriate*

systems people for their individual and/or group research needs.

This has already been done to some extent. Further pooling may be encouraged once we have formulated our strategic plan.

Personnel/Management

Recommendation 5.1 *The School should develop a plan for ongoing discussions and programs to encourage a higher participation of women.*

We are already involved in several such programs. We participate in Women Do Math - an ongoing program at SFU which is designed to encourage female students to pursue studies in mathematical and scientific disciplines. We developed (with Computer Science at UBC) a program called TARGET which is designed to encourage the best undergraduate students (in equal numbers male and female) to pursue graduate studies. We agree that additional programs of this type are necessary.

We have attempted to hire additional women faculty over the last several years. In the last six years, we have interviewed 25 candidates including 6 women. (This represents 24% of those interviewed at a time when the percentage of women obtaining Ph.D.'s in Computing Science has been fluctuating between 10% and 12%.). Although we made offers to 3 of these women, those particular candidates accepted offers elsewhere. We will continue our efforts to attract additional women faculty members.

Recommendation 5.2 *The School should develop a 5 year strategic plan. This plan should include space and equipment requirements.*

We have already begun to develop such a plan.

Recommendation 5.3 *In order to provide even minimal secretarial service to the faculty, the position of the half-time Undergraduate Affairs secretary (present occupant B. Ringham's) should be reinstated; furthermore, one new full time secretary must be hired. It is essential that this extra help must go to providing secretarial support to the faculty.*

Fortunately, the half-time Undergraduate Affairs secretary has been increased to full-time since the reviewers' visit. In addition, we have hired a full-time receptionist who is shared with the Dean's office, providing an additional half-time position for our front office. We will continue to request additional secretarial support.

Recommendation 5.4 *We recommend that there be a reorganization of the management of the School and that an Associate Director be appointed. His/her responsibilities could include the graduate program.*

There may be some merit in such a reorganization, however, it is not clear what the advantages are in linking the positions of Associate Director and Director of Graduate Programs. We plan to investigate how other largish departments (within SFU and outside) are organized.

Recommendation 5.5 *Every effort should be made to ensure continuity of the undergraduate and graduate director positions.*

We agree with this recommendation. Unfortunately, both of these positions entail a significant commitment of time and energy. The turnover in these positions has resulted from the fact that many faculty are unwilling to make this commitment. It is essential that members of the School are willing to fill these positions and it is important that they stay in the positions for longer than one year.

Although each faculty member must make a reasonable contribution to the administration of the School it is important to recognize the fact that this contribution need not be made uniformly over the years. Each member of the faculty should be willing to shoulder greater administrative responsibilities (particularly as Director of the School, Director of the Graduate Programs, or Director of the Undergraduate Programs) at various points during his/her career.

Recommendation 5.6 *Notification should be given to members of the School when minutes of meetings become available. This can be accomplished easily by e-mail and news groups.*

Another good suggestion which we will adopt. Further, we plan to make the minutes available on-line.

Linkages

Recommendation 6.1 *The team conducting the forthcoming review of CSS must be well aware of the dependence of the School of Computing Science on CSS, and must understand fully the ramifications on the school of any changes to the CSS programs.*

The Director of CSS has assured us that this will be made clear in the CSS internal review document.

Recommendation 6.2 *The Director of Computing Science must work closely with the Director of Engineering Science to deal with the three problems of hardware architecture and VLSI for research and graduate students, the*

accessibility of engineering science undergraduate courses to computing science students and the issue of the NSERC Chairs.

The Directors are in regular contact about various issues. We will raise these issues with them.

Recommendation 6.3 *We recommend that the Directors of CSS and the School of Computing Science meet on a regular basis to discuss openly the relationship between the two units. CSS must be made aware of the perception problems from which the School suffers. The School on the other hand, should make a greater effort to promote its strengths, a major one of which is its connection to CSS. The two Directors must also work very closely in the solution of the NSERC Chairs issue.*

The Directors have met regularly in the past. We agree that the meetings are worthwhile and should be reinstated.

Concluding Remarks

Recommendation 7.1 *Simon Fraser University should keep the School of Computing Science as a high priority and should make every effort to provide the resources for the implementation of the recommendations made throughout this report.*

We wholeheartedly agree with this suggestion.

The School of Computing Science has grown from a small program and matured to become a major department within the University and among Computing Science departments nationally. To maintain its current position and to continue to improve, the School needs support from the University administration. This support can come in many forms.

In the text of the review preceding this final recommendation, the reviewers suggest that the School warrants status as an A department. We believe that the time has come for such recognition to be granted and urge the administration to change the School's status immediately.

The reviewers suggest that additional secretarial support is urgently needed. (Recommendation 5.3) Since the review, we have been able to increase the half-time position to full-time. However, the reviewers specifically state that an additional full time secretary must be hired. We request that such a position be authorized as soon as possible.

The School plans to expand in the area of software engineering as suggested by the reviewers. (Recommendation 2.3) Although we are still considering various methods of addressing this concern, the School

will be requesting additional support in this area.

As noted by the committee, it is essential that we attract the best possible graduate students. Since the reviewers' visit, it has become more obvious that our level of funding for graduate students, specifically the availability of funds to "top-up" scholarships is inadequate to compete with other institutions, specifically UBC. It is essential that the University renew its commitment to graduate studies and make more funds available for this purpose.

Computing Science departments at other institutions currently make substantial commitments to start-up funding for new faculty. We are unable to be competitive at this time and have lost top quality faculty candidates to other Universities (in particular, to UBC) It is essential that more support is made available in this area. (Recommendation 4.2)

As noted above, the School is considering various changes based on the comments of the reviewers. The School requests the general support of the Administration in implementing these changes.

The School appreciates the time and energy that the reviewers devoted to the review. Their comments will enable us to continue to improve our School and we thank them for their advice.

Finally, the School acknowledges the efforts of various SFU staff and faculty that were involved in the review process.