S.00-72

Simon Fraser University
Memorandum

TO: Senate

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

DATE: August 16, 2000

SUBJECT: External Review - School of Computing Science

External Reviews of academic units are conducted under Guidelines[1] approved by Senate. The review process is intended to ensure that the quality of the department's academic programs and research is high, that members of the department participate in the administration of departments, and that the departmental environment is conducive to the department's objectives. Under these Guidelines, Senate is expected to receive advice from the new Senate Committee on University Priorities and to provide feedback to the unit and the Dean.

The following materials are forwarded to Senate for consideration:

The External Review Report
The response to the External Review Report by the School
The comments of the Dean
The comments of the Vice-President, Academic
The recommendations from the Senate Committee on University Priorities

A representative of the School will be available at Senate as a resource person.

Motion

That Senate concurs with the recommendation from the Senate Committee on University Priorities concerning advice to the School of Computing Science on priority items resulting from the external review, as outlined in S. 00 -72

J.M. Munro

---

[1] The Guidelines can be found at:
http://www.reg.sfu.ca/Senate/SenateComms/SCUP-ExReview.html

SIMON FRASER UNIVERSITY

Senate Committee on University Priorities

Memorandum

AMENDED

TO: Senate

FROM: John Waterhouse
Chair, SCUP

RE: School of Computing Science
External Review

DATE: 14 September 2000

The Senate Committee on University Priorities has reviewed the External Review Report prepared on the School of Computing Science August 30, 1999, together with the response from the School and comments from the Dean and the Vice President, Academic.

SCUP recommends to Senate that the School and Dean be advised to pursue the following as priority items:

1. The School of Computing Science should submit a plan to SCEMP regarding enrollment growth over the next 5 years. It is recognized that the success of the five year growth plan will depend on adequate resources. This plan should:

    a. evaluate the demand for Computing courses by non-CS-majors and identify what additions/revision are required to the curriculum to enable Computing Science to most effectively expand service teaching to non-CS students;

    b. outline the balance envisioned for expansion of non-CS-majors enrolments and the addition of new CS-majors FTEs;

    c. review the number of on-line courses available and assess whether increased use of on-line courses would form part of a strategy for increasing student enrollments within the School;

    d. specify the resource requirements associated with the enrollment growth plan and identify how these will be met;

    e. indicate any curriculum revision required to implement the plan; and,

    f. identify what accountability measures will be introduced to evaluate the plan and the impact of expansion over the five year period.

... / page 2

2. The School of Computing Science, together with the Dean of Applied Science and the Vice President, Academic, must find ways of achieving success in faculty recruitment and retention efforts. Further expansion of the Computing Science program should be developed in consideration of the faculty resources required to preserve the quality of the program.

3. The School of Computing Science needs to address the issue of course availability for computing courses for all students, and must increase the number of lower-level undergraduate courses being taught by tenure-track faculty.

c.: J. Delgrande
R. Marteniuk

SIMON FRASER UNIVERSITY

Office of the Vice President, Academic

MEMORANDUM

TO: Senate Committee on University Priorities

FROM: J.M. Munro, Vice President, Academic

SUBJECT: External Review, School of Computing Science

DATE: June 8, 2000

The report of the External Review Committee of the School of Computing Science was submitted on August 30, 1999 following the review visit on March 8-10, 1999. The response of the School was submitted on October 12, 1999 and the comments of the Dean of Applied Sciences on May 15, 2000.

My comments on this external review and the submission from the School and Dean are as follows.

1. A review committee for an academic unit of this size would normally have four members - three external and one internal. This review was carried out by a committee of two external persons. Nevertheless, this is a balanced and comprehensive review report.

2. Computing Science probably has a more dynamic environment than any other academic unit in the University. This is partly seen in the rapid growth of demand for admission to the undergraduate program and partly in the rapid evolution of curriculum structure and subject matter. Steps have been taken over the last nine months to deal with an emerging crisis situation in the undergraduate program through directing additional funding to teaching equipment, instructional resources, and staff. Further efforts are underway now. Nevertheless, despite this progress the need to plan for the future of the undergraduate program is still very pressing. The Dean's comments propose a major expansion of funding to allow an increases of between 50 and 100 percent in undergraduate FTEs by expansion of the number of majors over the next five to ten years. This may be inevitable, and even desirable, but consideration should also be given to expanding enrollment in Computing Science courses through an expansion of service teaching for Arts and Science students. This would have two advantages: it would cost less and it would

address the unmet demand of students in those Faculties for some level of access to Computing Science courses.

3. One of the many difficulties with a large expansion of majors in Computing Science is the shortage of suitably qualified tenure track faculty. The review report and the School's response do not contain explicit mention of this - neither do the Dean's comments. Other information received from the School of Computing Science suggests that all major computing programs in the country are finding a dearth of available candidates for faculty positions this year. This is no doubt both a supply (major industry demand for Ph.D. graduates) and demand (attempted rapid expansion at many universities simultaneously) problem- any realistic short-term plan for enrollment growth will have to take account of this major impediment.

4. While the reviewers found that undergraduate students had generally positive views of their experience in the School of Computing Science (the review was done before the major registration problems last summer), there were a series of concerns raised about the graduate program. These are important and it is encouraging that the School has taken steps to deal with many of these concerns.

5. The reviewers' observations concerning the excellent research reputation of the School and the scholarly accomplishments of its faculty are gratifying and we must not dilute this aspect of the School by too rapid expansion of its enrollments or unwise faculty hiring in response to this pressure. If suitable new faculty cannot be hired, it might be necessary to restrict the number of undergraduate majors even more than at present and the School might in time evolve into a unit with a large service teaching component and a smaller major program with admission requirements similar to Engineering Science. I would not recommend this as a preferred option, but it might be the best option if some current trends were to continue.

cc. R.G. Marteniuk
J. Delgrande

Faculty of Applied Sciences
Dean's Response
To The School of Computing Science's Response To Their External Review
May 16, 2000

The External Review of the School of Computing Science (CS), authored by Patrick Dymond of York University and Janice Glasgow of Queen's University, in my opinion, is an excellent review in that it covers many important issues faced by the School of Computing Science. Equally well done is the School's response to the External Review. The Response deals directly with the issues raised in the External Review and indicates actions that the School will take in regard to the various issues raised in the External Review.

My role in the process, as I understand it, is to comment on the Response of the School and, in those areas that require additional resources, suggest ways and means of acquiring those resources.

In regard to the above, I wish to concentrate my report on the following issues raised by the Reviewers and dealt with by the School in their Response. The Reviewers state on page 14 of their report "...if the School is to maintain its current ranking among Canadian computer science departments, then both the School and the administration must work more effectively together to deal successfully with its problems. In our view, the principal problems are student enrollments and faculty recruitment and retention."

If student demand for computer science courses is to be satisfied, CS must grow in faculty, staff, and basic infrastructure support. A plan must be put in place to provide these resources over a defined time period. As background to such a proposal, I wish to call upon documentation that, in combination with the External Review and the Response from CS can lead to a proposal for the necessary resources.

The Faculty of Applied Sciences' three year plan called for an increase to the size of the School of Computing Science in terms of numbers of faculty, staff, and students.

The Plan pointed out that over the past several years the School of Computing Science (CS) has increased its enrolment by 60 to 65%. Some of this growth was planned but a large component was in response to a significant demand for its courses by students seeking the CS major and by non-CS students seeking more knowledge about information technology.

The demand for courses and programs in CS should continue for some time. Currently there is a significant demand for graduates from CS by the Information Technology sector of BC, Canada, and indeed the rest of the world, where our graduates from CS are in unprecedented demand. This demand, arising from the development of the knowledge based economy, is unlikely to abate in the near future and in fact there will probably be an increase in the need for people with various levels of IT knowledge. In Canada alone, it is estimated that there is immediate need for 20,000 employees for the IT sector, many of these requiring university degrees. As well, Nortel hires a full 25% of all Canadian university graduates in computer science and electrical/computer engineering and could use more. It is statistics like these that dictate that at SFU the demand for CS courses will

increase in the next few years far beyond the demand for courses in the other disciplines noted above.

Related to this ongoing demand for computer science courses on the Burnaby Mountain campus, is the role that CS can play at the TIME Centre. As mentioned below, the School is willing to develop credit and non-credit programs at the TIME Centre that will serve as an important catalyst in the downtown IT sector. In this regard, SFU could be at the core of a large IT development as Vancouver moves to develop the Gas Town and harbour area into a large IT industrial area.

As the Faculty's and School's three year plans pointed out, increasing the size of CS will also be an investment in high quality scholarship and research in that the School currently enjoys a high reputation in Canada and abroad for the expertise and research productivity of its faculty. This is reinforced by the External Review but, as noted, we must act quickly and decisively if we are to maintain our high standing in regard to other Canadian Universities.

Above and beyond the above plans, CS also has some short-term enrolment management problems, the solutions to which are covered in their Response. However, these management tactics will not solve the basic issue of unprecedented demand for computing science courses, both from CS majors and non-majors alike. I think it is accurate to say that CS faculty are unanimous in indicating that the School would like to attempt to meet a good portion of this demand but the School needs additional: faculty; technical staff and front office staff; TA support; teaching equipment; and space.

The Academic Vice-President's Office has helped to increase the resources over the past two years to CS but this support, while much appreciated, is seen as necessary to help CS maintain its current programs at a high level of quality. To attempt to meet some of the unmet demand for undergraduate and graduate courses in CS, additional resources would have to be made available.

THE PLAN

The plan is to garner resources to allow strong growth to be achieved in CS faculty, staff and infrastructure support over a five to ten year. The specific areas targeted for growth over this time are:

- The further development and enhancement of our newly approved specialist undergraduate programs in Software Engineering and Multimedia Computing. Related to the multimedia specialist program is a proposal for an interdisciplinary initiative in Multimedia and Computer Graphics which has strong implications for the graduate program.

- The deployment of faculty to the NewMIC initiative among SFU, UBC and TechBC, UVIC, and Emily Carr at the Harbour Centre.

- The establishment of a "Software Skills" course sequence for non-computing students. This could include individual courses as well as minor programs planned with the Faculties of Science and Arts. Currently, there exists three courses, taught twice each

per year, that would form the basis of this sequence of courses. It should be noted that the School has received SIF money to cover the current costs of offering these courses.

- An expansion of the graduate program from 110 students to a target of 150.

- The growing of the Alternative Routes to Computing program that is now being offered but which the School would like to increase in numbers.

- Of high priority would be to bolster the Schools' involvement in the Pacific Institute for the Mathematical Sciences and in the Mathematics Initiative in Technology and Complex Systems. Both these initiatives are important to Computing Science in the long-term and require increased faculty numbers to provide critical mass.

- A strong collaboration between the Faculty of Business Administration and the School is possible in the Computing Science/Business Techo-MBA.

- The development of online courses. Two constraints on admitting more students into the CS major have to do with space and equipment. One way to partially avoid these constraints is to move towards putting as many CS courses online as is possible. The School feels that several courses can be put online and taken by students from home, thus partially alleviating the problem of space and equipment. Faculty, space and human infrastructure would be needed to implement this aspect of the plan.

Financial Considerations

The overall plan is to increase the School of Computing Science in FTE students, CFL faculty, and appropriate human infrastructure by 50% over the next five to ten years through funding from SFU and to perhaps expand by as much as 100% via special funding from the BC Government (i.e. ITBC – see below).. A 50% increase assumes the following:

- An average per FTE cost, in 1998/99 dollars of $6000.00 (not including space and equipment)
- A total 1998/99 FTE of about 822 (732 UG and 90 G)
- The total FTE grows to 1248 FTE
- The total FTE in at the end of the growth period is represented by 800 majors' FTEs, 298 service FTEs, and 150 graduate FTEs
- Funding the increase of 426 FTEs represents an increase of 426 X $6,000.00 = $2,556,000.00 to the base budget of Computing Science which does not include the cost of space and equipment needed to support the increased enrolment.
- Funding of approximately 15 new faculty positions would require annual costs in the form of an average increase of $20,000 to the starting salary. This is assuming that the average $15,000.00 market differential is still present. This additional salary cost adds $300,000.00 to the required total funding increase.
- Total request is for approximately $2,856,000.00

The Proposed Funding Solution

- The Strategic Initiative Fund. It is proposed that approximately $350,000.00 per year over the next five years be taken from the SIF for funding growth in Computing Science.
- Targeted FTEs. If the provincial government continues funding targeted FTEs for Information Technology purposes top priority be given to the School of Computing Science to bring the total funding increase per year to $560,000.00 for a total of five years (SIF plus targeted FTEs would equal $560,000.00 per year).
- CFI and KDF would be approached for new start up funding as well as major infrastructure grants.
- The space issue. Growth is impossible without additional space being assigned to CS. Even if the TEC (Technology and Environment Centre) Building is approved by the Government this summer, it will be three years before this space is available. Off campus space may have to be found to bridge to the new building. Lack of space explains why the proposed growth take place over a five to ten year span in that earlier rapid growth could not be accommodated even by off campus space.

Other Funding Considerations

- ITBC (Information Technology BC) ia an effort by UBC, UVic and SFU to get a significant funding increase from the provincial government in IT related areas in the BC universities. The proposal is to increase the IT related graduates from these three universities by 100% over the next five years. Included in this proposal is an effort to get a significant increase in federal funding (NSERC, CFI, etc.) for IT related research areas. Funding for IT activities might be forthcoming to the extent that the senior administration and the IT Faculties from each of the Universities can work together on a unified proposal. The present proposal, increased by another 50% could be seen as SFU's contribution to the unified proposal.

RESPONSE

of:

The School of Computing Science

to:

External Review of
The School of Computing Science
March 1999

by: Patrick Dymond
York University
Toronto, Ontario

Janice Glasgow
Queen's University
Kingston, Ontario

October 12, 1999

10

Preamble

The School appreciates the time and effort taken by Profs. Dymond and Glasgow, in visiting the School in March and in writing their detailed and wide-ranging report. We recognize that their task was made more difficult by the inability of the university to find an Internal Reviewer, and by the very unfortunate illness of the third External Reviewer.

The reviewers made various *recommendations* and *suggestions*, under those headings, in their review. These recommendations and suggestions made by the reviewers are addressed below. The replies reflect the views of the School's faculty, staff, and students, all of whom were invited to give their input to the reply.

Response to recommendations

Undergraduate programs

Recommendation 1 *Mechanisms must be put in place to control and manage access so that students have a reasonable expectation of getting the courses they need to make normal progress towards their degrees. The School and University must work together to find fair ways to allocate the still-scarce resources fairly.*

We are working toward a better control of enrollments. Currently, a large majority of our students are admitted into computing after completing 57 credits. The large body of intending computing majors places great enrollment pressure on our courses. As well, about 10% of the students attempt to improve their GPA by duplicating courses. The new admission policy addresses both these issues by requiring students to declare early, and disallowing duplicates for admission GPA calculation.

Students will shortly begin declaring at the end of their first undergraduate year; as well, students with a sufficiently high GPA may declare on entry to SFU. At present, a high school graduate may declare with an average of 93%.

For upper division students, we will be allowing students to take a maximum of three Computing courses in a given semester; after three courses, a student's priority for a fourth (or more) computing course will drop significantly.

For the interim, we are addressing the current "bulge" in our majors by shifting teaching resources to the upper division. As well, the VP Academic's Office has supplied up with one-time funds to mount extra sections of four courses in the 2000-1 semester.

For the second point, we look forward to working with the University toward relieving enrollment pressures.

Recommendation 2 *A significant increase in the total number of course sections offered by the school is needed.*

The number of sections offered by part-time and non-research faculty should be reduced as quickly as resources permit.

For the first point: we agree, but we require resources in order to increase the number of course sections. However, we have in the past year limited the maximum class size to 200 students; this is a reduction from our largest class size of 350 students previously.

For the second point: we agree in part, and subject to the caveat that our Lecturers constitute an essential and valued part of our faculty. We note that the number of Lecturers has not increased in the last 15 years, even though in the late 1980's the School grew by 13 research faculty. However we sympathize with the underlying problem that we see the reviewers as addressing, that too many lower division courses are taught by non-research faculty. Part of the problem is that we have a large number of upper-level courses; consequently, research faculty are called upon to teach the upper-level courses, possibly at the expense of the lower-level courses. We have addressed this latter point in the last year by stipulating that a research faculty member can expect to teach approximately one third of their courses at the lower division.

As well, we acknowledge that too many course sections are taught by sessional instructors. (Although we note that for the five year period for which figures were available for the review, 1993/94 – 1997/98, the proportion of courses taught by CFL faculty rose from 69% to 75% in the School while for the university as a whole it dropped from 69% to 67%.) We feel that having sessional instructors in moderate numbers can be a healthy thing; for example it allows Ph.D. students to obtain experience in teaching a course. However, in the last Spring semester (99-1) we hired 18 sessional instructors and since then we have not hired less than 12 sessionals per semester, including a planned 12 sessionals for the Spring semester (00-1). This is too many. Future hirings will help address this problem; we feel that future hirings may well include new Lecturers (but in balance with our research faculty). As well, our plans for enrollment management will go a long way to helping ease our reliance on sessional instructors.

In 1999 a total of 42 course offerings were taught by sessional instructors. Once we have hired into open positions, this number can be further reduced only through an increase in the faculty complement or a reduction in course offerings.

Recommendation 3 *Multi-year planning and budgeting for the School's equipment and software needs should be adopted.*

Agreed. We are in a discipline where a certain portion of our equipment will predictably go out of date in each year. One thing that makes planning difficult is the uncertainty over the University's Equipment Budget. This makes long-term planning for equipment purchases difficult, since funding isn't reliable yet in each year funds must, in one fashion or another, be obtained.

The reviewers also raised a number of issues concerning the undergraduate program, which we also address here. The reviewers state:

> *We are not taking a position on these points, merely suggesting they be thoroughly examined by the undergraduate curriculum committee.*

These points will be passed on to the Undergraduate Curriculum Committee for their consideration, and the results brought forward to the next School Meeting. We include a brief response here.

We were curious that there was no required project course for fourth-year students, that there were no required courses focusing on professional responsibility and social issues, that there seemed to be little overall integration of object-oriented programming approach in the curriculum.

The suggestion of requiring a project for Honour's students has been raised from time to time. We will be revisiting it.

Concerning a course on professional responsibility and social issues, we feel that this is a good point. We do have a course, CMPT 320, *Social Implications of a Computerized Society*, although this is not the same thing as a course *for* a computer professional concerning professional responsibility.

The school is looking at the possibility of increasing the breadth of courses available to fulfill the social aspects of computing requirement. The courses considered are:

- CMPT 320-3 Social Implications of a Computerized Society
- CMNS 353-4 Social Contexts of Information Technology
- CMNS 354-4 Communication and Social Issues in Design
- ENSC 406-2 Social Responsibility and Professional Practice
- HIST 361-4 The History of Science: The 18th Century to the Present
- WS 204-3 Women, Science and Technology

One of these courses is ENSC 406-2, which is on social responsibility and professional practise.

The role of object-oriented programming in our curriculum will be reviewed.

The School may also find it worthwhile to pursue accreditation of its undergraduate programs by the CIPS Computer Science Accreditation Council, which provides a useful detailed outside review of many undergraduate curriculum issues.

Agreed. There is a flurry of interest in further formalising the accreditation process, now that the "Software Engineering" suit has been settled (in favour of Computing Science). We will likely consider this in the coming year.

The programs in "Computing for Non-Computing Students" are important and should be permanently funded. The cancellation of evening sections of introductory courses is also regrettable.

Agreed, on both points. The Computing for Non-Computing Students programs are, we feel, valuable for non-computing students being able to obtain Co-op and permanent jobs, complementing and enhancing their skills in other disciplines. However, given current resource constraints, we feel that first priority must be given to our Majors.

Graduate programs

Recommendation 4 *The School should take steps to reduce the completion time for M.Sc. program.*

We feel that one major reason for the relatively long average MSc completion time (8 semesters) is that several students work part-time, although they are registered as full time (we do not have a part-time registration status). Funding for full-time graduate students in Computing Science is available for around $17,000/year, but many students can earn 2-3 times that amount in local jobs. We cannot prevent the students from working, so we are considering other methods for reducing completion times.

Reducing course expectations: The course requirement for an M.Sc. by thesis was reduced from 6 to 5 as a result of the previous external review. At UBC the course requirement remains at 6 courses, but students are encouraged to take 3 courses per semester, whereas our graduates seldom take more than 2 courses per semester. One way to preserve our breadth requirement of 5 courses, yet speed up the M.Sc. completion times, is to reduce the course workloads in the graduate courses, so that it is feasible to take 3 courses in a semester. Students can then commence their thesis work earlier than at present.

Reducing thesis expectations: Many of our M.Sc. graduate students spend a great deal of time on their thesis, which might be better spent working toward a Ph.D. thesis.

Improve the supervisory process: It may be possible, through more vigorous monitoring, to encourage slow students to complete faster.

Improve the quality of graduate students: It may be that the weaker students who are uncomfortable with writing in English take an inordinately long time to write up their thesis work. We now have very high admission requirements for foreign students, which should address this issue.

We will hold discussions to determine which alternatives offer desirable routes to take to reduce the M.Sc. completion times.

Recommendation 5 *The School should attempt to make graduate students feel more valued as members of the university community. This may involve increased communication, as well as an understanding of their roles on various committees.*

We have recently held a vote on whether graduate students should have voting membership on the faculty hiring committee. Of returned ballots the result was 18 in favour and 9 against. This was insufficient to allow the membership to change (for a change to the constitution of the School we require 60% of the faculty to be in favour, not, for example, 60% of returned ballots). However it has opened up the dialogue within the school, and the graduate students are feeling more involved in the decision-making processes now. As well, for the faculty search committee, there will be time set aside for the graduates to meet with a faculty candidate.

Recommendation 6 *The School should put more resources and effort into bringing external visitors into the School for seminars or longer-term visits.*

Agreed. This year we resurrected our (one-person) "Seminars" committee. We have a "Distinguished Speakers" series, put on jointly with the Centre for Systems Science. We will be putting resources into a forthcoming "Colloquium Series" of general-interest talks.

Recommendation 7 *Graduate students be encouraged to choose research topics as early as possible in order to help decrease the overall time to complete a degree.*

To help the graduate students chose a research area, we offer a weekly seminar series given by faculty on their research (CMPT 891). All new students must attend these seminars during their first two semesters here.

Further, all 4 of the alternatives presented above for reducing the M.Sc. completion time can also be applied to speeding up the search for a research topic.

Suggestion 1 *The graduate committee review the requirements for the Masters program to determine whether they are appropriate for this degree.*

We will be holding discussions to see if reducing the number of M.Sc. courses from 5 to 4, as well as reducing the course and thesis expectations, still leads to appropriate requirements for an M.Sc.

Suggestion 2 *The School look into whether there is some space available that would facilitate improved interactions among graduate students, or whether the current space could be better utilized.*

See the following item.

Suggestion 3 *A space planning committee be set up to study and report on the effects of increased graduate enrollments in terms of laboratory and office space.*

We have in place a Space Allocation committee for the current academic year, which will review space needs (particularly for research laboratories, but for "public" School space in general) and report to the School with recommendations for reallocating space. Part of their mandate will be to review the effects of increased graduate enrollments on laboratory and office space.

We agree with the reviewers that there is an overall space shortage; hopefully and presumably this will be addressed with the new Applied Sciences II building.

Research

Recommendation 8 *There is a need for growth in the School. When considering new faculty appointments, the School should consider those areas of research which are currently under-represented and in high demand from graduate students.*

We have been emphasizing "systems" areas in our hiring. Last year's advertisement stated: *The ideal candidate will have demonstrated research expertise in a systems area, such as database systems, software engineering, graphics, multimedia systems, distributed systems or networking.* In the last recruiting year we were able to hire a person in the Graphics area as well as in Database Systems.

For the current recruiting year, we will emphasize the same areas, which remain underrepresented, although rephrasing the advertisement to add emphasis to research excellence.

Recommendation 9 *Criteria for merit evaluation, promotion and tenure should be developed collegially by the School and communicated clearly to faculty members.*

This was a major topic of discussion at the (subsequent to the review) School retreat. In addition to the criteria set forth in the University's Policies and Procedures, the University has instituted a new Workload Policy that allows for out-of-the-ordinary work arrangements.

Staff and Facilities

Recommendation 10 *A review of the current tasks and expectations for the administrative staff should be carried out and budget made available for additional staff as required.*

A submission will be put forward to the VP Academic's Office for his consideration.

Recommendation 11 *The level of training for technical staff be considered and an appropriate budget be made available for keeping the staff up-to-date on equipment and software.*

Good idea.

Suggestion 4 *The ranking of technical staff in the School be examined with respect to similar positions in computing services to ensure equity for the staff.*

Agreed. Technical staff should be receiving equal pay for equal work regardless of the unit in which they work.

Suggestion 5 *A centralized (university-wide) inventory for software licenses be set up to minimize costs for the School and other units.*

We will follow up on this. A central inventory of all software purchased by the university would allow the university to lower costs by identifying applications for which site licensing would be cost effective. Other benefits, like interdepartmental technical support training, volume discounts, or industrial contributions, would reduce the total software application costs for the university. Where possible, centralized installation of software with a site license would reduce also support costs.

Gender and Equity Issues

Suggestion 6 *The School should consider the possibility of training in gender issues and equity for those individuals who sit on hiring or promotion committees.*

The university provides seminars to this end. As well, the Faculty of Applied Science's Equity Committee has a non-voting member sitting on our Faculty Search Committee.

Recommendation 12 *Efforts to promote equity and fairness within the School should be more recognized, encouraged and appreciated.*

In our opinion, we are promoting equity and fairness strongly within the School. We agree that efforts to promote equity and fairness should be recognized, encouraged and appreciated.

SCUP 00-03

Department of
Computer Science

Tel (416) 736-5053
Fax (416) 736-5872

UNIVERSITÉ
YORK
UNIVERSITY

FACULTY OF PURE AND APPLIED SCIENCE
4700 KEELE STREET • NORTH YORK • ONTARIO • CANADA • M3J 1P3

August 30, 1999

Professor John M. Munro,
Vice-President, Academic pro tem,
Simon Fraser University,
8888 University Drive,
Burnaby, B.C. V5A 1S6

Dear Professor Munro,

I am enclosing the results of our review of the School of Computing Science, conducted by Janice Glasgow and myself last spring.

We both appreciated the opportunity to visit Simon Fraser. I hope the report will be helpful to the University and the School.

Yours very truly,

Patrick Dymond
Professor

cc: Janice Glasgow, Queens University
Allison Watt, University Secretariat
James Delgrande, Computing Science

External Review of
The School of Computing Science
Simon Fraser University, March 1999

Patrick Dymond
York University
Toronto, Ontario

Janice Glasgow
Queen's University
Kingston, Ontario

August 30, 1999

Summary

The School of Computing Science at Simon Fraser University is highly-ranked among Canadian computer science departments. The School has taken on a significant increase in undergraduate enrollments without any significant increase in resources, and is now under-resourced for the current workload. The School appears to be carrying out its mission as well as possible under difficult circumstances. The School and the University face several challenges in addressing these severe undergraduate enrollment pressures and resulting problems, including faculty recruitment and retention.

1 Introduction

The visit of the external review committee to Simon Fraser University took place March 8–10, 1999. The charge of the committee was to: 1) assess the quality of the School, its faculty and its teaching and research programs; 2) assess the quality of the School's administration, the support and resource allocation for the work of the School, both internal and external; 3) provide an assessment of the School's plans, and its external relationships; 4) identify needs and opportunities for change; and 5) examine the three year plan of the School and the self-study document produced by the School in preparation for the review. Terms of Reference were provided by the School. We have also referred to the Senate Guidelines for External Reviews of Academic Units.

Originally, the committee was to consist of four members – three external and one internal. This became impossible because of the illness of one of the external members and because of an inability to find a willing internal committee member. The University administration, the School and the remaining committee members agreed that it was feasible and worthwhile to proceed on the original timetable for the visit. The result was a committee with only two members, Janice Glasgow and Patrick Dymond (Chair). This situation added stress and workload to the smaller committee, both during the site visit and while preparing the report. However we believe that a larger committee would not have differed significantly from ours in its conclusions.

In a three day visit it is of course impossible to fully understand or appreciate such a complex situation as the School of Computer Science, its interrelationships with its members and its

relationships with the rest of the University. Our opinions are based on the self-study materials provided to us, and on what we heard from those who spoke to us during our visit. The members of the committee thank the many people who helped arrange our visit or provided materials, and all those who talked with us to share their ideas about the School of Computing Science.

The committee has made several considered recommendations to the School and to the University. They are based on our view of the best interests of the University. These recommendations are numbered in the text. We have also more freely made *suggestions* concerning somewhat less critical issues and possibilities which we nevertheless think should be considered (or reconsidered) by the School and University.

2 Undergraduate programs

2.1 Enrollments:

The School has about 560 majors and 460 intended majors for the B.Sc. in Computer Science The School is one of the largest in the university in terms of undergraduate enrollments. This is one of the causes of what can reasonably be called a crisis in enrollments. Other factors contributing to this crisis are the School's direct entry mechanisms and cutoffs, and of course the continent-wide phenomenon of increasing popularity of computer science programs with students.

Cutoffs for admission are already at a very high level, and any further increase would seem to be arbitrary. Students who do not get direct entry will have very little opportunity to enter the School. Besides the students who have been directly admitted there are "five hundred wannabees" trying to get in. Once admitted to the major, senior students have in some cases been turned away from important upper level courses needed for their computing science major as many as three terms in a row. Lower level courses are also packed. The result is a possibility of serious student dissatisfaction with the university, along with excessive pressure on students and on the School. We were told that "...it looks bad to force qualified students into other disciplines when they have come to the university with the expectation of pursuing a degree in Computing Science" and we agree—it looks (and is) bad.

Students now routinely try to enroll multiple times in courses, to improve their chances of

meeting the minimal standard for entering the upper years of the computing program. Students are not always able to make the progress towards their degree each term to allow completion of the undergraduate degree in nominal time frame. The class size increases resulting from enrollment pressures generally lead to stresses on the quality of learning, despite the best efforts of instructors, teaching assistants, technical and advising staff.

The enrollment problems were referred to by some faculty members in the School as posing a "grow/no grow" dilemma. Should the School try to accommodate the student demand by increasing the number of faculty and technical resources needed? Or should they act to reduce the number of students instead, in order to provide a good learning environment within existing resources? Of course the School cannot act unilaterally to resolve this problem, given the importance of a balance in enrollments to the University's inter-faculty budget planning. We discuss this further in Section 9. Certainly more planning is needed to provide reasonable access to courses for students in the major.

Recommendation 2.1 *Mechanisms must be put in place to control and manage access so that students have a reasonable expectation of getting the courses they need to make normal progress towards their degrees. The School and University must work together to find fair ways to allocate the still-scarce resources fairly.*

2.2 Design of programs

The overall structure of the undergraduate major programs is "normal", by which we mean it is broadly similar to programs offered by other high-quality computer science departments in universities across Canada. (As in most programs, there are a few idiosyncrasies that reflect the School's history and the interests of its faculty members.) The program offers a good degree of flexibility and breadth for students to follow their interests and to prepare them for co-op work. The offering of a course in software engineering in year two is impressive, providing a strong foundation for upper year courses and facilitating placement of students in the co-op programs. Two specialist programs based on the major have recently been added, one in software engineering and the other in multimedia computing. These both represent valuable and appropriate specializations which will benefit students. (However we should note that there is currently a legal controversy in many provinces in Canada over use of the term "Software Engineering" by

university programs which are not accredited by Professional Engineering Societies. We fully agree with the School's position that the term "Software Engineering" denotes a recognized area of study in Computer Science, rather than a part of the purview of Professional Engineering Societies.) It would be valuable for the school to expand its ties to engineering, perhaps through stronger participation in a joint computer engineering program.

The School should consider the question of whether it is possible under existing program requirements for a student in the major to miss a significant amount of core material in computer science if courses are poorly selected. The question of the depth of mathematics in the program was also raised as a concern to us by some individuals. In our view an amount of mathematics of about one quarter of the total number of courses, or a little less, is fairly typical of rigorous programs across the country, and by this standard, the number of math courses appears to be about right. There remains the issue about the rigour and content of these courses, to be considered by the department and its undergraduate committee.

There are some other issues regarding the School's undergraduate programs which the School could usefully consider. (We are not taking a position on these points, merely suggesting they be thoroughly examined by the undergraduate curriculum committee.) We were curious that there was no required project course for fourth-year students, that there were no required courses focusing on professional responsibility and social issues, that there seemed to be little overall integration of Object-oriented programming approach in the curriculum. The School may also find it worthwhile to pursue accreditation of its undergraduate programs by the CIPS Computer Science Accreditation Council, which provides a useful detailed outside review of many undergraduate curriculum issues.

2.3 Students

Students with whom we spoke seem to like the faculty and their courses. Although labs are over-crowded and under-staffed, students felt they were given appropriate computing platforms and software for their work. They like their Teaching Assistants for the most part. They had complaints about the suitability of the campus dial-in access facilities, which provide an amount of access time only appropriate for students who are not computer science majors. Resources for advising of students in the School are too low, although this is mitigated somewhat by the excellent advising provided to the students by advisors for the co-op program.

It is a matter of concern to us that junior students are exposed to largely "teaching-only" instructors (lecturer/lab-instructors), and sessional (part-time) instructors. The extent of the School's use of full-time (non-researcher) teaching staff was strongly criticized by reviewers in the previous external review. The situation has not improved, and the amount of undergraduate teaching delivered through sessionals and lecturer/lab instructors is still too high in our opinion. However, we do not see how to avoid the use of non-regular faculty in the current circumstances. In general, the School needs to offer more sections of its courses, not fewer. This concern is not intended to impugn the value or dedication of these instructors, some of whom are among the most popular and effective in the School. Nevertheless contact between students and full-time (research-engaged) faculty members is an important component of a University education, and is a key part of what distinguishes a university education from other kinds of post-secondary education programs.

The programs in computing for non-computing students are important and should be permanently funded. The cancellation of evening sections of introductory courses is also regrettable.

Recommendation 2.2 *A significant increase in the total number of course sections offered by the school is needed. The number of sections offered by part-time and non-research faculty should be reduced as quickly as resources permit.*

2.4 Co-op program

The Co-op program is popular with employers and students. It provides good experience for students, and appears to be well managed. We talked to several co-op employers who were very satisfied with the program and viewed the students as well prepared and competent.

2.5 Technical resources

The adequacy of the computing equipment provided for the undergraduate programs varies from course to course. The platform for one course requires use of a computer system using two levels of emulations, and this is very slow. The technical staff seem to be dedicated and ingenious in keeping the systems advancing. Their morale seemed good. It is clear that there is a continuing need for software and equipment replacement in this field. Ideally long-range planning for yearly upgrades should be undertaken by the School. It would be better to reduce

the number of computing platforms supported by the technical staff. Students (and the School) should receive credit for lab hours in those courses requiring heavy use of specialized supervised computer labs. Unfortunately there seems to be no university centralized IT support and software inventory.

Recommendation 2.3 *Multi-year planning and budgeting for the School's equipment and software needs should be adopted.*

3 Graduate programs

The School has a healthy and active graduate program with a steady enrollment of approximately 100 students (though this number is now increasing). The students who graduate from the program are well-placed, with approximately half of the Ph.D. students entering academic positions after graduation. There was some concern expressed about the length of time it took for M.Sc. students to complete their studies, although it was observed that this has improved over the last few years. The median time is now less than eight semesters with an average of 8.8 semesters (just under three years). Previously the average completion time was three years. In our view the current level is still too high, and is out of line with programs of similar quality in other Universities. In many places the M.Sc. is nominally a one-year or four semester program, and actual completion times typically average under two years.

Recommendation 3.1 *The School should take steps to reduce the completion time for M.Sc. program.*

In general, the students seem happy with the supervision they received and the quality of courses in the graduate program. However, it was mentioned that the time that faculty had available to interact with students was variable (from very little to substantial).

3.1 Structure and Organization of the Program

Courses in the School are offered at the 700 and 800 level and cover a broad range of topics that primarily reflect the research interests of the faculty.

The M.Sc. program has two options: a thesis option that requires the completion of five graduate courses and a thesis, and a course option that requires nine courses and a project. Most

students choose the thesis option. The workload for this program is slightly heavier than that of most Canadian university programs in computing, which may account for the length of time it takes to complete the program. The Ph.D. program has a breadth requirement that is satisfied by taking seven courses covering three main theme areas (theory, systems and applications). This requirement replaces the previously applied comprehensive examination. A major requirement of this program is a thesis consisting of original research carried out under the direction of a supervisory committee.

Students expressed concern that there were some difficult constraints placed on completing their course work based on the requirements and the terms in which required courses were offered. For example, there may be few or no systems courses offered in a given term. They said this problem, which sometimes resulted in longer completion time for a degree, is improving. We noted that the students seemed to be quite happy with the current chair of the graduate committee, Stella Atkins, and with the committee in general.

There has been some discussion of cross-numbering fourth year courses with graduate courses, where the graduate course would have additional requirements. This option is being considered because of the current strain the School is under in terms of faculty teaching. While this approach is obviously financially appealing, it clearly increases faculty workload and acts to decrease the quality of the course component of the graduate program. Its use should be restricted to exceptional circumstances.

3.2 Recruiting

The School is recruiting high quality students. However, there is a concern that the number of good Canadian students applying to the program is decreasing. Because of workload constraints on faculty, they are not as pro-active in recruiting as they have been in some past years.

There are an impressive number of female graduate students in the program (approximately 30%). This is higher than in most Canadian computer science departments. The School encourages women applicants and the retention of these students.

3.3 Concerns

Several concerns related to the graduate program were raised by graduate students and faculty.

- Graduate students have a perception that they are not valued members of the School. This perception is primarily a result of the constitution recently put in place by the School, which they feel limits the participation and voting rights of students on various committees in the School. In particular, they are concerned about not having a voice on the appointments committee. On the other hand, The School's practice in this area is consistent with that of most computer science departments in Canada.

- Graduate students expressed a sense of isolation on campus. They stated that there was little opportunity for them to interact with other students or faculty outside of class or their individual labs. Partly this is based on the geography of the campus; students generally come to the university only to work as there are no nearby facilities for informal or social gatherings. As well, they did not feel that there was a comfortable location within the School for them to interact. We were told that there was a graduate lounge but that this was not adequate for their needs.

- Some faculty members expressed concern that the university did not recognize the value of faculty time spent on co-supervision of graduate students. They felt that this was somewhat discouraging to inter-disciplinary and collaborative research.

- There does not appear to be an as much active interaction with researchers from outside the university as we expected. In particular, there appeared to be too few seminars given by visiting researchers.

- Although the total number of applications for the graduate program is healthy, the graduate committee is concerned about the quantity of good applications from Canadian students.

- Graduate students also expressed concern about the lack of systems support for students in some of the labs. (The amount of technical support varies significantly from lab to lab.)

- As the graduate enrollment increases, laboratory and office space is becoming a serious concern.

Recommendation 3.2 *The School should attempt to make graduate students feel more valued as members of the university community. This may involve increased communication, as well as an understanding of their roles on various committees.*

Recommendation 3.3 *The School should put more resources and effort into bringing external visitors into the School for seminars or longer-term visits.*

Recommendation 3.4 *Graduate students be encouraged to choose research topics as early as possible in order to help decrease the overall time to complete a degree.*

Suggestion: The graduate committee review the requirements for the Masters program to determine whether they are appropriate for this degree.

Suggestion: The School look into whether there is some space available that would facilitate improved interactions among graduate students, or whether the current space could be better utilized.

Suggestion: A space planning committee be set up to study and report on the effects of increased graduate enrollments in terms of laboratory and office space.

4 Research

The School has an impressive research record. Almost all of the faculty members have NSERC research grants (many above the average amount). There is also a reasonable amount of other funding from industry and granting agencies. The majority of the active researchers are working in the area of theory and artificial intelligence. Other strengths include databases, programming languages, hardware and distributed computing. Previously, graphics was also a major strength of the School but because of recent departures, this area is not as active as it once was.

4.1 Research Funding

Most of the NSERC operating grants in the School are in the average to above average category for the discipline. There are also a few people who are in the upper end (greater than $40,000) range for these grants.

Other sources of research funding for the School include grants from the Science Council of BC, Networks of Centers of Excellence (MITACS, IRIS/Precarn, TeleLearning), and NSERC Strategic Program. Several faculty also receive industry funding from companies such as INTEL, Hewlett-Packard and IBM. Overall we view the level of extra-mural research funding as very high, representing evidence of the strong research strengths of the School.

4.2 CSS

The Center for System Sciences (CSS), which is directed by Brian Funt, provides research infrastructure for members of the School (and others.) The center appears to provide adequate network and technical support. One concern that was mentioned with respect to infrastructure is that there exists some tension between CSS and Computing Services personnel. Another concern was that there is an ongoing need for individual labs to provide some internal systems support.

CSS provides other useful services for the School, including support for visiting lecturers, research grant preparation, publicity, prize nominations, editorial assistance and conference travel.

On the whole, this center offers a valuable service that goes beyond the infrastructure provided in most computing departments in Canada.

4.3 PIMS and MITACS

The School is heavily involved with two major institutes. The Pacific Institute for the Mathematical Sciences (PIMS) is an NSERC funded institute set up in western Canada to promote mathematical sciences. About half of the School have some involvement in this institute and its existence and success at Simon Fraser is in a large part due to the efforts of Arvind Gupta, who holds the position of Deputy Director. Both PIMS and MITACS (the Mathematics of Information Technology and Complex Systems NCE) have provided for increased cooperation between the School and the Department of Mathematics. They have also raised the external reputation of the School.

4.4 Concerns

A primary concern in research (as well as other areas) is the attraction and retention of good faculty. This is particularly noticeable in the area of computer graphics, where up until recently

Simon Fraser had a leading group of researchers. This is not an uncommon problem: many universities in Canada are currently experiencing difficulty in hiring and retaining faculty in key areas such as graphics, software engineering and systems, where there is a great demand from both industry and university for highly trained individuals.

Another concern is the balance of research areas. At the moment it appears that the areas of theory and artificial intelligence are well served (with well over half of the faculty working in one of these two areas), whereas other key areas such as systems, databases and software engineering, are not so well served. Since these are currently areas that many graduate students wish to work in, the few faculty that carry out research in these areas may be comparatively overburdened with supervision.

There is also some lack of balance in the School with regards to seniority and research experience. At the moment there is only one faculty member at the level of Assistant Professor. Because of the lack of young faculty, it may be difficult for the School to adjust to the high demands that are occurring in this ever-changing field.

The committee was surprised that there was not more interaction with researchers at the University of British Columbia. There are some joint NCE grants, but we think there are many more opportunities for joint research, visiting speakers, etc. between the School and the computing department at UBC.

Some faculty members expressed concern over the difficulty in attracting industry money. It was suggested that this, in part, may be due to the geographic isolation (with respect to many of Canada's larger companies, which are located in Ontario or Quebec) of the university. It was also thought that the university did not encourage contract research, particularly since it is difficult (costly) to buy out of teaching responsibilities, which may be necessary to carry out such research.

Recommendation 4.1 *There is a need for growth in the School. When considering new faculty appointments, the School should consider those areas of research which are currently underrepresented and in high demand from graduate students.*

5 Faculty and Organization

The faculty members for the most part seem to respect one another and to work well together. We did encounter descriptions of some personality conflicts and some concerns about gender equity were expressed. Overall faculty members seem to be content with the degree of faculty participation in administration of the School. They seem to be committed to making sure the School does well across a broad range of activities, research and graduate studies to undergraduate education. As mentioned above, the School is highly ranked in research, and this is a major accomplishment of its faculty members. The faculty seem to be proud of the quality and flexibility of their undergraduate program. The committee structure seems to be sound and working well in terms of faculty participation, although concerns were expressed about the degree of participation of students on the important committees.

The associate faculty members are interested and well able to contribute to the School, although they expressed some concern about lost opportunities for more interdisciplinary studies due to "walls between decanal units". They would value increased opportunities for supervision of computer science graduate students.

Overall faculty morale is at an acceptable level but not as highly positive as it should be. Several plausible reasons were advanced for this. Many faculty members expressed a concern that the School is falling behind in comparison to other computer science departments across the country. This is partly due to the School not hiring many new young faculty members. The School had achieved a strong national reputation at the start of the nineties, having climbed over the previous decade to a ranking at or near the top of the "second tier" in the words of the last review. (The first tier consists of the much larger and longer established departments at Toronto and Waterloo.) The climb was partly accomplished through an exceptionally good record of recruitment of young faculty members. We believe the School is still ranked at or near the top of the second tier, but clearly its rate of improvement has slowed relative to that of other Canadian departments. External perception of trends for improvement is now focussed more on other universities which are more aggressively recruiting outstanding young faculty members. The School has gone from being "bottom-heavy" then (having a relatively large proportion of junior faculty members), to having only one assistant professor today.

In recruiting new junior faculty members, the School must of course build on its strengths,

but it is clear to us that a broader coverage of some key areas would be most helpful. These areas include the operating systems, software, databases, graphics, and other "systems" areas. We think the School might benefit somewhat from a shift in balance of areas in these directions. However significant opportunities to strengthen the School in other, less applied areas should not be completely ignored. Another issue involved in faculty recruitment is the question of lab space. There is a severe space shortage in the Faculty as a whole, and very careful planning for adjusting space needs will be required to bring in new research faculty members.

There are also some morale issues caused by a perception by some faculty members that the administration does not seem to fully appreciate the quality of the School's efforts and achievements, This is coupled with frustration caused by the School's inability to cope with high student demand for its undergraduate programs. Some faculty members feel that the School's concerns about enrollment pressures are not viewed as sufficiently grave by the senior administration. Whatever the truth of this, it is clear to us that if the School is to maintain its current ranking among Canadian computer science departments, then both the School and the administration must work more effectively together to deal successfully with its problems. In our view, the principal problems are student enrollments and faculty recruitment and retention. The faculty retention issue is being exacerbated by the heavy workload, by the salary cap, and by the the fact that there are lots of opportunities elsewhere for faculty members in this area.

We found very broad, in fact near unanimous, support for the current chair of the School. Even professors who were unhappy with their own merit evaluation or with some other decision, praised the chair for his collegial approach and expressed hope he would accept a second term. The preparation of the School's new constitution has created some bad feelings by specifying somewhat less student participation than may have previously existed informally. The preparation of the constitution nevertheless represents a very significant effort which should benefit the School.

There was some concern by some faculty members about the formulas and evaluation criteria used for merit evaluations. Some felt the criteria did not provide sufficient encouragement for working with industry. We recommend (as suggested by the chair) that the faculty members meet to discuss these issues in general. We recommend they consider the role in merit adjustments of contributions in industrial consulting and contract research, although we see little need for change in weight We think the existing criteria provide a good starting point for this discussion.

Recommendation 5.1 *Criteria for merit evaluation, promotion and tenure should be developed collegially by the School and communicated clearly to faculty members.*

6 Staff and Facilities

The administrative staff appear to be a competent and well-organized group. However, given the size of the School, the amount of support is on the low side. This is evident in several respects: each staff member has a significant work load; there is no backup when someone goes on holidays; there is no receptionist (this role is rotated among staff who already have a full agenda); and the co-ordinator of academic programs and services is on leave (this may be the result of the stress of being overworked). In terms of administrative staff resources, there is a lot of stress and clearly some shortage of essential resources. The current half advising position should be made permanent.

The shortage of administrative staff puts an added burden on faculty to carry out tasks (such as photocopying, routine secretarial work, etc.) that would normally be handled by this group. This is certainly not an efficient use of faculty time. It is important that the School should support its faculty members to pursue contract and grant research by providing a high degree of staff resources for the administrative management of these contracts and grants.

The systems staff and computing facilities appeared to be adequate for the current needs of the School. However, with the ongoing increases in enrollment, the undergraduate labs are in need of expansion. As well, the increased enrollment implies additional sessional instructors who put added burden on the technical staff (particularly with regards to instruction). There is a serious lack of training resources for technical staff.

Recommendation 6.1 *A review of the current tasks and expectations for the administrative staff should be carried out and budget made available for additional staff as required.*

Recommendation 6.2 *The level of training for technical staff be considered and an appropriate budget be made available for keeping the staff up-to-date on equipment and software.*

Suggestion: The ranking of technical staff in the School be examined with respect to similar positions in computing services to ensure equity for the staff.

Suggestion: A centralized (university-wide) inventory for software licenses be set up to minimize costs for the School and other units.

It is a matter of concern to the School that the degree of administrative complexity of the School is not fully recognized by the University. The operation of the School is administratively complex because of several factors, including the large numbers of enrollments and the high degree of funded research activity. In addition to these, there are large joint programs such as those with business, there are large service courses operated for students in other Schools, the programs all require the operation of labs with equipment and technical staff, and there is an unusual level of advising needed, including advising for the co-op programs.

7 Gender and Equity Issues

The School currently has three female faculty members and a healthy percentage of female graduate students. Although gender equity was not considered a problem for most of the people who were interviewed in the review, there were comments that suggested that individuals (in these cases female) did feel that they have experienced some unfair treatment. One particular concern was with the hiring equity policy. The membership of the hiring committee has recently been changed to exclude the membership of voting graduate students. This was felt by some to reduce chances for hiring females. In addition, some incidents of explicitly sexist remarks were reported.

It was expressed by one individual that tolerance, diversity and individuality used to be a unique strength of the School, and that there has been a radical change away from this in the last decade. It was also mentioned that the student body is now polarized, where most of the non-Canadians are from only one part of the world.

Suggestion: The School should consider the possibility of training in gender issues and equity for those individuals who sit on hiring or promotion committees. (In some universities, such as Queen's, such training is mandatory.)

There is a gender issues committee which seems to be useful and effective. The goal of this committee is to recognize and lift barriers to equity. Concern was expressed that there is a perception that this is light work, or less important than other kinds of School committee service. In our view this work should be highly valued by the School.

Recommendation 7.1 *Efforts to promote equity and fairness within the School should be more recognized, encouraged and appreciated.*

The School can be proud of its equity record in terms of numbers of female students; the ratio is significantly higher than that of most Canadian computer science departments. As mentioned above we did hear some anecdotal evidence of intolerant remarks. Difficulties in overcoming gender bias in a recent faculty hiring case were referred to by several people. While the School's committee chairs and those in senior positions appear to us to be sensitive to these issues and well able to ensure they are taken seriously, there was enough mentioned to cause us to wonder if there may be problems in this area after all. We believe that the School's members must work on this issue themselves.

8 Library

In general, the library facilities appear to meet the demands of the School. Students (particularly undergraduate students) are growing more dependent on the internet for resources the library may have provided in the past.

The one concern expressed was that of the rising costs of journals in the information technology area.

9 External Linkages and Planning

9.1 University Administration

As discussed in Section Two, the current undergraduate enrollment problems were described by some faculty members in the School as posing a "grow/no grow" dilemma: should the School try to accommodate the student demand by increasing the number of faculty and technical resources needed, or should the School act to reduce the number of students instead, in order to provide an appropriate learning environment within existing resources? Both the School and the University Administration will have to work together to address the enrollment problems. They must together deal with not one but two enrollment problems. The first is the "bulge" in enrollments caused by lowering the numbers required for direct entry two years ago; the second

is the overall long-term student demand for computing science programs. The problems caused by the bulge cannot be ignored, even if cutoffs for direct entry are raised to allow the bulge to pass through the system, after which enrollments return to the status quo ante. As a long-term strategy, we do not believe that it is prudent for the University to ignore the level of demand for courses in Computing Science, or for the administration to view the situation as roughly equivalent to that in other Schools and Departments which also may have some unsatisfied student demand. In fact, we believe that in Computer Science, the level of unsatisfied demand and the level of student dissatisfaction due to unsatisfied demand in Computing Science is exceptional. This exceptional level of demand is consistent with patterns elsewhere in the Province and throughout North America. This is an issue that is currently being addressed by programs such as ATOP in Ontario, where universities are receiving separate financial support from the provincial government to try and deal with the rapidly expanding needs of computing programs.

In our view the appropriate approach to the "grow/no grow" question is for the Administration and the School to jointly develop plans which address both sides of the issue, by doing some growing and also adding some additional enrollment restrictions and controls. There must be an increase in resources to accommodate some of the demand. The University 's reputation may suffer if doesn't handle student demand properly. Furthermore, the strength of the department may be diminished if quality suffers, and faculty morale problems will lead to additional problems in faculty recruitment and retention.

10 Conclusion

In considering the history of Computing Science at Simon Fraser University, we observe that the School became an unusually strong department in terms of national ranking during a time (late seventies and eighties) when it was very difficult to build a first-rate computer science department, due primarily to a national shortage of computer science faculty members. Since then the University's commitment to having a top-ranked computing science department may have waned somewhat. But the School is still strong and well-placed to renew its advance.

The School has many strengths, based on the quality of its people. It has a reputation for quality and flexibility in its programs, and a high level of research activity. Although there were internal conflicts a few years ago, the current administration (and in particular the Department

Chair, Jim Delgrande) have gone a long way in bringing the School back to a point where it could flourish given resources for change and growth.

This is a time when the information technology industry is demanding increased enrollments in computing programs. It is also a time when there are many research incentives for faculty members in computing. In our opinion, if Simon Fraser identifies continued strength in Computing Science as one of its priorities, the University has the opportunity to have a School of Computing Science which continues to be nationally recognized as a leader.

Authors' email addresses:
dymond@cs.yorku.ca janice@cs.queensu.ca