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MEMORANDUM

ATTENTION	Senate	**DATE**	December 11, 2013
FROM	Jon Driver, Vice-President, Academic and Provost, and Chair, SCUP	**PAGES**	1/1
RE:	Faculty of Applied Sciences: External Review of the School of Computing Science (SCUP 13-68)		

At its December 4, 2013 meeting, SCUP reviewed and approved the Action Plan for the School of Computing Science that resulted from its External Review.

Motion:

That Senate approve the Action Plan for the School of Computing Science that resulted from its External Review.

c: M. Ester
    N. Rajapakse

SIMON FRASER UNIVERSITY   ENGAGING THE WORLD

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MEMORANDUM

ATTENTION	Jon Driver, Chair, SCUP	**DATE**	November 26, 2013
FROM	Gord Myers, Associate Vice President, Academic and Associate Provost	**PAGES**	1/1
RE:	Faculty of Applied Sciences: External Review of the School of Computing Science		

Attached are the External Review Report and the Action Plan for the School of Computing Science.

Excerpt from the External Review Report:
"SCS is a strong department, with several excellent faculty engaged in important high-impact research across many areas of computer science. The School's reputation is growing and it has achieved international recognition in several domains for its research prowess."

<u>Motion:</u>

> **That SCUP approve and recommend to Senate the Action Plan for the School of Computing Science that resulted from its external review.**

Following the site visit, the Report of the External Review Team* for the School of Computing Science was submitted in July 2013. The Reviewers made a number of recommendations based on the Terms of Reference that were provided to them. Subsequently, a meeting was held with the Dean, Faculty of Applied Sciences, the Director of the School of Computing Science and the Director, Academic Planning and Budgeting (VPA) to consider the recommendations. An Action Plan was prepared taking into consideration the discussion at the meeting and the External Review Report. The Action Plan has been endorsed by the School and the Dean.

SCUP recommends to Senate that the School of Computing Science be advised to pursue the Action Plan.

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*External Review Team:
Gregory Dudek, School of Computer Science, McGill University (Chair, Review Team)
Maria Gini, Computer Science and Engineering, University of Minnesota
Suzanne Stevenson, Department of Computer Science, University of Toronto
Paul Ho (internal), Simon Fraser University

Attachments:
1.   External Review Report (July 2013)
2.   School of Computing Science Action Plan

cc   Nimal Rajapakse, Dean, Faculty of Applied Sciences
       Martin Ester, Director, School of Computing Science

Simon Fraser University
School of Computing Science
External Examiner's Report

Gregory Dudek, Maria Gini, and Suzanne Stevenson

with input from Professor Paul Ho and many others

July 2013

Executive Summary

Preamble

This report was produced by the external assessment committee after detailed inspection of documentation regarding courses, funding, teaching and other activities at the SFU School of Computing Science (SCS) and interviews with selected faculty, staff, university administrators and students.

Findings

1. Options for research and graduate programs at the Surrey campus in (a) a no-growth scenario and (b) an opportunity to expand CS enrollments if expansion of the Surrey campus is funded.

   Our finding is that a no growth option for Surrey campus would be highly problematic leading to expected problems with retention of faculty, maintenance of a competitive academic program, and additional challenges. At the very least computer science at the Surrey campus needs attention and renewal to meet the standards and objectives expected from the unit, and thus our discussion below focuses on options for growth.

   To expand the current Software Systems program from 150 to 250 students would take 5 or 6 faculty lines, so by driving the growth in a strategic way there is an opportunity to innovate in teaching and also create new research opportunities.

   Within the various growth options available, there are several variations. These include the development of new programs, but could also include the renewal or expansion of existing programs. We identified three distinct growth scenarios based on faculty and staff capabilities and expectations, and outline them below. More details are given later in Section 6.

   (a) The first scenario was to place emphasis on undergraduate teaching only at the Surrey campus, and use it as an incubator and show piece for innovative teaching methods. The quality of undergraduate teaching at the Surrey campus is generally quite high, although it is targeted to less research-oriented content. The pedagogical experience at Surrey has a good reputation among undergraduate students in Burnaby, for those subjects that are addressed there, and this could be expanded and exploited. Within this scenario we propose several options for the areas the program could focus on (see details later under CS@Surrey).

   (b) The second scenario is to strengthen the Mechatronics program by adding a stronger software component, focused on embedded systems, real time systems, and related themes from core computer science topics. This option would provide an opportunity to use existing CS courses and faculty tailoring them to the Mechatronics students.

   (c) The third scenario is more radical, and calls for the development of a health informatics program at Surrey campus. This could be addressed developing a two-track program that includes a computer science track and a health track within one truly interdisciplinary program. We believe that this could be effective in bringing students from the two programs together to develop skills and appreciation for each stream, while still providing strong expertise in one or the other. The CS track would use some of the Software Systems courses, given importance of software in health informatics, but will require adding CS courses in the area of data bases, data analytics, and privacy.

2. Should the School develop courses for non-majors and non-minors, in order to provide computer science skills to a broader segment of the SFU undergraduate community?

The department has suggested a "Computational thinking" course for any/all SFU students, which is an excellent idea. Computational thinking is an approach to logical design and implementation of solutions to the kinds of complex problems facing society today, often requiring large-scale data and scalability involving IT systems. This kind of course fits SFU's focus on experiential learning and applications to industry, and moreover may help attract women into computing science. – (Such an approach has been shown to have a positive impact on female student numbers in various places across North America). However, a broad course like this is discouraged by having funds follow student enrollments, which inevitably leads to departments not wanting students to take courses from other departments.

The burden of responsibility must fall on the upper level administration at SFU to clarify expectations regarding well-rounded education, and to support inter-departmental arrangements/relationships that will encourage access to courses across departments. Student access to high quality education across the institution – in the form of broad courses such as this suggested one – should not be so constrained by internal budgeting.

We suggest the department design an appealing course, and gradually build up numbers, while in the meantime addressing the funding issue with the Dean and other academic administrators.

3. Analyze the School's teaching load policies and practice. In particular, a review of class sizes, and balancing of research, teaching, and service workload should be commented on.

Total teaching loads are appropriate with 3 courses as a "default" load for research faculty, and with variances under various special circumstances. One element of the policy that is the most controversial is the tradeoff of classroom teaching against graduate supervision, but given the student loads that need to be served and the standards at other institutions, this did not seem inappropriate. The department also needs to ensure that the lecturers are appropriately supported, given that they bear a large part of the burden of the large classes and TA management accompanying recent enrollment growth.

There is an absence of mechanisms to encourage faculty to take on undergraduate research projects, particularly in the summer. The NSERC USRA program is one element that could be better used to encourage undergraduate engagement, and the eventual pursuit of graduate research, but the program needs to be taken up with greater enthusiasm by the faculty.

4. Assess the School's strategic hiring plan, and provide advice on retaining high quality faculty, future hiring decisions, and School's policies related to tenure and promotion.

Renewal and growth are critical issues, and they will have side effects on retention of top faculty as well. A strategic vision for hiring at Burnaby campus should be developed, even if current funding only allows for retention since it will have an impact of the ability to seize future opportunities. Further growth of the faculty would help retention and allow the school to better address new emerging areas in the field. With respect to inter-disciplinary impact, there would be advantages in hires that connect deeply to other areas (which is a growing aspect of the field of computer science).

The School would benefit from guidelines to consistently and more comprehensively assess teaching at major review points (such as tenure, promotion, etc.). Such an assessment would

benefit from a wider range of criteria than teaching evaluations, and could include peer assessment in the classroom, supporting material in the teaching portfolio (including a teaching statement), and consideration and evaluation of the engagement of undergraduates in research.

5. Review the research environment (including technical and grant administration support) of the school and comment on strengths and weaknesses; NSERC performance and total research funding; and opportunities for major research endeavours involving interdisciplinary collaboration.

Research funding levels are quite good across many aspects of the School's activities, given the constraints and limitations of the Canadian research funding system.

6. Review the School's interaction with industry, assess potential for specialized professional programs for industry and comment on the School's strategies and opportunities to strengthen collaboration with industry and external community.

Industrial interaction is good. Activities were biased towards smaller companies and smaller programs, but this is typical in computer science and as the relationships mature this bias may self-correct somewhat.

The department requires support for fundraising and development from the Faculty and upper level administration, especially advancement professionals to help them leverage good industrial relations.

The review team was impressed with the plans for a graduate coop program as an addition to existing activities. This would be potentially valuable for students generally, and could have the potential to help with recruitment of domestic students. It would also be very beneficial to the department in forming valuable connections to industry. We suggest funding it on a pilot basis (perhaps 2 years) for hiring a coop coordinator and to see if the program can achieve the target number of students needed to fund that position. If the program can become established and have a stable student base in 2 to 3 years, this could be a substantial benefit for the department and the students. Furthermore, engaged students are more likely to become engaged alumni.

An alumni mentoring program can provide additional highly-relevant mentoring and career opportunities, and can help establish important connections for the students and the department to local industry.

7. Evaluate the quality of the graduate programs from the perspective of student experience, enrollments, completion times/rates, specialization areas, and financial support. How could the graduate student educational experience be enhanced?

The graduate program is very good and both students and faculty seem highly satisfied with most aspects. Financial support levels are adequate but not overly-generous, and students have some concerns. Time to completion is an issue and it needs to be tracked carefully. Having three different types of MSc programs is not justified; the structure of all three MSc programs should be reviewed and an appropriate pair of funded and non-funded programs put in place.

Student experience could be enhanced by more departmental activities and connections among research groups within and outside the department. We suggest that the department leadership brainstorm with interested students on how to address this need. Inter- and multi-disciplinary work is becoming more and more a central part of computer science research, as is the need

to demonstrate the connections between theory and applications. Creating an environment that encourages cross-cutting work will require the interest and commitment of both faculty and students. The introduction of the grad coop program (noted in item 6 above) will also contribute greatly to the student experience by forging links to industry and giving students the opportunity to directly experience and contribute to the applications of their developing knowledge to current problems.

1 Introduction

The external reviewers, both separately and in conjunction with the entire Cyclical Review Committee, met with members of the School of Computing Science (SCS) and senior administrators over a period of three days March 20-22, 2013. The meetings and activities of the review committee encompassed meetings with the Director of the School, staff, faculty, student representatives and included meetings at both the Burnaby and Surrey campuses.

SCS is a strong department, with several excellent faculty engaged in important high-impact research across many areas of computer science. The School's reputation is growing and it has achieved international recognition in several domains for its research prowess. While it is difficult to provide a definitive ranking of the School, we estimate it to be in the middle of the top ten Computer Science units in Canada.

Faculty morale seems to be generally very good with many energetic faculty members who are engaged in both research and departmental affairs, although there are widespread concerns with faculty renewal.

The unit currently has strong leadership as embodied in both the Director, who has an impressive level of support and has done well at leading the School, as well as an ensemble of effective supporting faculty. Several young faculty members play critical roles in terms of both research and administration, which is laudable, but also places great demands upon them.

2 Undergraduate Programs

Note: This section focuses on the Burnaby campus undergraduate program and issues, since there is a separate section (Section 6) on the Surrey campus. Teaching and program issues that intersect across the two campuses are covered here.

2.1 Overview

SCS has a very good undergraduate (UG) program with excellent facilities and good TA support. Some issues that need attention are the quality of advising provided to students, and communication between the department and student leaders. Below we elaborate some recommendations in these and other areas concerning UG curriculum and environment.

In addition, the review team was informed that there is no room for growth in UG enrollments at Burnaby generally, and that it would be unlikely for UG enrollments to be reallocated from other divisions to allow for increased capacity on that campus in SCS. This seems somewhat shortsighted, and contrary to the best interest of Canada – CS enrollments are skyrocketing across North America due to labour market needs in IT, and the SCS-Burnaby program currently requires an 88% average for admission, preventing many excellent students from studying CS at SFU. The university would be well-served by finding a way to permit growth in this strategic area. In addition, the university may need to intensify advocacy to ensure that the province will recognize that educating students in CS and Engineering requires relatively higher grant and tuition funding.

2.2 Undergraduate Environment

The review team witnessed a noteworthy level of community and camaraderie among the undergraduate students when we visited the labs and the student society lounge. The facilities are

excellent, as they should be at an institution that prides itself on experiential learning. The practice is to ensure equipment is no older than 4 years, and the goal is replacement after 3 years, which is laudable and appropriate. Labs were busy, with students actively working together and engaged, and exhibiting a very good atmosphere.

While some schools are moving towards a model focused on laptops (or other forms of student-owned computing) in lieu of more traditional computer labs (to save both space and equipment costs), SCS prefers labs so that students use compatible software and environments, and have backups of their work. This is an impressive achievement since it has clear advantages in terms of collaboration and morale. Since the labs appear well-used and seem to be a locus of community interaction, this seems to be an appropriate approach, but it is different from the ongoing trend being observed across the continent.

Despite the excellent facilities and sense of a positive environment, some students expressed concern that research faculty are not sufficiently engaged and interested in their undergraduate teaching – a sentiment that may not be widely held, but one that should be noted. On the other hand, some faculty noted that undergraduate satisfaction appears to have decreased in recent years, and course evaluations have declined. Many factors may be at play including demographic shifts, increasing workloads, and the demands imposed by a vibrant and growing research program which clearly requires human capital. There is a perception that international students are not as well integrated as would be desirable. In addition, it was noted that the department could do more with advancement and connections to industry, which can start with building more community among students, which will lead to a solid alumni base.

Importantly, both Burnaby and Surrey campuses expressed that student advising capacity and quality had diminished since advising functions were brought up to the Faculty level. And indeed, this practice seems contrary to the accepted wisdom, which is that advising functions are most effective when kept closer to the day-to-day program experience of the students, so that it is more knowledgeable and more nimble.

Recommendations and suggestions on the undergraduate environment

1. The department needs to work on establishing better relations with the student leadership. Closer interaction between the department leadership and the student society executives or representatives would help communications and might also lead to mechanisms that would allow the student society to better engage the entire student body. This might even include annual or biannual town hall, inviting all students, to gather input on the undergraduate environment. An action plan developed jointly between the department and student leadership could help to increase a sense of shared community and responsibility for improvement, and reassure students that the department is attending to their concerns.

2. It is not ideal that the undergraduate student computer labs and lounge are separated from faculty, graduate students, and research labs, which can reinforce a sense of lack of engagement between the research faculty and undergraduate students. Although bringing these functions physically closer together is not currently practical, SCS should look to this as a long-term goal, and in the meantime consider means for allaying the negative effects of this physical separation.

3. The decreased advising capacity must be addressed to maintain the quality and competitiveness of the program. The Faculty should consider reinstituting advising functions at the depart-

ment/program levels. Additionally, using Lecturers more effectively for advising and mentorship could help, but that would have to be taken into consideration in their teaching load.

4. All of the above activities that are focused on improving the student environment should also be considered in the context of the lifecycle from student to alumni. Engaged students are more likely to become engaged alumni. An alumni mentoring program can provide additional highly-relevant advising, and can help establish important connections for the students and the department to local industry.

2.3 Undergraduate Curriculum

The department is pursuing a model of an undergraduate program with a fairly prescribed year 1 and 2, very little required in year 3, and all optional electives in year 4. This is a very good approach that ensures a solid foundation in the early years with much room for exploration in the upper years. There is a commitment to reviewing and revising curriculum, which we have some suggestions on below.

The review team was told that the Faculty is happy with the joint programs that SCS has with other units across SFU, and that there are opportunities for tying curriculum to other areas with high employment or research interests – e.g., the business school and the natural resources sector. We encourage this, given the growing importance of computer science across virtually all economic and societal sectors.

It should be noted that although students like the flexible curriculum and trimestering offered at SFU, this necessarily poses a challenge (and a cost) to the department in having to staff courses year-round. It also means that it is more difficult to build community among the UGs, when there is not a clear cohort moving through the program together.

Recommendations and suggestions on undergraduate education

1. Recommendations on undergraduate curriculum renewal:

   (a) Having a wide choice of elective courses in upper years is good, but can often be enhanced by providing guidance to students on appropriate selections to form a coherent set of courses. Bundling courses into "threads" (GATech) or "concentrations" (UToronto) can provide this guidance, build a cohort of students taking similar pathways, and allow subspecialties to be acknowledged on a transcript.

   (b) Course syllabi and materials should be reviewed and updated, and a commitment made to do so on an ongoing basis. – Students noted that a number of 3rd and 4th year courses are not teaching up-to-date material, and some faculty noted that some courses are not up to date.

   (c) Whatever happens with the future of the Software Systems program at Surrey, SCS needs to sort out the future of the SE program at Burnaby, which was noted to need renewal of course and program content.

   (d) The review team agrees with stated intention to institute mandatory labs in 1st year courses. Some faculty expressed interest in reducing lecture hours and increasing lab hours, and we encourage such exploration: experience with inverted classrooms and more

activity-based learning elsewhere has shown a positive impact on student retention and instructor enthusiasm.

   (e) SCS should consider changes in introductory courses and elsewhere that have been shown to attract and retain female students more effectively. See more on the issue of women students in Section 3.5.

2. The department could benefit even more from its very good cohort of Lecturers by encouraging and supporting them to play a key role in trying out new pedagogies, forging community with the undergraduate students, etc. Some adjustment in teaching load may need to be considered, along the lines of the proposed teaching relief for graduate student supervision.

3. Research faculty should be encouraged to engage in undergraduate research supervisions (through some kind of support or incentive structure). This is important for maintaining SCS's distinctiveness in "hands on" learning, but also could serve as an important pipeline for domestic graduate students. The department should take advantage of the university's commitment to fund more research opportunities for UGs. Supervisors could assign graduate student mentors both to alleviate the perceived burden on faculty and to provide professional development for the graduate students.

4. We suggest more cross-listing of graduate/undergraduate courses. Faculty said that they can do this for graduate lecture courses but not seminars. However, in our experience, even the latter can be successful if either the number of undergraduate spots is limited and/or only UGs with a certain GPA or other qualification are admitted. This would be a straightforward way to give UGs more exposure to current/research topics, and may encourage excellent students to stay on for further graduate study or help place them in competitive graduate programs elsewhere. SCS might also consider a combined 5-year BSc/MSc, which could attract good domestic students into their graduate programs.

5. The department has suggested a "Computational thinking" course for any/all SFU students, which is an excellent idea. This kind of course fits SFU's focus on experiential learning and applications to industry, and moreover may help attract women into computing science. –(Such an approach has been shown to have a positive impact on female student numbers in various places across North America.) However, a broad course like this is discouraged by having funds follow student enrollments, which inevitably leads to departments not wanting students to take courses from other departments.

   (a) The burden of responsibility must fall on the upper level administration to clarify expectations regarding well-rounded education, and to support inter-departmental arrangements/relationships that will encourage access to courses across departments. Student access to high quality education across the institution – in the form of broad courses such as this suggested one – should not be so constrained by internal budgeting.

   (b) We suggest the department design an appealing course, and gradually build up numbers, while in the meantime addressing the funding issue with the Dean and other academic administrators.

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2.4 SFU-Zhejiang Dual-Degree Program (DDP)

The DDP program appears to be viewed very favorably by the SFU administration, the BC government, and partners in China. Moreover, the Zhejiang students it brings to SFU are excellent. Although an expensive program (due to the resource-intensive training of the Canadian students), it is worth it for the visibility, goodwill and the benefits of the partnership. (There are even benefits to non-DDP students at SFU, as the Mandarin instructor teaches non-DDP students as well as DDP students.) However, the program doesn't attract many Canadian students. It seems this is partly due to the time commitment, and partly due to the students receiving lower grades at Zhejiang than at SFU, given cultural issues.

Recommendations and suggestions regarding DDP

1. There is a sense that Canadian students have such good job opportunities that they don't need to make the extra effort and time commitment to participate in the DDP. The department should consider other models that may make it more appealing, such as less time spent at Zhejiang, different timing of residence there, links to Chinese industry/research, etc. Establishing links to jobs/research at SFU or in the region might be very attractive: for example, guaranteeing students an internship with a local industrial or government partner that would value the training in China, or participation in some research at SFU that has links to Chinese partners. It might help to survey students to find out what might make this more appealing.

2. The department needs to address the issue that Canadian students going to Zhejiang may hurt their GPA due to different grading standards. Perhaps the material covered in Zhejiang courses could be examined and calibrated to better fit the expectations at SFU. One option is to have faculty at SFU assign the grades for the courses taken at Zhejiang. (At University of Toronto, there are cases where faculty within one division assign the grades for courses their students take in another division, if the student populations are very different, with different background preparation. This enables students to benefit from a course without their grades suffering unfairly.)

3. Having a graduate DDP in the same location could help with some of the difficulties faced by undergraduate students. If the graduate DDP is established at Zhejiang, it should include provision for graduate students to serve as mentors to the undergraduate students.

4. In the past, DDP received special funding, but is now "normally" funded as a Faculty of Arts and Sciences program. Given the broad benefits as noted above, the SFU and faculty leadership should ensure that the program is on stable financial footing.

3 Graduate Programs

3.1 Overview

The graduate program is very good and both students and faculty seem highly satisfied with most aspects. Financial support levels are adequate but not overly-generous, and students have some concerns. Time to completion is an issue and it needs to be tracked carefully. Student experience could be enhanced by more departmental activities and connections among research groups within and outside the department.

3.2 Graduate Student Environment

The review team spoke officially with 6-8 students from a variety of research areas. They expressed a high level of satisfaction with the environment, and perceive it to be a collegial place to study. The grad student society is active and engaged. There are good facilities and tech support, and students noted that they receive a lot of one on one attention from their supervisors. Students appreciate the guaranteed funding for PhD students, but raised concerns about the adequacy of funding levels, although the concerns may be endemic to the Canadian system and to the nature of graduate schools in general. Sources of conference travel funding seemed good.

One area of concern regarding the environment is the need for more connections and communications among research areas, both between the research groups within SCS and between SCS and other departments. Students would like to see more support for making connections between applied and theoretical work, and more collaboration with other departments. On the other hand, the head of SCS noted that the department tried to institute a faculty talk series but got a poor turnout; he also noted that their distinguished lecture series brings in excellent speakers, but is admittedly infrequent.

Recommendation on the graduate environment

1. We suggest that the department leadership brainstorm with interested students on how to address the need to make more research connections both within and outside the department. Inter- and multi-disciplinary work is becoming more and more a central part of computer science research, as is the need to demonstrate the connections between theory and applications. Creating an environment that encourages cross-cutting work will require the interest and commitment of both faculty and students.

3.3 Graduate Programs

Generally, the graduate programs are of high quality and this is consistent with the strong and growing research profile of the department. One issue that warrants attention is the structure of the MSc program. Having three different options – thesis, project, and course-based – that overlap in content and/or goals does not seem efficient or well- motivated academically. Concerns were raised by some faculty about the differential quality of students between the options.

Time to completion was raised as an issue for both MSc and PhD students. It was noted that few MSc students move into the PhD program, which seems inefficient in terms of supervisory time and recruiting: students who have been trained in relevant research content and methods for 1-2 years then move on without the faculty benefitting further from that expertise, and new students enter the PhD program requiring initial training in the particular research area and approach of the supervisor. While the CS community in general embraces the idea that doing graduate studies at different institutions is beneficial to the students concerned (and possibly also enriching to the broader academic community), a more sustained effort to engage some MSc students to stay on for PhD, when it suits their needs, would be useful.

Several issues were raised that impact time to completion of the PhD: wide variation in expectations for the depth exam, a tendency to delay PhD milestones, and progress reports that have limited real incentives (i.e. consequences). The review team's experience is that these are common problems across PhD programs and are difficult to address, but they should nonetheless receive some ongoing attention.

Some issues were raised by faculty about SGS policies/procedures; on the other hand, SGS raised concerns about the appropriateness of the division of responsibility for some tasks between students and administrative staff. The review team interpreted these concerns as indicative of a greater need for communication and understanding of the culture within each entity.

Recommendations and suggestions regarding the graduate programs

1. The review team was told that the MSc course option was added as replacement for the project option, but both are still on the books and together they comprise almost 25% of MSc students. The MSc thesis option has time-to-completion issues. The structure of all three MSc programs should be reviewed and an appropriate pair of funded and non-funded programs put in place. The review team suggests that a funded research option (thesis or research project), and a non-funded course option, would be a standard structure.

2. The graduate courses and the course requirements should be reviewed, with student input into this process. Graduate students raised the issue of there being a single course requirement that is theoretical in nature (algorithms or complexity), and the review team also found this odd. Students also noted that some courses need to be updated in content, and that they would like a greater variety of courses offered.

3. The department should consider whether it would be appropriate to encourage more MSc students to transition to the PhD, in order to increase the benefit from the investment of supervisory time during the MSc.

4. The department should track time to completion for both MSc and PhD, and review the milestones in the PhD to see if they are meeting department goals, and supervisor and student needs.

5. The graduate coop program is an excellent idea. We suggest funding on a pilot basis (perhaps 2 years) for hiring a coop coordinator and to see if the program could achieve the target number of students needed to fund that position. If the program can become established and stable in 2-3 years, this could be a great benefit for the department and the students.

6. The review team suggests a regular forum for communications between SGS and the department – such as meetings between the leadership once per term – to keep each other informed and to foster a partnership approach to graduate issues.

3.4   Graduate Student Recruiting

Grad student numbers are down a little from steady state in recent years, but the review team endorses the approach of maintaining consistent quality in a time that saw fewer applications to CS graduate programs across North America. However, some concerns were raised about recruitment:

1. The graduate programs in SCS are too dependent on a small number of countries as a source of students, since international recruitment can be overly affected by economic and political situations that are not entirely predictable.

2. There is no "graduate programs visit day" or other proactive recruiting mechanism to showcase the department to admitted students.

3. There appears to be no proactive recruiting of women students.

There is room for improvement in these areas now, especially as undergraduate numbers in CS in North America are rising dramatically.

Recommendations and suggestions regarding graduate student recruitment

1. The department should undertake to communicate to its undergraduate students that SFU CS is a high quality place to be as graduate students.

2. The department could use USRAs to attract domestic students. The office of the VPR provides matching funds and would increase these funds if there were greater faculty demand. USRAs could be used to attract both SFU and UBC students.

3. The department should consider encouraging more of its excellent MSc students to continue on within their PhD program.

4. In all recruitment and admissions, the department should be aware that its number of women students is low and proactive means are required to address this. The department has an active Women in Computer Science group that should be included as a partner in such efforts.

3.5   Women in Computer Science

This is a very active group that organizes many good events for both female and male faculty, staff, and students (graduate and undergraduate). The executive is comprised of 7 undergraduate and graduate students. The students we met were very engaged and committed, and their accomplishments are especially noteworthy given that they are operating with no faculty or staff support.

The proportion of women students is low, especially among the UGs. This should be an issue of great concern for the department, which should make a concerted effort to proactively recruit more women students, and to support groups such as this one to ensure a positive and welcoming environment for both male and female students, faculty, and staff.

Recommendations and suggestions regarding women in computer science

1. The Women in CS group should be assigned an official faculty mentor who can help them with improved communications with the leadership and faculty of SCS, with making connections to local industry and community organizations, with scholarship nominations and applications, etc. This position should be recognized as an important element of service to SCS.

2. This group could hold more events if provided more funding (currently have about $1,500). The department should track attendance and provide support to expand events if popular. Faculty should be encouraged to attend, and to help students with appropriate publicizing and promotion of events.

3. The department should partner with this group to expand its set of activities. For example, the group could help in outreach to local high schools. If they don't already do so, this would also be a great group for establishing graduate students as mentors for undergraduate students, to the benefit of both.

4. We applaud SCS for supporting students to attend the Grace Hopper Celebration of Women in Computing (5 × $500 conference scholarships). We encourage them to do more, or encourage supervisors to contribute.

3.6 Teaching issues

The Double the Opportunity program (DTO) appears to have been a somewhat delayed response to rising undergraduate numbers in the late nineties. This led to a situation where significant hiring was followed by a decrease in student numbers, but now numbers are back up. The view of the higher level administration is that faculty numbers are now in alignment with the level of student interest in CS. However, the department rightly sees the recent rise in student numbers as having a negative impact on their ability to meet their high standard of teaching quality. Especially given the current very high admissions cutoff, such excellent students will also demand the best educational experience. One topic raised by both students and faculty as a serious issue that has worsened in recent years is academic integrity.

The majority of issues about teaching that the review team heard involved TAs. Concerns were expressed by both faculty and UG students regarding the adequacy of both language skills and content skills of TAs in courses. Concern was also raised that TA support was down with end of DTO, but the TA hours per number of students in courses seemed reasonable to the external reviewers. However, additional hours might be needed for TA training, given the seriousness of concerns raised. Indeed, some faculty suggested that it would be a better use of funds to pay students their first few months to engage in TA training, English language skills improvement, etc., before they can TA. Despite what seems to be good TA support, there were also concerns about marked assignments and tests not being returned in a timely fashion.

A very important topic that was raised as a critical issue by some faculty was the lack of any periodic assessment of teaching quality. Faculty would like more thorough evaluation of teaching at tenure/promotion. Faculty need quality feedback on their teaching; moreover, regular assessment might help with issues raised by both students and faculty of pockets of outdated curriculum.

Although the program at Surrey is covered elsewhere, it is worth noting here that undergraduate teaching at Surrey was perceived to be in very good shape. Moreover, undergraduate students at Burnaby find Surrey courses appealing due to their smaller size and great teaching. If the department chooses to focus its activities in Surrey on undergraduate education rather than including a new/expanded research focus, the Surrey campus could, with a great team of lecturers and smaller classes, serve as an incubator of innovative pedagogical practices, especially in more experiential, activity-based learning. The current lecturers at Surrey could certainly form the basis for such an approach.

Recommendations and suggestions regarding teaching issues

1. SCS (or SFU more broadly) should develop guidelines for assessing teaching at major review points (tenure, promotion, "3-year review" or other midpoint to tenure/promotion). Such a review should include broader input than simply student evaluations – peer assessment in classroom visits, teaching statement by the candidate, teaching portfolio of course materials, consideration of involvement of UGs in research, etc.

2. SCS should reconsider the expectation that every research faculty member teach a graduate course every year, regardless of undergraduate and graduate program needs. Teaching alloca-

tions should depend on the course offerings needed to mount both the undergraduate and grad programs effectively. A rational allocation that responds to program needs will avoid a situation of overly large undergraduate courses at the same time as numerous very small graduate course offerings.

3. Undergraduate students are frustrated by a perceived apathetic response to cheating, which is perceived as unfair to the good students. Issues of academic integrity require a more consistent approach across instructors and TAs. The process needs to be streamlined to the extent possible, to alleviate the burden on faculty so there isn't so much disincentive to follow up on cases. SCS also needs to recognize instructor effort in pursuing cases, and proactively create a culture among students and TAs of the expectations of appropriate behaviour.

4. The following recommendations reflect the many issues raised about TAs during the review:

   (a) The number of hours of TA support in classes seems sufficient to allow for some improved training of TAs, although more hours may be required. −A concerted effort should be made to use training hours to ensure adequate communication abilities in particular.

   (b) It seemed that there is not a culture of different kinds of TAs, which could help in addition to further training. Grad students whose language skills are insufficient for running tutorials/labs should be allocated to marking of non-essay assignments/tests.

   (c) Faculty seem resigned to TAs frequently not having appropriate skills/background. A culture of high expectations for the contributions of TAs to the teaching mission should be cultivated.

   (d) TA assignments should be driven by matching of skills to positions, rather than by preferences expressed by the TAs.

   (e) The department should consider allocation of TA hours that takes into account the size of the class − large classes have more coordination issues, etc. Perhaps large classes should have one "head TA".

   (f) Grad students expressed concerns regarding the demanding expectations of some instructors. The department should discuss and encourage consistency of practice.

   (g) TA allocations are best done by or in conjunction with a faculty member who understands the academic needs of the courses.

   (h) TA funding should be placed on secure basis to the extent possible. If the department is expected to contribute a certain share of TA costs from its budget, that should be discussed up front and agreed to with Dean's office, and year-to-year expectations should be clear.

   (i) Concerns were raised regarding TA allocations at Surrey. The department should consider using upper-year undergraduate TAs there.

4 Research

The level of research activity and associated research funding levels are quite good. Generally speaking SCS faculty publish in good quality venues, which include both journals and conferences, and their work has a good level of scientific impact and, most importantly, is exhibiting a very clear positive trend.

4.1 Research Quality

Overall research quality within the unit has been on a clear upward trend and should be regarded as a source of significant pride for the university. While precise measurements of research impact and quality are elusive and often subjective, several sources of evidence including publications venues, quantity, bibliometrics indices, and funding levels all suggest that the School of Computer Science is in the "middle of the pack" of the top ten universities in Canada.

The biggest challenges to additional research growth are attracting increasing amounts of research funding that supports sufficiently long-term objectives, and the recruitment of top-quality graduate students with long-term research potential.

4.2 Inter-disciplinarity

The school has a substantive number of ongoing inter-disciplinary interactions within the university. This should be encouraged, and also brought to the attention of the administration since these collaborations reflect well on the school and may not have the visibility they deserve.

4.3 Industrial Relations

The extent of industrial interaction is good and associated with a substantial number of small to moderate grants or contracts that involve industrial participation. Industrial research activities are biased towards smaller companies and smaller programs, but this is commonplace in computer science, and particularly computer science in Canada. In addition, as the research relationships mature this bias may self-correct somewhat both with respect to the ensemble of company sizes and the size of the associated projects.

Going forward there is a clear opportunity for an enhanced degree of fundraising via grantsmanship, as well as a longer term opportunity for other types of development. Based on feedback from faculty members these activities would benefit from additional administrative support, and particularly the availability of professionals to assist in developing industrial contacts including associated IP agreements and licensing.

4.4 Advancement

1. The unit needs attention and advice from central advancement professionals, given the lack of an advancement office in the Faculty of Applied Science and what appears to be limited staff availability at ORSU.

   Administrative support for advancement activities and gaining access to new funds is a significant shortcoming as expressed by several faculty members. For a young energetic academic unit, the availability of additional administrative support might make a significant difference in their ability to attract funding. This could have an impact on both the short-term development of projects, as well as the development of suitable skills and linkages within the unit that could be an advantage even if administrative support was subsequently reduced. In short, the provision of additional administrative support for advancement activities could be an opportunity for the university despite the challenges in finding and funding the required human resources.

2. The unit wants more endowed chairs and industrial chairs.

There is no doubt that chaired positions would enhance the School, but they are very difficult to fund. At present Canada Research Chairs may not be available, but NSERC Industrial Chairs are an opportunity the School may be able to capitalize on as existing industrial linkages grow. Since they depend, however, on large industrial partners, instead of the small companies that many SFU faculty work with, they may be difficult to capitalize on. The School seems to have an appropriate level of awareness of these issues, and is doing what it can to address these opportunities.

5 Resources and Administration

The "centralization" in the Faculty of Applied Science and SFU of various administrative and technical support functions has led to a loss of service in some areas. While we recognize the need for administrative efficiencies, centralized services must respond to the needs of the clients or they are in fact cuts in service rather than efficiencies.

5.1 Administrative Staff

1. Here are some of the issues that have been raised about centralization:

   (a) The Faculty of Applied Science advising staffing may be insufficient to keep up with student demand at peak times, with anecdotes regarding substantial lineups for service: (tens of students) waiting to talk to the advisor.

   (b) SCS clearly perceives that its messaging is not getting delivered effectively or is diluted in recruitment activities.

   (c) Staff feel they have been given new duties without job descriptions reflecting it.

2. The physical separation of the administrative staff from the teaching and research faculty is regarded by many of the staff as an impediment to the development of a sense of engagement as a team, and thus the mission of SCS. Not all members of the community felt this problem to an equal degree, but overall the staff did seem to feel a need for closer ties to the faculty and their activities. The physical limitations of the available space makes this hard to address in any simple way, but there may be simple alterations at the operational level that might encourage more frequent interactions between the staff, faculty, and graduate students.

3. The administrative staffing levels seem low for a unit of this size. For example, having one Financial Assistant to do grant support for a unit of this size and number of grants does not seem reasonable. Also, it is not clear what kind of administrative support faculty receive, if any.

4. The graduate program staffing seems to be at an appropriate level, but there are concerns expressed about downloading of tasks to graduate students that are inappropriate, such as scheduling their own defenses. Some of this is a culture issue, since computer science tends to be fairly informal in relations with graduate students.

5.2 Technical Staff

Issues about centralization:

1. The centralization of technical support for research labs in SCS runs contrary to the trend in many other comparable universities. While there is no definitive principle regarding the centralization or allocation of computing services, the reviewers were surprised that a centralized mechanism was responsive and specialized enough for the needs of an active research community. Using a "point of contact" model (whereby a specific individual deals with requests from each research lab) can provide efficiencies by ensuring that the POC understands the day-to-day needs of their client base and can respond at maximum efficiency to those, but can call on more centralized resources when necessary.

2. In any case, the coordination and communication between technical staff in SCS and SFU is an area where there is room for improvement.

The technical staff generally seemed to operate with a commendable degree of efficiency and showed initiative and technical competence. There were clear indications, however, that they were under stress due to the challenge of maintaining a level of service that met their own high standards especially in the face of a shrinking staff cohort.

There was an apparent absence of consistent off-site backup for research data (and possibly other types of related data). While off-site backup is easily overlooked since it is only required in rare and exceptional circumstances, it should be considered a necessity in an academic unit of the scale of SCS.

There seems to be little doubt that the fraction of computing activity that is housed on computers owned by graduate and undergraduate students in destined to grow. To some extent, it is already surprising that it has been possible to retain so much computer science activity on university-owned computing devices, but this provides definite advantages in terms of encouraging group work, positive interaction and camaraderie. If more activity migrates onto student-owned systems (particularly laptops or mobile devices), it may become necessary to develop additional mechanisms to facilitate backing up these devices, the provision of technical support (either directly or via commercial vendors), and the use of software that can be downloaded on an individual basis.

5.3 Resources

Faculty Hiring Plans

The hiring policy for Burnaby campus appears to be overly focused on short-term problem mitigation and renewal, which is not surprising given the recent economic realities, but it should be aligned with a longer term strategic plan. Without financing for new positions and new growth it is difficult and of questionable relevance to formulate a long term vision for strategic growth, and yet if such a vision were developed it might help guide long-term planning, build readiness in case new opportunities develop, and even potentiate such opportunities. In addition, planning for future growth, especially if realized to at least some degree, would be a positive factor with respect to the retention of existing strong faculty.

To strengthen the already strong inter-disciplinary work being conducted by the SCS faculty, new hires should focus on areas where there are opportunities for synergies created by connecting

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them to computer science. Some examples of such areas are mentioned in Section 6 on the expansion of the Surrey campus.

Workplace Environment

The workplace environment is friendly and collegial. Faculty have multiple collaboration efforts with other faculty and share a strong sense of loyalty. There are a few suggestions that could improve an already good environment:

1. Colloquium. The school does not have a regular colloquium. Adding a weekly colloquium would help strengthen the sense of community among faculty and students and expose students to various research issues. The colloquium could have a mix of

   (a) internal faculty talks to communicate to students and other faculty about what people are working on and build a shared base of knowledge;

   (b) a Distinguished Lecture Series to bring in a broader set of people, ideally high-profile speakers. This would not only expose students to other research ideas but also extend the network of faculty and increase their visibility.

2. Workload balancing. The total teaching load of three courses/year across the School is reasonable. A non-uniform load should be considered to account for factors such as different levels of involvement in research, student supervision, and class size. This has to be done carefully, with support from the faculty, to avoid resentment from people who will end up with a higher teaching load, but it is important to ensure people think everyone is treated fairly and their efforts are recognized. The teaching load on the lecturers is growing - as enrollments grow and TA budgets are cut, lecturers are disproportionately negatively affected due to the size of the classes they teach.

3. When numbers of students increase and TA hours decrease, lecturers tend to be disadvantaged disproportionately due to their disproportionate teaching of large 1st and 2nd year courses. This needs to be taken into account by providing appropriate support and rewards.

4. External outreach. The web site development, curation, and maintenance need attention and dedicated resources. The web site is critical for projecting the image of the School to the outside world and to SFU, but also for current students and faculty to know what is happening, who has received awards, etc. The web site is a good place for recognizing accomplishments of faculty, students, and alumni, and making those accomplishments visible to the external world.

5. Transparency and communications with central administration. Since some of the services are centralized, there has to be an explicit effort to identify the needs of the component units that are served, and to respond in a way that indicates a common purpose, and keeps people informed.

6 CS@Surrey

6.1 Summary

The Surrey program is not sustainable in its current form. The enrollment is not as high as desired, the space is getting tight, and the faculty are not sure about the future of the program, but undergraduates like taking courses at Surrey because the classes are smaller and they get better interactions with the instructors. There are opportunities for development at Surrey, spurred by the strong desire of the state government to grow the Surrey campus, and by the growing population in the Surrey area that is currently underserved.

6.2 Options for Growth

We have identified three options that have potential for success, each with different opportunities and challenges for SCS and for the faculty at Surrey.

1. Focus the Surrey program to be an undergraduate teaching program, possibly expanding the current Software Systems, and giving it a different focus. The campus could serve as an incubator for new pedagogical practices at the undergraduate level. The quality of undergraduate teaching is already high and the Software Systems program has a good reputation among undergraduate students in Burnaby. In terms of the program contents, the program should be an applied program, as the current Software Systems is, and should be a program that is recognized as a valuable and distinctive degree. Here are different alternatives we recommend to consider within this option:

    (a) Expand the current Software Systems program into a full-fledged program in Software Engineering (notwithstanding possible issues regarding the nomenclature). The discipline of "Software Engineering" is more widely recognized world-wide than Software Systems and this will help attract a larger pool of students and be more attractive to employers. The program could maintain its current emphasis on software systems and add a stronger coverage of software architectures, software design, software testing, and software management.

    (b) Focus the current Software Systems program on embedded and real-time systems, with additional courses in software verification and formal methods. This could be done as a degree in embedded systems, or in partnership with the existing Mechatronics program (see below in the next option).

    (c) Expand the current Software Systems program to cover software systems for health applications, adding courses in data bases, data management, data analytics, and privacy. The program would prepare professionals for the data management and software developments needed by the health industry. This could also be done to a larger scale in partnership with other department to create a degree in Health Informatics (see the third option listed below).

2. Develop a partnership with Mechatronics and strengthen the Mechatronics program by adding to it a strong component on embedded systems, real time systems, software verification, safety critical systems, and related themes that are part of the core of Computer Science. This requires

creating consensus and agreements between the current leaders of the Mechatronics program and of the School of Computer Science. An interdisciplinary Mechatronics program with a stronger software component would be attractive to employers.

3. Develop a new area of research and teaching in health informatics. This will exploit the growing importance of and need for a wide range of approaches to the health sciences, and the position of CS@Surrey in proximity to health activity in Surrey. This option will require building partnerships with other units, such as information management from the business school and public health. Various alternatives can be considered for this new program, depending on who the partners are and what the focus of the partnerships is. Here are some specific recommendations:

    (a) Establish a two-track degree program with a Computer Science track and a Health track within one truly interdisciplinary program. This would bring students from both sides together, enabling them to appreciate different perspectives, and will create professionals who are literate in both Computer Science and Health and who have a strong expertise in one or the other disciplinary area. Opportunities for team projects across the two tracks would strengthen the interdisciplinary nature of the degree. Related research projects would be pursued by faculty and used to support graduate students and provide research opportunities for graduate students. This could be built as an extension of the current Software Systems program, which would need to be expanded to cover the software needs in health informatics, and in partnership with other units in public health or information management.

    (b) At a smaller scale, this option could start as an undergraduate program in Software Engineering focused on health informatics (listed above under the Software Engineering options).

Recommendations and suggestions regarding the Surrey campus

No matter what option is selected, there are a number of important considerations that have to be taken into account

1. There is a need to consult widely – among faculty, staff, and students (grad and undergrad) at both campuses, in the School of Computer Science and other relevant disciplines. The objective is to develop a vision that will have buy-in from the ground up, and that realistically dovetails with a resource plan to put the current Surrey degree on a path to success (whatever the goals are determined to be). This consultation process should be guided by parameters from the SFU and SCS leadership reflecting overall University and School goals and a practical assessment of future sources of funding and how they might be allocated within the Faculty of Applied Science and within SCS across the two campuses.

2. Stop hiring permanent positions at Surrey until this vision is elaborated. Although it is clear there are teaching needs at Surrey in the short term, it doesn't make sense to invest new permanent lines in particular areas until the medium and long term goals are clearer. Expanding the program at Surrey from 150 to 250 students would take 5 to 6 faculty lines, so faculty hires have to be considered carefully because they provide a unique opportunity to expand the computer science faculty and offer new areas for teaching and research.

3. The Surrey campus needs strong leadership immediately, and communications between it and the Burnaby campus need to be improved. Communications and cohesion between the campuses is an issue, especially due to the other factors that divide the campuses, hence a specific effort needs to be made to address this. Courses at Surrey should not be scheduled to conflict with faculty meetings at the Burnaby campus. Requests for administrative assistance or IT support from Surrey should be tracked carefully to assure they are handled efficiently and, most importantly, the staff at Surrey is kept informed regarding how and why issues are being handled as they are.

4. Keeping the autonomy of Surrey is important, but there is a need to address the sense of "Burnaby doesn't care" via better communications for faculty, administrative staff, and technical staff. Faculty/staff at Surrey should have their own regular meetings to address issues at the campus and increase the sense of ownership and engagement in the program.

5. Space at Surrey is currently an issue. There appear to be reasons to believe this pressure will be relieved, given the plans for expansion of the buildings in the Surrey campus, but the space issue needs to be addressed. The Surrey staff should be apprised of expected solutions so that they can develop a more expansive long term vision and feel part of the decision process.

EXTERNAL REVIEW – ACTION PLAN

Unit under review School of Computing Science	Date of Review Site visit March 20 – 22, 2013	Responsible Unit person Martin Ester	Faculty Dean Nimal Rajapakse

Note: *It is **not** expected that every recommendation made by the Review Team be covered by this Action Plan. The major thrusts of the Report should be identified and some consolidation of the recommendations may be possible while other recommendations of lesser importance may be excluded. Should an additional response be warranted, it should be attached as a separate document.*

1. PROGRAMMING

1.1 Action/s (description what is going to be done):

1.1.1 Undergraduate:

- Discontinuing the Software Engineering specialist option.
  To focus our teaching in this area and to clarify our offerings to students, we plan to discontinue the Software Engineering specialist option that has been offered at the Burnaby campus and will refer interested students to the Software Systems program offered at the Surrey campus.
- Instituting mandatory labs in 1st year courses.
  Mandatory labs for the key introductory course CMPT 125 are currently being developed and will be offered for the first time in Spring 2014. These labs will be three credit courses that run in parallel to the lecture-based courses. The corresponding lectures and labs will be co-taught by a team of two faculty members, preferably one teaching and one research faculty member.
- Introducing a combined BSc/MSc program.
  In May 2013, the School passed a motion of approval in principle for creation of a concurrent Bachelor-Master's program in Computing Science. We will now proceed to design the program.
- Introducing a "computational thinking" course for students of other programs.
  Such a course will offer an increasingly relevant introduction to "computational thinking" for students from a broad range of programs. We will design an attractive course, gradually build up enrollments, and apply for a Q-designation of the course.
- Better support for the Women in Computer Science student group.
  While they have had unofficial faculty mentors, we will assign an official faculty mentor to our Women in Computer Science group. The faculty mentor will help with scholarship applications and liaise with faculty at SFU as well as with the local industry. This position will be considered as the internal service of that faculty member instead of the regular committee assignment.

1.1.2 Graduate:

- Streamlining our MSc portfolio.
  To streamline the portfolio of MSc programs, we will work to eliminate the unfunded MSc project option with the goal of offering only a funded research option (thesis or research project) and a non-funded course option. We have recently experienced an upward trend of the number of non-thesis applicants, which fits well with the new graduate co-op program.
- Establishing the graduate co-op program.

A graduate co-op program began in January 2013. The grad co-op courses may be used for credit towards MSc degrees. PhD students may participate in grad co-op, but may not count co-op courses towards their course requirements. The program will be reviewed after two years to evaluate student and employer demand. The program is currently supported by a half-time co-op coordinator, which is sufficient for roughly 60 student work terms per year. We anticipate growing demand from an increasing number of course-based MSc students, which will require the upgrade to a full-time coordinator position.

- Reducing the dependency on a small number of source countries.
  In order to reduce our dependency on applicants from China and Iran, and to diversify our graduate student population, we will actively strengthen existing relationships with universities in India (IIT Madras, Jadavpur University), Brazil (Universidade Estadual de Campinas), Germany (Technical University of Darmstadt, University of Bielefeld) and other countries. As a next step, we will explore the opportunities for exchange programs or even dual degree programs with these universities.

- Increasing the percentage of domestic and female students.
  We will establish a "graduate programs visit day" for admitted top students. We will also promote our graduate programs more systematically, through classroom visits and undergraduate research projects including USRAs, to our own undergraduate student population. Our recent efforts with invited visits and offers of entrance awards to the very top domestic applicants have already led to an increase in the number of domestic and female students, and we will pursue these efforts more aggressively.

- Strengthening the graduate DDP with Zhejiang University.
  To strengthen the recently (fall 2011) introduced graduate DDP and to recruit more Canadian students, we will increase the exchange of faculty members between SFU and ZU and strengthen the research collaboration. We are already in the process of establishing a joint research center in Big Data Science which will hold annual workshops etc. and support faculty members of both universities in joint research grant applications and industry collaborations.

1.1.3 Teaching:

- Establishing better relations with the student leadership.
  We will invite representatives of the CS student groups to attend one Executive Committee meeting per semester, or on demand, to give them the opportunity to share student concerns and suggestions. In return, the Undergraduate and Graduate Program Directors may attend meetings of the student group executives. We will also consider holding an annual town hall to gather input on the student environment from all students.

- Assessing teaching.
  We will develop guidelines to assess teaching in the context of the biennial salary review and of tenure and promotion applications that will include not only student evaluations but also other sources such as peer evaluations, student focus groups, teaching portfolios, and undergraduate research supervision. This process will be led by a committee consisting of teaching and research faculty members that will start its work in the fall 2013.

- TA budget.
  We will include the full amount of planned (and required) TA expenditure in future budget submissions to the Dean's Office, so that TA funding will be placed on a secure basis to the extent possible.

- TA allocations.
  Starting this September, we will assign a faculty member to allocate TAs to courses together with our Manager, Administrative and Academic Services. This faculty member will ensure that TA applicants have the required skills, including language skills, and that allocations match skills of TA applicants to TA positions.

1.2 Resource implications (if any):

- The School is currently at its teaching capacity. The offering of a new "computational thinking" course for students from a broad range of other programs will require the increase of our teaching capacity, in the short term through the hiring of limited term faculty, and in the longer term through the hiring of a number (depending on the three-year average enrollments) of continuing faculty members. The funding for such positions under the SFU budget model will have to be negotiated with the Dean and the VPA.
- The upgrade of the graduate co-op coordinator position from half-time to full-time will be funded through student co-op fees.
- The creation of a joint research center in Big Data Science with Zhejiang University will require additional funding for joint workshops as well as exchanges of faculty members and students.
- Broader assessment of teaching will require additional resources from the assessed faculty member (e.g., creation of teaching portfolios) and from the assessors (e.g. classroom visits). We plan to assign a few faculty members to a new teaching assessment committee as their regular service assignment. However, we will have to constrain the additional resources to a reasonable amount. The teaching assessment committee will require training and support from the SFU Teaching and Learning Center.

1.3 Expected completion date/s:

- All of the above actions will be implemented by the time of the review update in April 2016.

2. RESEARCH

2.1 Action/s (what is going to be done):

- Improving administrative support for large research grants.
  With the increasing number and size of research grants, we will create additional administrative staff positions to support large research grants such as NSERC Create and NCE. These positions may be shared by multiple grants.
- Increasing advancement capacity.
  FAS has only one full-time Advancement Officer position to serve three large, industry-oriented Schools. The advancement support will have to be increased to capitalize on the many opportunities in the CS/IT sector. In particular, the School needs and sees the potential for more endowed chairs and industry chairs, whose acquisition will require substantial advancement efforts.

2.2 Resource implications (if any):

- Administrative support for large research grants will be funded through these research grants and be coordinated by the School.
- The creation of additional FAS Advancement capacity will require corresponding funding from the Dean's or VP level.

2.3 Expected completion date/s:

All of the above actions will be implemented by the time of the review update in April 2016.

3. RESOURCES AND ADMINISTRATION

3.1 Action/s(what is going to be done) :

- Improving administrative staffing levels.
  As covered in section 2.1, additional administrative staff will be hired to support the increasing number and size of research grants. As pointed out by the Reviewers, the administrative staffing levels are low for a unit of this size, in particular in the area of financial assistance. We will consider increasing the staffing level or, if an increase is impossible, re-organizing the job descriptions of the current staff members based on the needs in the various administrative areas.
- Reviewing the services of the FAS Student Affairs Unit.
  Concerns have been expressed that the FAS Student Affairs Unit may not be able to keep up with the advising demands of CS students, and that the School's messaging is not getting delivered effectively in recruitment activities. These concerns will be reviewed and necessary actions will be negotiated with the Dean's Office. Improved communication is considered to be crucial to improve the services in the future. The School will assign a faculty member to liaise with the FAS Student Affairs Unit and provide better faculty and staff representation at events organized by the FAS Student Affairs Unit.
- Maintaining the School website.
  We will take advantage of the SFU Content Management System to improve our web presence. We will assign a faculty member overall responsibility and authority to supervise and direct our website maintenance. Responsibility for routine maintenance and updates of areas of content will be assigned staff members of the School most closely involved in that area. Once these responsibilities are in place, the assigned faculty member will initiate a review of each section to ensure that content is up to date, well written and that all links are correct.

3.2 Resource implications(if any):

- As covered in section 2.1, administrative support for large research grants will be funded through these research grants and be coordinated by the School.

3.3 Expected completion date/s:

All of the above actions will be implemented by the time of the review update in April 2016.

4. WORKING ENVIRONMENT

4.1 Action/s(what is going to be done) :

- Establishing a Colloquium.
  To strengthen the sense of community among faculty and graduate students, and to expose them to current research issues, we will establish a CS Colloquium with internal speakers, which will complement the already existing Distinguished Lecture Series featuring high-profile external speakers. The CS Colloquium will feature talks of selected faculty members and graduate students that are of interest and accessible to a broader audience. To attract a good attendance, we will offer a free lunch.

- Balancing the workload.
  The School will develop a workload policy that specifies the teaching load of faculty members taking into account factors impacting the workload such as different level of graduate student supervision, involvement in large research projects, and class sizes. Our current workload policy considers only graduate student supervision. Using extensive consultation, we will develop a broader policy that is considered to be fair by the different groups of faculty members, including research and teaching faculty members, and has wide support.

4.2 Resource implications(if any):

- The food expenses for the CS Colloquium will be covered from the School's operational budget.
  The new workload policy will likely lead to a reduction of average course load of faculty members which in turn may lead to a reduction in the number of classes offered by the School. By offering fewer sessions of our courses and fewer elective courses, this may be absorbed without reduction in the AFTEs.

4.3 Expected completion date/s:

- All of the above actions will be implemented by the time of the review update in April 2016.

5. CS@Surrey

5.1 Action/s:

- Developing a vision.
  SFU considers the Surrey campus as its main opportunity for growth and expects the Province to double the current 2500 FTE students to 5000 FTE in the near future, with the specific dates determined by the Province. The School currently has a clear vision for the undergraduate Software Systems program, and our Surrey program is doing very well for such a small group of faculty. In fall of 2013 the Software Systems program had 201 majors, over 60 Computing Science majors taking over half their courses at Surrey, and well-attended service courses, for a total of 944 students enrolled in courses offered by the program.
  We plan to expand that vision in two ways. First, we propose to partner with the Faculty of Health Sciences to offer a Health Informatics

program at Surrey. Second, we will develop a plan for research and graduate training at the Surrey campus. The vision and the corresponding proposals will be developed in consultation with our faculty members, the Dean, the VPA, and other academic units at the Surrey campus. The process will be led by the School Director and the Associate Director, Surrey and will include a series of special faculty meetings, with a focus on Surrey faculty members.

- Strong leadership.
  The position of the Associate Director, Surrey has been vacant for more than a year, but it has been filled as of September 2013. The new Associate Director will provide strong leadership and improve communication between the Surrey and the Burnaby campuses.

5.2 Resource implications(if any):

- The implementation of the resulting vision for CS@Surrey will require funding for new faculty positions to grow the existing Software Systems program and to establish any new programs. This funding will be provided upon approval of the expansion and the new programs by the Province.

5.3 Expected completion date/s:

The new Associate Director, Surrey started in September 2013.
All of the above actions will be implemented by the time of the review update in April 2016.

The above action plan has been considered by the Unit under review and has been discussed and agreed to by the Dean.

Unit Leader (signed)		Date
Name ....M. Ester....	Title....Director....	....Nov 25, 2013....

Section 2 - Dean's comments and endorsement of the Action Plan :

The reviewers have commented positively on school's activities and recognize that Computing Science (CS) at SFU is one of the top schools in Canada. High reputation of the School is also confirmed by several international rankings that place the School amongst the top 150 CS schools in the world. The review team has identified several areas that require careful attention and effort over the next few years. These include the undergraduate and graduate programs, research, future of Surrey Campus programs, resources and student affairs.

With regard to the recommendations and action plan outlined by the Director, I am in agreement. I plan to work with the School to address challenges and issues identified by the visiting team. My comments on the key topics of the review report and Director's recommendations are given below.

Programming: The proposed action plan is acceptable. I am pleased to note that the School plans to discontinue software engineering option in Burnaby and move that focus to Surrey, strengthen interactions with students, further improve teaching and TA support, attract more female students, increase the diversity of graduate student population, introduce combined B.Sc./M.Sc. program and several other initiatives to improve the overall quality of its programs. In my opinion, the School has sufficient resources to implement the proposed actions. I encourage the School to further consolidate the senior elective courses to open up more teaching resources for lower level courses and new initiatives such as the computational thinking course. The School should launch professional graduate programs without further delay to generate revenue and increase industry interaction.

Research: The School has some of the top CS researchers in the world. There is room to increase the annual research income, especially large team grants. Recent success with an NSERC CREATE grant is a positive development. Additional staff positions for research support could be created by increasing annual research income and attracting more grants from industry. The Faculty will consider adding another advancement officer in 2014 subject to availability funds. This would help the school to increase its interaction with industry. The Faculty currently provides support for industrial liaison through a full-time staff position.

Resources and Administration: The School has a reasonable staff complement. However, the staff resources are divided between two campuses and it causes some inefficiencies. Centralized student services provided through the Faculty has improved student recruitment especially for CS programs but student advising has had some challenges due to several staff leaves of absence. FAS Student Services unit will report directly to the Dean effective January 2014 and a review of its activities will be done to improve student services.

Working Environment: Actions identified in this section are feasible. I encourage the School to implement the proposed work load policy as early as possible.

CS@Surrey: This is the main challenge facing the School. As recognized by the visiting tem, the current program is not sustainable. I disagree with the recommendation to add more faculty lines to this program as there is capacity in the current courses to accept more students. A careful review of School's Surrey activities is required as the identity of the undergraduate program is confusing and the research performance can be improved. In view of the continuing modest enrollment in SoSy, it is important to consider how a new program in Health Informatics will affect SoSy. There are also issues about the feasibility and success of the current graduate program in Surrey. Overall academic environment for graduate students is not as attractive as in Burnaby where the main activities of graduate program reside (graduate courses, major research labs, access to resources, etc). I encourage the School to consider consolidating its graduate program to Burnaby. The recommendation to collaborate with Mechatronics is an attractive suggestion and should be explored. I agree with the recommendation that no further permanent hiring for Surrey should be made.

Faculty Dean	Date
...............Nimal Rajapakse..	...November 25, 2013...