

SIMON FRASER UNIVERSITY
Senate Committee on University Priorities
Memorandum

TO: Senate

FROM: John Waterhouse
Chair, SCUP and
Vice President, Academic

RE: School of Computing Science

DATE: February 13, 2007

The Senate Committee on University Priorities (SCUP) has reviewed the External Review Report on the School of Computing Science, together with responses from the School and Dean of the Faculty of Applied Sciences, and input from the Associate Vice President, Academic.

Motion :

That Senate approve the recommendations from the Senate Committee on University Priorities concerning advice to the School of Computing Science and the Dean of Applied Sciences on priority items resulting from the External Review.

The report of the External Review Committee* for the School of Computing Science was submitted in May 2006 following the review team's site visit, which took place March 27-29, 2006. The response from the School and the response from the Dean were received in September and December 2006 respectively.

The Review Team found that the general environment in the School is positive and that faculty members, staff and students were cautiously optimistic about the future prospects for the School. The Team believed that the School had done 'remarkably well' to sustain enrolment levels when the majority of schools in North America saw enrollment fall dramatically in the last three years.

A number of recommendations were made and there is general agreement on these recommendations between the School and the Dean.

SCUP recommends to Senate that the School of Computing Science and the Dean of Applied Sciences be advised to pursue the following as priority items.

1. Strategic Planning

- Conduct a SWOT Analysis (Strengths, Weaknesses, Opportunities and Threats) and articulate clear goals for each program at each campus, including the number of faculty, staff and students.
- Participate fully in the process initiated by the Vice President Academic for reviewing the effectiveness of the Faculty structure at SFU.

2. Research

- Continue the development of an Industry Relations Centre and the proposed Centre for Open Source Technology and Applications Research and ensure that activities of these centres coordinate with the efforts of the University /Industry Liaison Office.
- Explore ways of strengthening the School's research clusters with a view of increasing their success in seeking funding opportunities and ensure both junior and senior faculty members are involved.
- Establish a forum for the School of Interactive Arts & Technology and Computing Science faculty where they could discuss common research problems and foster collaboration.

3. Graduate Programmes

- Continue to ensure all graduate students participate in TA training through the mechanisms established in the School.
- Ensure all graduate students at SFU Surrey receive broad exposure to the faculty and other graduate students at SFU, as well as visiting faculty.

4. Undergraduate Programmes

- Continue to pursue more effective ways to recruit students for Surrey by integrating the School's efforts with other SFU recruitment activity, thereby offering a more harmonized attractive package to potential students.
- Investigate CSAC accreditation (the process could be used to review and evaluate the Computing Science degree and the multi-disciplinary programmes offered by the School).

5. Academic Quality

- Improve quality assurance mechanisms to:
 - Ensure that the curriculum design reflects and achieves the identified educational objectives.
 - Establish industry/external advisory panels where appropriate.

6. Faculty

- Continue with the recently introduced formal mentoring programme to assist in the integration of new faculty into SFU, particularly those at the Surrey campus.
- Consider the introduction of meaningful ways to encourage and recognize the scholarly contributions of lecturers and senior lecturers.
- Continue to reassess the current policies for assigning teaching duties to ensure an appropriate palette of courses is offered each semester and that faculty members have more flexibility in their choice of lecturing schedules.

7. Communication

- Ensure that communication channels are established and operate effectively to consult, inform and provide feedback mechanisms among the Dean, the School, the Surrey campus, faculty members and staff.

* Dr. Randy Goebel, Chair, (University of Alberta)
Dr. Frank Tompa (University of Waterloo)
Dr. Mary-Anne Williams, (University of Technology, Sydney)

CC Brian Lewis, Dean Applied Sciences
Uwe Glässer, Director, School of Computing Science

External Review of the School of Computing Science, Simon Fraser University, March 2006

Executive Summary

This report describes the results of an external review of the School of Computing Science. It is based on the information sources made available to the review team, complemented by discussions held during the site visit.

The report includes 22 recommendations that we suggest be considered by administrators at various levels within the University. Of these we, believe the following to be the most important (numbers refer to the ordering of the recommendations in the body of the report):

Recommendation 18: The School should articulate clear goals for each program at each campus, including target audiences and curricular objectives. These goals should be incorporated into recruiting and planning documents. In this way the School can ensure that potential student pathways will lead to the attainment of the academic objectives.

Recommendation 1: The Dean, the Director of the School, and the Associate Director for CS@Surrey should ensure that communications, consultation, and feedback channels among all interested parties (and especially among these three individuals) are well-established so that they can build a shared understanding of priorities, opportunities, concerns, and financial realities.

Recommendation 13: The School should consider ways to enhance its research clusters so that they function even more effectively as meaningful units, and it should explore the creation of a School based research centre that could provide the clusters leverage their common strengths to seek funding opportunities.

Recommendation 3: The School should introduce a mentoring program to help integrate new faculty members into the School activities and to help them develop an understanding of the School objectives, expectations, and how to access support and potential opportunities. This is particularly vital at Surrey, where the infrastructure is much less well established.

Recommendation 7: The effective recruiting methods for Burnaby should be expanded and adapted to encompass candidates for the Surrey campus. CS recruiters should work closely with recruiters for TechOne and Science Year One to present a harmonized, attractive package.

As reviewers, we appreciate the effort and energy expended by administrators, faculty, staff, and students in preparing for the review, and we thank all those who willingly shared their views and experiences. We recognize that such an external review is based on looking through a small peephole at a complex organization, and that it inevitably includes some misperceptions. Furthermore, many of our observations may result from transient events, and several identified shortcomings may well be in the process of being addressed. Nevertheless, we trust that the report will serve to help make a strong program even better.

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1 Introduction and Terms of Reference

The site visit for the external review of the School of Computing Science took place from March 27 to March 29, 2006. The external reviewers included Professors Randy Goebel (University of Alberta), Frank Tompa (University of Waterloo), and Mary-Anne Williams (University of Technology, Sydney). Professor Rick Routledge (Department of Statistics and Actuarial Science) served as the internal member of the committee.

The terms of reference for the review included SFU's standard goals to seek peer review of the quality of the teaching programs, faculty research, governance, and working environment in the School. The issues of particular interest were specified to be:

- a) "Evaluate the "Double the Opportunities" enrolments in undergraduate and graduate Computing Science programs and provide advice on ways of increasing these numbers in the foreseeable future;
- b) Provide advice on ways of securing sustainable financial support for graduate students at a level that is competitive with other Computer Science departments at major Canadian universities;
- c) Suggest opportunities for increasing external research funding through major research grants for strategic research projects, specifically in interdisciplinary research and priority areas as outlined in SFU's Strategic Research Plan;
- d) Suggest alternative academic structure(s) that, in the context of a restructuring of the Faculties of the university, make the most sense with respect to the needs and interests of the School of Computing Science;
- e) Suggest possible strategic directions and focus for the undergraduate program, in light of current strengths and weaknesses, and in light of changes in the academic discipline."

We have structured the report with these points in mind. There are eight sections covering the following areas; working environment, governance, enrolments, graduate student financial support, external research funding, academic structure, and undergraduate programs in the School. Related comments on teaching, research, and governance are included in all sections, as appropriate. The final section includes other observations that lie outside these specific foci.

To place our comments in perspective, it is important to understand the state of flux affecting the School during the time of the review. Most of the School's offices and activities moved into the TASC I complex in August 2005, with some furnishings and infrastructure still not in place. Several people told us that the move "threw them off their stride." Secondly, the composition of the School is in the middle of transformation: the activities at Surrey started only a couple of years ago and will soon move to new premises, and the exchange program with Zhejiang University and activities at a third campus site, Harbour Centre, are about to commence. Thirdly, the Director of the School had been in his job for only three months and the Dean of the Faculty was very recently re-appointed; both are still striving to determine how best to work together for the benefit of the School. Finally, the prospect of possible Faculties restructuring is creating great uncertainty in all aspects of governance, decision-making, and planning.

2 Working Environment

2.1 Staff concerns and uncertainties

Despite the potentially disruptive impact of office relocations, new programs, new campuses, new faculty members, and proposals for new Faculty structures, as outlined in the introduction, the general mood in the School is positive. The faculty members, staff, and students we met during the site visit were all cautiously optimistic about the future prospects for the School. They were clearly happy to be at SFU, because of a combination of its reputation, geography, and general working environment.

Most of the groups we met expressed some uncertainty in light of recent and possible pending changes. For example, many of those involved in building or administering the program at Surrey were concerned whether it would prove itself viable at the undergraduate and graduate levels soon enough to avoid undermining the School's reputation. Many more were concerned about the possible negative effects of DTO coupled with the North American downturn in undergraduate applicants: Would the faculty complement be significantly reduced? Would graduate students continue to be funded at appropriate levels? Were staff positions secure? Would the amount of overwork, overcrowding, and turmoil revert to the worst times during the CS boom in the 90s?

On the other hand, there was a nearly universal belief that the undergraduate enrolments will soon rebound, and this aligns with the expectations at other institutions in North America, the Asia-Pacific region, and Europe. Effective recruiting efforts for students have been developed over the last several years, and these have helped the School to maintain their undergraduate numbers at Burnaby when many other institutions in North America and elsewhere have seen enrolments drop by 60% or more.¹ Whereas co-op jobs were in short supply very recently, this year there were more positions available than there were students enrolled in the program. The concern in everyone's minds was that the University might cut support to the School before the turn-around is confirmed, and that this could jeopardize the future. This concern was fueled by the uncertainty in the commitment to hire new faculty this year (when recruiting season was in full swing and faculty candidates were, in fact, visiting the campus) and the possibly unjustified belief that the upper administration thought the faculty complement was already too high in view of lack of growth in student numbers and therefore positions might be cut.

A significant challenge for senior faculty and administrators will be to address these challenges and to overcome the uncertainties.

2.2 Communication

During the site visit, we found several discontinuities in communications. Some of these seemed to rest solely within Computing Science, whereas others seemed to fall between the School and the Dean or the School and the University Vice-Presidents. Surprisingly we were often told of some concern during one interview, only to be informed that the concern was ill-founded in a second interview, and then told by the first party that this was news to them. These communication shortfalls impact operations, tactical planning,

¹ See <http://www.cra.org/CRN/articles/march06/vegso.html> for figures from North American PhD-producing universities and <http://www.cra.org/CRN/articles/jan06/vegso.html> for Canadian universities.

and strategic planning, and they may have a detrimental effect on the School, the Faculty and the University.

In the examples that follow, we do not assign blame to any individuals or groups but merely illustrate some the communications breakdowns that became apparent to us during the site visit.

The most striking example related to whether or not the School would be able to hire new faculty members during the 2006 recruiting season, which was well underway. Several faculty members wondered why recruiting visits were taking place when positions were not yet confirmed. The Director of the School and the Associate Director for CS@Surrey indicated that positions for 2006 were not yet approved, and indicated that they believed that the approval was being held up in the office of the Vice-President, Academic. The Dean stated that positions for Surrey had been approved, but that replacement positions at Burnaby were at risk. The Director re-affirmed that he had not yet been informed of approval for hiring at Surrey (and he was glad to hear from us that it could apparently proceed, since it is sorely needed).

A second example concerned the suitability of the TechOne program at Surrey to prepare students for ongoing studies in Computing Science. We heard from the Computing Science Director of Undergraduate Programs that many students in the TechOne program at Surrey were struggling with the standard first year computing science course and that, starting in September, it was to be replaced by a service course that would not allow students to continue towards a degree in Computing Science. There was general concern that this change was needed because of the cohort-based structure for first year students at Surrey, and that it would result in fewer undergraduate students enrolling in Computing Science, in spite of DTO pressures. In a later meeting with the Associate Director for CS@Surrey, we were told that in spite of being structured as a cohort program, TechOne students can opt for one of two streams: in one stream the standard first year course was to be replaced by a service course, but students were being advised that if they wished to keep their options open for a degree in Computing Science, they should register in the other stream which would continue to offer the standard first year course. He believed that this would not be problematic for such students, and that the ability of Computing Science students to attract undergraduates would not be hampered. Apparently this information was not common knowledge within the rest of the Computing Science faculty, including the other members of the Academic Executive Committee.

While discussing potential opportunities for funding graduate students, several faculty members mentioned that they were considering how best to apply for support from the Community Trust Endowment Fund. We were told that even though the first application deadline was only two months away, "it was still very early on" and many aspects of how the applications were to be adjudicated were unclear. In a later meeting with the Vice-President, Research, we were told that five information sessions had been held and nobody from Computing Science had attended any of them, and furthermore that all the information was clearly laid out on the web pages. Subsequently we were informed by the Director of Computing Science that at least two faculty members had, in fact, attended the January 9 information session directed at the research theme "Communi-

cation, Computation and Technology,” within which Computing Science research was most apt to fall.

We learned that the School holds monthly meetings to inform faculty and staff of important information, to seek counsel and advice from the members at large, and to make or confirm decisions on actions to be taken by the School. This is an excellent opportunity for information to be shared, but apparently it is insufficient:

1. As at all institutions, some faculty members are disengaged from the School and do not benefit from nor contribute to this communications channel. We were told that some of the senior faculty members, including some strong researchers, are the ones most disengaged, which means that some potential leadership is absent. This is exacerbated by past hiring patterns, which have resulted in a faculty profile with very few faculty members of moderate seniority.
2. A recent change means administrative staff members are no longer invited to the meeting, but are instead represented by their managers. These staff members feel disenfranchised as well as less informed.
3. In spite of these meetings, some faculty members commented that the Executive Committee made decisions without consulting the faculty at large. We heard more than one person remark that some of the material in the self-study was news to them and that important decisions were often announced at the School meetings without prior discussion. It is important to recognize, however, that such failures in communication might arise from the Executive not soliciting advice in the first place or from faculty members ignoring such requests but then complaining after the fact.

Clearly such communications shortfalls impact the School's operations. However, they also impinge on the School's ability to plan tactically and strategically. For example, without a clear understanding of the commitment to recruit faculty for Surrey, it is impossible to plan for next year, much less for the next three to five years. Furthermore, there is a lack of understanding of the program to be offered at Surrey (for which a new proposal has just been completed). This means that the roles of TechOne and Science Year One in preparing students for that program are unclear, as are which channels are to be pursued for student recruiting. Thus it is impossible to plan how CS@Surrey can thrive.

In addition, the absence of a revised timetable for enrolment growth, performance indicators against which such a plan will be evaluated (e.g., enrolment numbers vs. graduation numbers), and clear backup plans in case DTO projections are met in only some of the programs make other planning impossible. Some of these issues are elaborated in later sections of the report.

Recommendation 1: The Dean, the Director of the School, and the Associate Director for CS@Surrey should ensure that communications, consultation, and feedback channels among all interested parties (and especially among these three individuals) are well-established so that they can build a shared understanding of priorities, opportunities, concerns, and financial realities.

Recommendation 2: The School should strive to improve communication, consultation, and feedback channels among all faculty members, staff, and administrators within the School.

2.3 Faculty Profile

Over the last few years the faculty has experienced rapid growth. This has resulted in an unusual bimodal faculty profile, where the number of professors and assistant professors is high, and there are very few associate professors. The distribution of staff as of the end of April 2006 is given in Table 1 below; for comparison, the corresponding numbers from five years ago are also included.²

The influx of new faculty members has significantly enhanced the teaching and research capabilities within the School. It has reinforced several areas of existing strength, and also led to the creation of several new areas of expertise in emerging areas of growing global interest such as computational biology. However it has also introduced several new problems, such as an increased need for mentoring, and a need to actively improve communication channels within the School.

Level	Burnaby	Surrey	Total	2001-02
Professor	19	1	20	16
Associated	7	0	7	9
Assistant	16	3	19	4
Senior Lecturer	2	0	2	3
Lecturer	6	3	9	3
			57	35

Table 1: Distribution of faculty members

As a consequence of the diversification of expertise, the School has been able to offer a wide range of courses. This has clearly benefited both undergraduate and graduate students. However the number of 800 level course offerings may have grown beyond the optimum level in balancing highly focused research-oriented courses offerings against broader, more established ones.

In response to the DTO program, the School has also increased the number of teaching faculty at the rank of lecturer. These faculty members contribute immensely to the School's educational mission, and care should be taken that they remain sufficiently engaged in the course material to keep it up-to-date and to motivate the students. To this end, it is important that they remain engaged in some scholarly activity (although not necessarily in pushing the limits of knowledge through independent research).

Recommendation 3: The School should introduce a mentoring program to help integrate new faculty members into the School activities and to help them develop an understanding of the School objectives, expectations, and how to access support and potential opportunities. This is particularly vital at Surrey, where the infrastructure is much less well established.

² Simon Fraser University Calendar, 2001-2002.

Recommendation 4: The School should reassess its current policies for allocating teaching opportunities and responsibilities in order to ensure that an appropriate palette of courses is offered each term. This should include a re-examination of the factors that motivate professors to offer 800-level courses in preference to 700-level ones.

Recommendation 5: The School should develop meaningful ways to encourage and recognize the scholarly contributions of lecturers and senior lecturers.

3 Double the Opportunity Enrolments

The B.C. provincial government's Double The Opportunity (DTO) funding sought to increase enrolment in post secondary technology programs (Computer/Computing Science, Electrical and Computer Engineering, and related technology programs such as TechOne at TechBC, and now SFU Surrey), beginning with the base full time equivalent student enrolment numbers (FTEs) in the 2001/2002 academic year.

In that particular year, Computing Science at SFU "enjoyed" its all-time peak enrolment. This coincided with the onset of the so-called "Dot Com bust," followed by the increased media attention on "outsourcing," both of which created a strong public perception that there was no hope for employment in the technology sector. Even though there is growing evidence that the demand for computer science graduates is growing and already exceeds the demand of 1999,³ the public perception persists.

Around the same time, SFU took over the programs at TechBC, which included first year cohort programs designed to attract technology-oriented students in common first year programs, potentially leading to CS majors programs. The two technology programs are referred to as TechOne (counted as .5 contribution to DTO) and Information Technology. In the current year (2005/06), there are 569.2 (TechOne) and 132.2 (Information Technology), which provide $569.2 * .5 + 132.2 = 416.8$, or 16.8 FTEs over the DTO Surrey targets.

3.1 Undergraduate Program at Burnaby

While it is clear that the Burnaby targets were artificially high because of the time of measurement, the school has done remarkably well to sustain those levels, especially when the majority of schools in North America and elsewhere have seen enrolments fall dramatically over the last three years.⁴ The incredible success in sustaining the CS major numbers is likely due to both the School's reduced admission requirements (shifting from about 90% to 80% averages for direct admissions from high school), as well as exceptional recruiting efforts in the high schools, both generally and by the WICS programs. (Even though other universities also lowered entrance requirements, they still suffered significant enrolment reductions.)

The undergraduate CS program at the Burnaby Campus has always been relatively strong, and its strength in the lower mainland may account for some of its ability to

³ For example., see http://campus.acm.org/public/pressroom/press_releases/2_2006/globalization.cfm/, <http://www.cs.rice.edu/~vardi/ibd.htm>, and <http://money.cnn.com/magazines/moneymag/bestjobs/top50/>

⁴ See <http://www.cra.org/wp/index.php?p=75> for North American freshman enrolment trends in computing.

sustain the 2001/2002 numbers, despite the drop in enrolments in most other jurisdictions.

In our conversations with undergraduate students, there was uniform praise regarding their perception of the quality of the program, with no negative comments on either the structure or quality of program content and instruction. Some concern was raised regarding the quality of teaching assistants, especially with the difficulties many have with language and communication. There is concern that, as the program grows, there will be more foreign graduate students, increasing the challenges to improve the communication skills of TAs. We were informed, however, that the School is diligent in its management of graduate student TAs, and it appears that SFU's practices are comparable to TA assignment and training at both the University of Alberta and the University of Waterloo.

Recommendation 6: All graduate students should participate in TA training, which should attempt to prepare non-native speakers of English and students with diverse undergraduate backgrounds to serve as effective TAs.

3.2 Undergraduate Program at Surrey

The DTO growth targets of 100 per year over four years are based on the confidence that the one year cohort programs will prove attractive in that jurisdiction, and that the students it attracts will be well able to transfer into the majors programs that lead to the granting of degrees in the regular bachelor's programs.

Currently, the DTO-counted admissions in both the TechOne, and Science Year One cohort programs show that the DTO admissions targets of 100 per year are being met, with the final year (05/06) producing 16.8 surplus of FTEs. However, it is not yet certain how the DTO counting of FTEs vs. final graduates will map to performance targets at the end of the evaluation period.

It is clear that the Surrey faculty and staff are working hard to market the value of the Surrey programs, despite the lack of clarity on overall structure to the Surrey program (see above). However, the success of CS@Surrey will depend on recruiting both into the cohort programs and into CS. We have observed that there is a need to coordinate the marketing of CS programs across Surrey cohort programs (i.e., both TechOne and Science Year One) and across Computing Science programs at all campuses.

Recommendation 7: The effective recruiting methods for Burnaby should be expanded and adapted to encompass candidates for the Surrey campus. CS recruiters should work closely with recruiters for TechOne and Science Year One to present a harmonized, attractive package.

3.3 Undergraduate Program at Harbour Centre

The evening courses in CS will begin at the downtown campus in Fall 2006 (with four course offerings currently planned), and we understand that the students will be counted in the Burnaby campus enrollments. The new programs are currently targeted at second

degree and post baccalaureate diploma students,⁵ which contribute to DTO performance measures.

The various program offerings across campuses are expected to be quite diverse and yet complementary. It will become increasingly important to clarify program offerings, including effective means for initial registrations, for cross-registering in courses at other campuses, and for transferring among the programs. Increased clarity here is important for creating the targeted marketing material that will distinguish the opportunities at the Harbour Centre, Burnaby, and Surrey campuses.

3.4 Graduate Program in Computer Science

The vast majority of the graduate students and graduate course offerings are in Burnaby, with a few students operating instead in Surrey. The masters program is considerably larger than the doctoral program; but notably, in 2004 Computing Science accounted for 10% of all doctoral students at the University.⁶

As is true for similar programs across the country (e.g., in Ontario and Alberta), the DTO graduate student growth targets have been just slightly exceeded. The target baseline was 105.1 (as reported in the Dean's summary), with growth targets of 15 per year for four years. In the official final year of 2005/06, the total is 170.2 FTEs, which is 2.7 over the DTO target. (We did not ask whether graduate students at Surrey contribute to graduate targets at Burnaby or undergraduate targets at Surrey, but the number of such students is small, and both targets have been exceeded in any case.)

Recommendation 8: Care must be taken that the graduate students in Surrey continue to receive a worthwhile graduate experience, including adequate access to lab facilities, exposure to academic visitors (through seminars and small meetings), and broad exposure to the faculty and other graduate students at SFU.

3.5 Summary of DTO challenges

The DTO budget allocations are made to the Vice President Academic office, and the School's portion is then passed on to the Dean of the Faculty, who in turn controls the DTO allocations to the School. There is some lack of understanding in the School in how this happens, with concerns heightened about how the funds will reach the School. We understand that, until this year, the Dean's office had simply passed through the DTO allocation without earmarking particular budget lines, but that this year, part of the allocation is explicitly earmarked for TAs. It makes sense that DTO funds would be specifically targeted for graduate students, since the graduate targets have been met.

A significant concern within the school is the pressure on budgets to support graduate students. Until now, full time graduate students have been supported 2/3 by the School (through TAs and fellowships) and 1/3 through research grants. The department is currently gathering consensus to shift to 1/3 school 2/3 research. This will put extra pressure on the faculty acquisition of external funds. It is clear that the faculty and students have engaged in this need to raise more graduate student funds, but they are

⁵ See <http://www.cs.sfu.ca/undergrad/Advising/programs.html>

⁶ School of Computing Science, External Review 2006, Graduate Student Data.

expecting (eventual) relief in the form of an increase in TA funding, under the belief that enrollments will increase over the next few years, and provide further DTO money.

Overall, the challenge of DTO and confirmation of current DTO budgets will rely on sustained growth in the undergraduate program. The university has apparently negotiated with the provincial government to extend the time frame to achieve the DTO targets, to 2010-11. It is clear that the School has invested significant effort to create an outstanding repertoire of outreach programs both to communicate the value of computer science to potential students and to provide a communication vehicle with the general public. Based on mostly anecdotal information, this program appears among the best in the country.

Recommendation 9: The School, Faculty, and University together should articulate goals for a healthy balance of relative complement sizes for faculty, staff, graduate students, and undergraduate students. It is expected that actual numbers will fluctuate over time and that changes to opportunities and priorities will require new goals to be set. Thus the numbers should be re-examined periodically, perhaps as part of the School's three-year planning exercises.

4 Funding of Graduate Students

A significant concern within the school is the pressure on budgets to support graduate students. The shift to increase support from research grants will put extra pressure on the faculty to acquire external funds. Most faculty members appear to have accepted this need, and they have begun to formulate plans to apply for NSERC Strategic Grants, industrially-oriented grants (primarily through NSERC or MITACS), support from the Community Endowment Trust Fund, and funds from other sources. Apparently graduate students have also been alerted to the need to find new research support, and several told us that they were working with their supervisors to draft grant applications and to meet with potential industrial sponsors. The intentions are clearly well-founded, and it is now a matter of execution to secure the necessary funding.

Recommendation 10: Although there is benefit in learning how to apply for funding support while being a graduate student, care should be taken that this activity does not dominate the graduate students' educational experience nor detract from their research endeavours.

5 Increasing External Research Funding

Given the University's recently published academic plan and the VP Research Strategic Research Plan, there is a top down emphasis on increasing the intensity of research at SFU. This implies higher expectations for research funding.

The School is doing relatively well in terms of NSERC funding, with 40 of 46 regular full time research faculty currently holding some level of NSERC Discovery Grant. Tables 2-4 below, created by using the NSERC Awards Engine, summarizes the relative success in NSERC Grant Selection Committees over the last five years. Indicative of the School's research success, note the relative standing with respect to other Computer Science departments in Canada. Confirming the School's strengths, performance over the last five years has been stronger in GSC 331.

GSC 330	#	\$	\$%	Average Award
Toronto	44	1,801,053	9.76	40,933
Waterloo	53	1,688,895	9.15	31,866
Alberta	49	1,570,724	8.51	32,056
UBC	31	1,066,344	5.78	34,398
Concordia	40	1,019,572	5.52	25,489
Victoria	23	678,471	3.68	29,499
SFU	22	650,468	3.52	29,567
McGill	15	442,154	2.40	29,477
Montreal	17	443,623	2.40	26,095

Table 2. Relative success in GSC 330

GSC 331	#	\$	\$%	Average Award
Toronto	66	3,176,319	13.78	48,126
Waterloo	76	2,297,378	9.97	30,229
SFU	67	1,819,704	7.89	27,160
McGill	37	1,467,580	6.37	39,664
UBC	39	1,459,050	6.33	37,412
Montreal	36	1,202,117	5.21	33,392
Alberta	32	915,553	3.97	28,611
Concordia	22	1,751,404	3.26	34,155
Victoria	14	394,150	1.71	28,154

Table 3. Relative success in GSC 331

GSC 330+331	\$
Toronto	4,977,372
Waterloo	3,986,273
Concordia	2,770,976
UBC	2,525,394
Alberta	2,486,277
SFU	2,470,172
McGill	1,909,734
Montreal	1,654,740
Victoria	1,072,621

Table 4. Relative success in both GSC 330 and 331 combined

Note from Table 4 that the overall funding from NSERC Discovery Grants is very good in comparison to other Canadian Computer Science departments (even ignoring department sizes).

In addition to this strong indication from NSERC Discovery Grants, the University's grant tracking system shows quite strong research funding in a variety of other areas, including the following as well as a collection of other industrial sources:

MTI - Millenium Technologies, Inc.
TELE - Telelearning Network
BC Ministry of Small Business and Economic Development
SSHRC - INE Public Outreach Grants
MITACS - NCE
COGENT - Cogent Chipware, Inc.
GEOIDE - Geomatics for Informed Decisions
PRECARN - IRIS
SW - Silent Wireless Systems
SAIT - Samsung Electronics Co. Ltd.
Constraintworks
IBM Student Scholars
HP - Hewlett Packard

The SFU Community Trust Endowment Fund is also believed to be a ready local source of funds, but with some concern over how proposals would align with the Strategic Research Plan document, and how the adjudication will be managed (as mentioned in Section 2.2). The overall success of the program and the level of participation within Computing Science will be better understood after the first couple of rounds of funding.

In light of increased pressure to raise funding support for graduate students, it is important to recognize that most of the new funding available outside of the NSERC Discovery Grants program is coupled with an industrial component, e.g., the industrial matching requirements of MITACS. Nevertheless, we note that many researchers who apply for funding through GSC 331 have been successful in obtaining such funds.

The perception of immediate external grant opportunities include the Michael Smith Foundation (<http://www.msfnr.org/>), targeted at health related research in BC, for which the groups doing related research (e.g., data mining/bioinformatics cluster, medical imaging cluster) are already funded. Other agencies on the list of spoken targets include MITACS, PIMS, and both NSERC Strategic and IRAP grants.

NSERC Strategic grants require industrial participation at least to the extent of statements of support, and MITACS support requires matching industrial money, so there is a natural urgency to make meaningful relationships with industry, especially locally. There is significant contact with local industry instances of some funding from larger corporations (e.g., IBM, Microsoft, Hewlett-Packard), but there does not seem to be an explicit School strategy to build relationships with the larger corporations.

There was concern expressed that the University/Industry Liaison Office provides little support in this kind of matchmaking (which is not a complaint unique to SFU). Apparently the School's Centre for Systems Science assumed the role of matchmaking previously, but this activity was discontinued when that Centre was disbanded to evolve into the Faculty's Research Resource Group. Even though MITACS provides matchmaking support for specific areas related to industrial mathematics, efforts to extend this form of outreach activity to other areas within CS would likely pay dividends.

In preparing for the move to the new TASC building, the School introduced new research clusters, primarily to facilitate the sharing of lab resources. These new alignments appear to have been accepted by the various research groups as natural alliances. For example,

the database and bioinformatics groups are already working with collaborators that have funding from the Michael Smith Foundation. The existence of these clusters may well help individual faculty members and small groups to secure new funding. However, not every cluster has senior faculty members who assume mentoring roles, and as a result some opportunities may be missed.

Recommendation 11: The School, potentially together with other units within the University, should investigate how to re-institute the industrial outreach and matchmaking role formerly provided by the School's Centre for Systems Science.

Recommendation 12: The University/Industry Liaison Office should re-examine its procedures with a view to streamline negotiations on industry funding (e.g., by working with representatives of the IT industry to simplify intellectual property and overhead agreements).

Recommendation 13: The School should consider ways to enhance its research clusters so that they function even more effectively as meaningful units, and it should explore the creation of a School based research centre that could provide the clusters leverage their common strengths to seek funding opportunities.

Recommendation 14: The School should devise strategies to improve the collaborative working environment so that it encourages senior faculty to seek external funding and to work with junior faculty to assist them to seek funding.

6 Alternative Academic Structure(s)

For the School to function effectively, it needs to share common goals and aspirations with the Faculty within which it is situated. Furthermore, it is important that the evaluation of its research and teaching be seen to be based on a deep understanding of the discipline of computing science.

Both the Dean of Applied Science and the members of the School agreed that the School does not embrace a common vision with FAS. On top of that, the recent push to establish a program at Surrey appears to have pitted the School's interests against those of the School of Interactive Arts and Technology, on more than one occasion.

Among the Schools within the Faculty, Engineering Science appears to be the only natural partner. This is not to deny that successful links have been created with other schools within FAS. Indeed with encouragement and support from the Dean's office, Computing Science is developing multidisciplinary undergraduate programs in multimedia arts and technology (with Interactive Arts and Technology), health information systems (with Communication), and information technology programming (with Engineering Science and Interactive Arts and Technology).⁷ In addition, research clusters have been formed in biomedical engineering (with Engineering Science and Kinesiology) and in human machine interaction (with Communication and Interactive Arts and Technology).⁸

⁷ Faculty of Applied Sciences, Academic Plan 2004-2007.

⁸ FAS Research Review (brochure).

However, it is important to emphasize that additional links will require even more energy and resources to create and support than would be the case for more traditional multidisciplinary activities. Outside the Faculty, Mathematics is a natural partner, and many members of Computing Science enjoy close collaborations with members of that department. Elsewhere, experimental computer scientists and those involved in data mining often have close collaborations with specialists from Statistics, and applied computer scientists often find collaborations with physical and life scientists (historically in physics and more recently in biology), or with health scientists (medical imaging). In fact, collaborations with faculty members in the natural sciences have included financial support for Computing Science graduate students from natural science research grants. At SFU there may also be a natural synergy for joint undergraduate or graduate programs with Business, but there is little apparent research interest within the School in this discipline.

Considering previously noted communications difficulties, it may well be the case that members of the School do not understand the FAS vision. Many of them view the Faculty as a forced marriage of disparate disciplines, with no common focus. They also do not believe that faculty members within the Faculty but outside of Computing Science and Engineering Science are well-equipped to judge the merits of proposed research projects, proposed curricula, or the quality of the achievements of computing scientists (whether being assessed for hiring, for promotion and tenure, or for awards). The result is that the support for FAS within the School is either weak or ambivalent.

Recommendation 15: The School should articulate one or more potential alternative Faculty structures, which can be assessed for feasibility, costs, and benefits.

Recommendation 16: In collaboration with the SIAT and CS Directors (or their representatives), the Dean should establish a forum in which researchers from Interactive Arts and Technology and Computing Science meet to discuss common research problems in order to foster greater collaboration. Where appropriate, internal funding should be made available to seed interesting collaborative projects.

7 Strategic Directions and Focus for the Undergraduate Programs

It will continue to be difficult for the School to devise and implement effective strategic plans under the current high levels of uncertainty and scope for miscommunication. In terms of strategic planning, one problem is the lack of easily accessible information about shifting student enrolments, such as the breakdown of students according to course and majors. As a result, determining important trends among the existing student population is limited, since current student information systems do not support the generation of the kind of reports that would assist the planning process within academic units.

7.1 Current Situation

Currently, the School offers several high quality programs in Computing Science. These are coherent and sound programs of study that bring considerable value to the students. During our visit it became abundantly evident that the majority of the faculty and support

staff considered the teaching programs to be an important endeavor of the School and that the undergraduate students were important stakeholders.

Most programs offered by the School are fairly traditional, with a strong technical computer science focus that is highly aligned with the expertise within the School. As a result the Computing Science programs represent a major strength and important capability for SFU.

The School has also developed several novel initiatives in a diverse array of emerging areas, such as computational biology and biochemistry, cognitive science, multimedia, information systems in business, geographic information science, and management and systems science. These also align with existing and growing research expertise. At this stage of the planning cycle, a more thorough evaluation of the potential and early success of these directions may be beneficial.

Although the Computer Science Accreditation Council is a national standards accreditation body in Canada, no computing programs at SFU are currently accredited. In fact, currently no university degree programs in British Columbia are accredited by CSAC. We note, however, that two joint programs with Business, the MIS Concentration with the Bachelor of Business Administration Major, and the Joint Major in Business and Computing Science, have been previously accredited.⁹ Thus the recommended in-depth review may perhaps be pursued in the context of seeking accreditation.

In terms of identifying weaknesses of the current programs, it became clear that more documentation concerning the objectives and outcomes of each program needs to be developed. When the School had a smaller course offering and fewer faculty members, maintaining consistency and coherence could be achieved informally. However with the recent faculty expansion and increased potential loss of knowledge built up over the years through faculty retirements and turnover, it is increasing important for the School to articulate its objectives with respect to undergraduate programs.

For example, we received several comments from various groups that course offerings in the systems area were weak in comparison with other areas. Such statements are based on many unstated assumptions and value judgments, which clearly illustrate that without stated objectives it is difficult to identify and subsequently address areas of weakness effectively in the undergraduate program. On the other hand, once weaknesses are identified, they can be prioritized and strategies can be developed to address the high priority weaknesses in teaching programs. (In the case of enhancing systems offerings in the undergraduate program, there remain several challenges, including the difficulty of attracting additional high quality faculty to teach in areas suffering global skill shortages.)

Recommendation 17: The School should consider applying to CSAC for accreditation.

This can be used both as a means to review and evaluate the Computing Science degree and the multi-disciplinary programs offered by the School against the School's strategic objectives, and as another recruiting tool in support of the claim that undergraduates are well-prepared to become software professionals.

⁹ See <http://www.cips.ca/standards/accreditation/isac/default.asp?load=accredited>

Recommendation 18: The School should articulate clear goals for each program at each campus, including target audiences and curricular objectives. These goals should be incorporated into recruiting and planning documents. In this way the School can ensure that potential student pathways will lead to the attainment of the academic objectives.

Recommendation 19: The School should improve quality assurance mechanisms within the School by considering the following additional measures: (i) develop explicit links between program/courses and objectives/outcomes, (ii) establish industry/external advisory panels where appropriate for key programs, and (iii) ensure that curriculum design reflects and achieves the educational objectives and outcomes by having the designers/maintainers of individual courses identify the objectives and outcomes to which they contribute.

7.2 Future Possibilities

It is expected that student numbers in Computing Science and related degree programs will increase over the next few years. What is less clear are the specific areas of growth. Early indications are that the core areas evident in the School's existing degree programs, such as software engineering, systems and architectures, and information systems, will continue to be of major significance in the new areas of growth. In addition, other areas such as enterprise systems, information system management, e-business, and web technologies could provide significant opportunity for growth; however the School does not currently have the requisite expertise or interest in many of these areas.

Clearly, no academic unit can cover the full range of potential and growing computing related topics, therefore it is important that, for the next phase of growth in student numbers, the School develop a set of stated objectives for its teaching programs together with strategies which will allow it to reach the stated objectives. The School has demonstrated its capacity to conduct strategic planning successfully, with its student recruitment in light of the DTO being just one example of its effective response to internal and external pressures and opportunities.

A Strengths, Weaknesses, Opportunity and Threats (SWOT) analysis will lead the School to develop a better understanding of global trends in undergraduate programs and also identify a comprehensive set of local issues which will have an impact on future teaching programs. This should include some emphasis on predicting the value and potential growth of the joint undergraduate program with Zhejiang University. Such an analysis will help develop effective plans and strategies. In addition, an analysis of competitor's offerings will assist the School in developing new markets and new teaching programs.

Burnaby Campus: The Burnaby campus already has a strong foundation upon which to build. The review of current programs and a strategic analysis will help identify appropriate areas to direct resources in the future and help develop effective strategies. In particular, new undergraduate programs could be developed to meet the needs of potential students and other stakeholders.

Surrey Campus: The establishment of a viable program at Surrey is critical to the School and to the Faculty. It has been decided by the central administration that this is to be done by developing distinctive programs in IT and coherent cross disciplinary studies

with other groups at the Surrey campus such as SIAT, Business, Mathematics, and Science. The Associate Director for CS@Surrey has recently proposed one such program, which is currently under consideration by the School. Such programs should be carefully crafted to meet the needs of the local community. A SWOT analysis will help develop appropriate strategies that will lead to the achievement of the School and university objectives.

Harbour Centre Campus: The School has the opportunity to develop distinctive programs in IT and coherent cross disciplinary studies with other groups at Harbour Centre. Some potential programs could be developed in the management of information technology, e-business, finance, marketing, management of human resources, international business, and law. The potential student base for the Harbour Centre is significantly different from that at Surrey and Burnaby, and as a result there would seem to be significant opportunity, particularly in the arena of a course-work masters program. Again, these programs should be carefully crafted to meet the needs of the local community, and developed to meet the needs of potential students and other stakeholders.

Recommendation 20: In order for the School to be well placed for the next growth phase in computing science, it should conduct a strategic analysis of its undergraduate and coursework-based graduate programs. It will be important for the School to ensure that its strengths are used effectively to pursue the opportunities that serve to attain its objectives most appropriately.

8 Miscellaneous

There remain a few observations and recommendations that do not fit easily within the previous sections. These are addressed here.

8.1 Inter-campus infrastructure

It was repeatedly mentioned that one impediment in fostering closer ties between the Burnaby and Surrey campuses was the length of time for students and faculty to travel between them. This may well also become a problem with the campus at Harbour Centre once Computing Science begins operations there.

Recommendation 21: If it has not yet done so, the University should investigate instituting a shuttle bus service between the campuses, preferably scheduled to match several class start and end times and avoiding times of maximal road congestion. If several runs are in place each day, class and meeting schedules should be arranged to take maximum advantage of the possibility of using the shuttle.

8.2 Allocation of teaching resources

Even though the faculty on the Burnaby campus is apparently sufficiently large to cover the teaching needs at the undergraduate and graduate levels, there was still a need to appoint 24 sessional instructors over the past three terms. It is always desirable to have some sessional instruction so as to take advantage of the particular expertise of visiting faculty members, to provide teaching experience for some of the senior doctoral students, and to cover some holes in the available expertise of regular faculty members in the

School. However, there has apparently been an annual shortfall in regular instructors to teach during the summer term, especially in the systems areas.

Recommendation 22: The School should investigate the possibility of offering faculty members the option to adopt an alternative lecturing schedule, such as teaching two courses every other term for two years (i.e., instead of the lecturing schedule following the traditional pattern of 2-1-0-2-1-0 or 1-2-0-1-2-0 for the fall, spring, and summer terms respectively, some instructors might prefer to follow a co-op-like pattern of 2-0-2-0-2-0 or 0-2-0-2-0-2). To encourage the temporary adoption of such alternative schedules, the School should ensure that faculty members are not locked into offering courses every (or even every other) summer term should they wish to change their patterns of teaching.

School of Computing Science

Simon Fraser University

Response to the Recommendations of the External Reviewers

September 20, 2006

The School of Computing Science greatly appreciates the hard work and the constructive and helpful recommendations of the External Reviewers, Professors Randy Goebel (University of Alberta), Frank Tompa (University of Waterloo), and Mary-Anne Williams (University of Technology, Sydney).

1 Introduction

The School is pleased with the recognition by the External Reviewers that Computing Science has attained "incredible success" in sustaining the CS major numbers at a time when most schools in North America and elsewhere have seen enrolments fall dramatically over the last three years. We believe that our success in terms of enrolments can be attributed to our exceptional recruiting efforts and the diversification of our faculty expertise and programs. This allows us to offer a wide range of courses that has proven to benefit both the undergraduate and graduate students. This has been confirmed by our enrolment numbers and in conversations with students, where it was noted by the reviewers that there was uniform praise regarding the perception of the quality of our programs.

The worldwide decrease in CS enrolments has been caused by the so-called "Dot-Com Crash" in 2000-2002, followed by the increased media attention on "outsourcing," both of which created a strong public perception that there was no hope for employment in the technology sector. However, as the External Reviewers also note, there is growing evidence that the demand for computer science graduates is steadily growing and already exceeds the demand of 1999. Therefore, we believe that the School needs to be well prepared for the generally expected increase in CS enrolments in the near future.

The reviewers acknowledge that, with the influx of new faculty members, we have significantly enhanced the teaching and research capabilities of the School, reinforced several areas of existing strength, and created several new areas of expertise in emerging areas of growing global

interest. Coupled with this growth it was noted that the overall funding from NSERC Discovery Grants is very good in comparison to other Canadian Computer Science departments, which demonstrates the high quality of our research programs and level of commitment of our faculty members and students.

The External Review was guided by the following focus questions:

- a) "Evaluate the "Double the Opportunities" enrolments in undergraduate and graduate Computing Science programs and provide advice on ways of increasing these numbers in the foreseeable future;
- b) Provide advice on ways of securing sustainable financial support for graduate students at a level that is competitive with other Computer Science departments at major Canadian universities;
- c) Suggest opportunities for increasing external research funding through major research grants for strategic research projects, specifically in interdisciplinary research and priority areas as outlined in SFU's Strategic Research Plan;
- d) Suggest alternative academic structure(s) that, in the context of a restructuring of the Faculties of the university, make the most sense with respect to the needs and interests of the School of Computing Science;
- e) Suggest possible strategic directions and focus for the undergraduate program, in light of current strengths and weaknesses, and in light of changes in the academic discipline."

The remainder of this document contains our responses to the individual recommendations, structured based on the chapter headings used in the External Review Report. The five recommendations considered to be most important by the reviewers are highlighted in the text in bold font.

2 Working Environment

As the External Reviewers acknowledge, the general mood in the School is positive despite the potentially disruptive impact of office relocations, new programs, new campuses, new faculty members, and proposals for new Faculty structures. However, the explosive growth and dynamics of the School has created considerable challenges in managing the change at all levels of the School.

Recommendation 1:

The Dean, the Director of the School, and the Associate Director for CS@Surrey should ensure that communications, consultation, and feedback channels among all interested parties (and especially among these three individuals) are well-established so that they can build a shared understanding of priorities, opportunities, concerns, and financial realities.

In response to the recommendation by the External Reviewers, various possibilities for more direct and more frequent communication have been considered and partly already been implemented. As a direct result of this initiative and the good will on all three sides, the situation

has notably improved over the last few months. CS will continue to work toward improving communication within the School's Executive and also between the Director of the School and the Dean.

Recommendation 2:

The School should strive to improve communication, consultation, and feedback channels among all faculty members, staff, and administrators within the School.

The School is now in the process of revising existing communication structures and practices for consultation and feedback among faculty members, staff, and administrators, aiming at more efficient and effective solutions. In particular, we are currently reviewing the School's Constitution and the School Council and Executive meeting structures. This will be the first step to improve communication, at all levels, between staff and faculty members located at the two CS campuses in Surrey and Burnaby.

Recommendation 3:

The School should introduce a mentoring program to help integrate new faculty members into the School activities and to help them develop an understanding of the School objectives, expectations, and how to access support and potential opportunities. This is particularly vital at Surrey, where the infrastructure is much less well established.

The School will in fact introduce a formal mentoring program. Each new faculty member will be matched with a senior faculty member, if possible from their research cluster. One senior faculty member will be assigned to oversee the mentoring program. As an additional resource (not only, but also) for new faculty members, wikis have and will continue to be developed to assist new and current faculty in various ways, such as the teaching wiki that we currently have in place.

Recommendation 4:

The School should reassess its current policies for allocating teaching opportunities and responsibilities in order to ensure that an appropriate palette of courses is offered each term. This should include a re-examination of the factors that motivate professors to offer 800-level courses in preference to 700-level ones.

Members of the Undergraduate Program Committee (UPC) and Graduate Program Committee (GPC) are currently examining all course offerings, enrollments, and redundancies in our schedule in order to ensure that an appropriate variety of courses is offered every term. In particular, we want to offer more courses in the summer and more 700 level courses on a regular basis. For summer course offerings we are considering a new rotation scheme.

Recommendation 5:

The School should develop meaningful ways to encourage and recognize the scholarly contributions of lecturers and senior lecturers.

Lecturers are currently provided a non-teaching semester every third year which can be used for research. However, it is not presently a requirement of the position and is of less significance in the periodic evaluation of performance than teaching history and administrative service. The

School, as per Recommendation 22, will be examining creative ways to allocate teaching to better meet the needs of both faculty and the School.

3 Double the Opportunity Enrolments

Recommendation 6:

All graduate students should participate in TA training, which should attempt to prepare non-native speakers of English and students with diverse undergraduate backgrounds to serve as effective TAs.

The School will be enhancing and expanding its orientation program for all new graduate students. The School currently encourages graduate students who wish to be sessional instructors to complete introductory teaching programs offered by the Learning and Instructional Development Centre and provides financial assistance for them to do so. The School is also developing resources that provide guidance to graduate students in becoming effective teaching assistants. The first of these resources will be introduced over the next year, beginning this fall. In the format of the re-designed 891 course, which is mandatory for new graduate students, we will have a component that specifically addresses training for TAs and a separate component for testing and improving language skills.

Recommendation 7:

The effective recruiting methods for Burnaby should be expanded and adapted to encompass candidates for the Surrey campus. CS recruiters should work closely with recruiters for TechOne and Science Year One to present a harmonized, attractive package.

As acknowledged in the review, we have established effective recruiting methods. We are proactive in our recruitment efforts, and each year we explore and determine where we may expand our outreach and recruitment activities. These efforts include ways to attract more prospective students south of the Fraser River. We are also actively pursuing more effective ways in which to collaborate with SFU Recruitment and SFU Surrey Recruitment.

Recommendation 8:

Care must be taken that the graduate students in Surrey continue to receive a worthwhile graduate experience, including adequate access to lab facilities, exposure to academic visitors (through seminars and small meetings), and broad exposure to the faculty and other graduate students at SFU.

We plan to take various measures to ensure that graduate students in Surrey receive a worthwhile graduate experience. The Surrey research labs will be integrated into the existing research clusters, which will strengthen interactions with faculty members, other graduate students, and visiting researchers. The School will operate a research seminar series at the Surrey campus in conjunction with its proposed Centre for Open Source Technology and Applications Research. At least once each semester, the School will bring all graduate students to the Surrey campus for a CMPT 891 research seminar.

In order to improve the access to seminars in Burnaby, we will be asking the University to provide extra funding for the installation of an advanced video-conferencing system and access grid nodes in our seminar rooms in both Burnaby and Surrey. This technical infrastructure is also indispensable to support administrative meetings across the two campuses.

Recommendation 9:

The School, Faculty, and University together should articulate goals for a healthy balance of relative complement sizes for faculty, staff, graduate students, and undergraduate students. It is expected that actual numbers will fluctuate over time and that changes to opportunities and priorities will require new goals to be set. Thus the numbers should be re-examined periodically, perhaps as part of the School's three-year planning exercises.

The School will work together with the Faculty and the University to define goals for the relative numbers of faculty, staff, graduate, and undergraduate students. In order to meet the University's goal of establishing strong Computing Science programs and presence in Surrey, we will require funding for new tenure-track faculty positions as follows: 2 faculty members in 2007, 2 faculty members in 2008 and 1 faculty member in 2009.

4 Funding of Graduate Students

Recommendation 10:

Although there is benefit in learning how to apply for funding support while being a graduate student, care should be taken that this activity does not dominate the graduate students' educational experience nor detract from their research endeavours.

The GPC has been developing a document that clearly spells out the expectations that the School has of its new, incoming students. Furthermore, a wiki has been developed that clearly lays out some of the expectations and responsibilities of both students and supervisors. The issue of grant writing is one of the many issues that has been covered in these documents.

5 Increasing External Research Funding

Recommendation 11:

The School, potentially together with other units within the University, should investigate how to re-institute the industrial outreach and matchmaking role formerly provided by the School's Centre for Systems Science.

The School is currently developing an Industry Relations Centre as part of its Three Year Plan to explore industry relations at several levels, including the promotion of research collaborations as well as provision of technical support for its graduate and undergraduate students. In addition, a new Centre for Open Source Technology and Applications Research, located at the Surrey

campus, will specialize in industrial technology transfer in accordance with open source business models.

Both centres will be led by faculty members with industry ties together with the Manager, Academic and Financial Planning who will develop and implement the market strategy and oversee the start-up. Initially, our current staff will provide administrative support for the operations of the centres, but we foresee that by September 2007 a dedicated infrastructure will be required, as the management of the centres becomes a fulltime activity. We will be looking to the Vice-President Academic and the Faculty Dean to provide funding to hire the necessary staff to run both centres.

Recommendation 12:

The University/Industry Liaison Office should re-examine its procedures with a view to streamline negotiations on industry funding (e.g., by working with representatives of the IT industry to simplify intellectual property and overhead agreements).

It is expected that the new Industry Relations Centre (see Recommendation 11) will coordinate its activities with the University/Industry Liaison Office and that this relationship will be mutually beneficial and streamline negotiations on industry funding.

Recommendation 13:

The School should consider ways to enhance its research clusters so that they function even more effectively as meaningful units, and it should explore the creation of a School based research centre that could provide the clusters leverage their common strengths to seek funding opportunities.

The School will explore innovative ways to strengthen its research clusters. As a first step, the CS@Surrey research labs will also be assigned to clusters and meaningful names will be developed to replace the current cluster numbers. The clusters will organize joint seminars in order to stimulate collaborative research projects. The technical support for the clusters will be improved by designating a specific Computing Science Technical Support (CSTS) staff member to each cluster as a liaison person. A School-based Research Centre will be established to support the research clusters in leveraging their common strengths, especially for seeking external research funding. For this purpose, the Research Centre is intended to have its own grant facilitator to proactively assist the research clusters and faculty members of the School with large interdisciplinary grant proposals.

The External Reviewers state that even though MITACS provides matchmaking support for specific areas related to industrial mathematics, efforts to extend this form of outreach activity to other areas within CS would likely pay dividends. Considering that the School already now brings in \$2,000,000 of external research funding per year and is planning to significantly increase such funding, we will be asking the University for extra funding to hire a grant facilitator exclusively for Computing Science.

Recommendation 14:

The School should devise strategies to improve the collaborative working environment so that it encourages senior faculty to seek external funding and to work with junior faculty to assist them to seek funding.

The planned new mentoring program (see Recommendation 3) will take place within the clusters. This will build relationships and encourage senior faculty members to seek external funding together with junior faculty members. Another improvement of the collaborative working environment will result from the cluster-wide research seminars and further activities coordinated by the new Research Centre.

6 Alternative Academic Structure(s)

Recommendation 15:

The School should articulate one or more potential alternative Faculty structures, which can be assessed for feasibility, costs, and benefits.

The School is currently preparing a document critically analyzing potential alternative Faculty structures for Computing Science. This document will be used as input to the SFU Faculty Restructuring Initiative, should the current faculty structure be reconsidered.

Recommendation 16:

In collaboration with the SIAT and CS Directors (or their representatives), the Dean should establish a forum in which researchers from Interactive Arts and Technology and Computing Science meet to discuss common research problems in order to foster greater collaboration. Where appropriate, internal funding should be made available to seed interesting collaborative projects.

The School would welcome the establishment of a forum within FAS where researchers from CS and SIAT (and possibly also from other schools) discuss common research topics and explore opportunities for collaborative projects.

7 Strategic Directions and Focus for the Undergraduate Programs

Recommendation 17:

The School should consider applying to CSAC for accreditation. This can be used both as a means to review and evaluate the Computing Science degree and the multi-disciplinary programs offered by the School against the School's strategic objectives, and as another recruiting tool in support of the claim that undergraduates are well-prepared to become software professionals.

The School will consider CSAC (Canadian Information Processing Society) accreditation of our programs. A member of the UPC will look into CSAC accreditation this year. In particular, we

want to know how far our current programs are from meeting their criteria. Knowing this, we would be in a better position to make a strategic decision on seeking accreditation.

Recommendation 18:

The School should articulate clear goals for each program at each campus, including target audiences and curricular objectives. These goals should be incorporated into recruiting and planning documents. In this way the School can ensure that potential student pathways will lead to the attainment of the academic objectives.

The School will develop clear goals for each of the existing and future new programs, including target audiences and program objectives. This applies especially also to the new Computing Science Major program to be offered at SFU Surrey and the program for post-baccalaureate students to be offered at SFU Vancouver. Learning objectives, including academic and career outcomes and life learning options, will be identified for each academic pathway. Once identified, they will be included in our program promotional material to clearly and distinctly specify to prospective students what each route offers. The program goals will also direct the ongoing re-design of our programs in order to make sure that they serve the changing needs of their audiences.

Recommendation 19:

The School should improve quality assurance mechanisms within the School by considering the following additional measures: (i) develop explicit links between program/courses and objectives/outcomes, (ii) establish industry/external advisory panels where appropriate for key programs, and (iii) ensure that curriculum design reflects and achieves the educational objectives and outcomes by having the designers/maintainers of individual courses identify the objectives and outcomes to which they contribute.

We have begun preliminary work on a template for writing course objectives/outcomes. The UPC will start with the lower division and create universal outlines for our courses (at a learning outcomes level, not specifying administrative details). Once these exist, we can sensibly tackle (i) and (iii) from this recommendation. The planned Industry Relation Centre (see Recommendation 11) will also be used to meet part (ii) of this recommendation, i.e. forming an industry advisory panel.

Recommendation 20:

In order for the School to be well placed for the next growth phase in computing science, it should conduct a strategic analysis of its undergraduate and coursework-based graduate programs. It will be important for the School to ensure that its strengths are used effectively to pursue the opportunities that serve to attain its objectives most appropriately.

A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis will be conducted by the UPC and GPC in order to assist our academic planning for each campus and to ensure we are well positioned to meet the needs of our potential students and to recommend areas upon which we can improve.

8 Miscellaneous

Recommendation 21:

If it has not yet done so, the University should investigate instituting a shuttle bus service between the campuses, preferably scheduled to match several class start and end times and avoiding times of maximal road congestion. If several runs are in place each day, class and meeting schedules should be arranged to take maximum advantage of the possibility of using the shuttle.

The School strongly supports the recommendation of establishing a shuttle service between the Burnaby and Surrey campuses. Such a shuttle service would not only greatly strengthen collaborations in research, teaching, and administration across the two campuses but it would allow for an easier and less expensive commute for both undergraduate and graduate students, thus helping to integrate the two campuses.

Recommendation 22:

The School should investigate the possibility of offering faculty members the option to adopt an alternative lecturing schedule, such as teaching two courses every other term for two years (i.e., instead of the lecturing schedule following the traditional pattern of 2-1-0-2-1-0 or 1-2-0-1-2-0 for the fall, spring, and summer terms respectively, some instructors might prefer to follow a co-op-like pattern of 2-0-2-0-2-0 or 0-2-0-2-0-2). To encourage the temporary adoption of such alternative schedules, the School should ensure that faculty members are not locked into offering courses every (or even every other) summer term should they wish to change their patterns of teaching.

The School will be exploring innovative ways to combine faculty research activities with teaching commitments in a way that allows the School to distribute the teaching of its continuing faculty more equally over all semesters. However the goal will be not only to improve the School's ability to have continuing faculty teach in all semesters, but to provide more opportunities for non-teaching semesters when research may be more readily conducted.

M E M O R A N D U M
SIMON FRASER UNIVERSITY
FACULTY OF APPLIED SCIENCES

DATE: December 1, 2006

TO: Bill Krane, Associate Vice-President Academic

FROM: Brian Lewis, Dean, Faculty of Applied Sciences

RE: External Review – School of Computing Science

This was a thorough and capable review. I agree with most of the recommendations and note that considerable progress has been made in response to them, as described by the School in its document.

I note specifically that in response to the recommendations:

- a mentoring program for new faculty will be implemented;
- the course schedule is being optimized for undergraduate students;
- a high quality experience in the new graduate program at Surrey is a priority for the School;
- increased interest in industrial outreach will be facilitated through structures and centres in the School;
- there will be efforts to strengthen research links and clusters within the School;
- CSAC accreditation is being explored;
- the goals, outcomes and pathways open to students in CS will be more clearly articulated in documents;
- that a SWOT analysis will be conducted by undergraduate and graduate committees to guide program development.

In addition to these positive steps I note the following general considerations, which merit further reflection.

- The reviewers note that Computing Science has been successful in maintaining student enrollment in the face of precipitous drops elsewhere in North America. I agree. Nevertheless, funding has been flowed to the School and space has been allocated in anticipation of far greater numbers. CS must continue to work extraordinarily hard to recruit, and to provide programs which will be attractive to diverse groups of students. Will targets be reached, or were they too ambitious? This question remains open, and it is linked to the question of resources.

- As CS has grown dramatically, communication and governance challenges—both internal and external—have grown with it, as noted by the review. Further there has been a dramatic increase in research faculty in diverse areas, and the research and teaching interests of the expanding faculty are evolving. The current University initiative looking at structures and possible faculty restructuring provides an opportunity for CS to consider its own structure, assessing it against its rapid expansion, new administrative challenges, the research interests of the faculty, changes in the academic discipline, and new opportunities.

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cc: U. Glaesser, Director, School of Computing Science