

Internal Academic Review 2006-2007
School of Computing
Internal Academic Review Committee Report to Senate

The Internal Academic Review (IAR) of the School of Computing is now complete. The Internal Academic Review Committee (IARC) has taken into consideration all of the submissions related to the IAR of the School of Computing and respectfully submits the following report. The IARC Report to Senate is intended to supplement the findings of the attached Review Team Report and to provide a mechanism for the Director of the School and the Dean of the Faculty of Arts and Science to jointly report on the progress in addressing the Review Team recommendations (please see the “Outcomes” section of this report).

Summary of the Internal Academic Review of the School of Computing

The School of Computing is to be commended for their innovative and successful advancement of both specialized and multidisciplinary programs in a field of science that is experiencing rapid and frequent transformation. The Senate Internal Academic Review Committee (IARC) applauds the record of faculty members’ success in research grants and awards, and the dedicated administrative and technical support staff assisting the work of the School of Computing.

The IARC agrees with the reviewers that the limited teaching and research space, and the need for renewal of the faculty complement, must be addressed as the School of Computing develops its future academic plan, and that substantive progress will require additional resources for the School. The IARC encourages the School of Computing to engage in a strategic planning discussion, including a comprehensive curriculum review, with the Faculty of Arts and Science. While the growth of the graduate program in the School holds much prestige and integrates well with goals of the Queen’s Strategic Plan, the IARC agrees with reviewers that the undergraduate core program requires attention. In an effort to build cohesion and to bring a better balance to the allocation of resources across the undergraduate and graduate programs, the proposed strategic planning exercise should incorporate a curriculum review and the integration of faculty members’ specialized expertise into strengthening the core undergraduate computing program. The

IARC recommends the School develop plans and approaches to deal with the pressing issue of space while recognizing the unique program requirements for computing laboratories.

The IARC recognizes the School of Computing for its progress and creative problem solving and fully supports the School and the Faculty of Arts and Science working in collaboration to explore new ways to address the recommendations outlined in the Review Team Report.

Outcomes of the Internal Academic Review of the School of Computing

*Joint response submitted by the
Dean of the Faculty of Arts and Science and the
Director of the School of Computing*

Space:

The Faculty of Arts and Science recognizes the importance of addressing the significant issues related to adequate space in the School of Computing. The School has engaged various creative, but temporary, solutions to optimize use of the present space. The undergraduate laboratory mentioned in the IAR report has been moved back to a renovated facility in Walter Light Hall. The Faculty and the School have worked cooperatively with other university units to acquire alternate space for certain Computing research laboratories. Active efforts to identify other space that might be occupied by the School of Computing are ongoing. As the external reviewers note, the School of Computing needs a considerable addition to the size and quality of its space in order to facilitate laboratory based research and to accommodate its very large graduate student contingent. It must be noted that although the Faculty of Arts and Science has no direct financial control over capital projects, the Faculty remains committed to working with the School of Computing to develop a long term space plan.

Faculty Complement in Core Fields:

The Faculty of Arts and Science recognizes the importance of providing resources to maintain the faculty complement. In the last two years, the School of Computing has enjoyed the addition of a tenure stream position and a non renewable faculty position; also, a number of Term Adjunct positions have converted into Continuing Adjunct positions. The Faculty and the School are actively investigating external programs that could provide alternate revenues for supporting faculty positions. As noted by the external reviewers, additional faculty member capacity will help to stabilize the teaching schedule and will enhance the already excellent research profile of the School. The

reviewers advocate that faculty appointments in the core areas of computing are needed to redress faculty turnover and to complement appointments made in applications areas of computing. The Faculty and School recognize the importance of securing resources for renewed investment of faculty members in the core areas of Computing.

Curriculum:

To maintain the status of its undergraduate curriculum as one of the most dynamic, challenging, and innovative in the country, the School of Computing has joined with the Faculty of Arts and Science to engage in regular, comprehensive reviews. These reviews have recently led to several significant curriculum modifications in response to changes in the technological environment and student interests. For example, the School has added several novel introductory computing courses, new opportunities for students to become engaged in programming, more course options for students in certain degree programs and a new program in Computing and Concurrent Education. Additional changes, particularly interdisciplinary programs, are being considered. The Faculty of Arts and Science and the School of Computing have together enhanced the administrative mechanisms that will allow Biomedical Computing students to access the courses needed to fulfil their degree programs. The School remains committed to a vigorous graduate curriculum which is supplemented by a number of seminar series where both graduate students and faculty members present their research in a spirit of scholarly exchange.

Follow-up on these recommendations and issues will take place during the annual academic planning and budget process between the Dean of the Faculty of Arts and Science and the Vice-Principal (Academic).

Attachment:

Review Team Report

**QUEEN'S UNIVERSITY
SCHOOL OF COMPUTING
INTERNAL ACADEMIC REVIEW**

INTERNAL REVIEW TEAM REPORT

March 9, 2007

Submitted to the Senate Internal Academic Review Committee by

Christopher Ferrall (Economics), Chair of the Internal Review Team

on behalf of the Review Team

Dr. Andrew Daugulis (Chemical Engineering)

Ms. Peg Hauschildt (Physics)

Dr. Barbara Kisilevsky (Nursing)

Mr. Brian Kuchar (Political Studies)

Dr. Kevin Munhall (Psychology)

Mr. Jonathan Vandersteen (Civil Engineering)

Executive Summary

Since its last IAR, the School of Computing has experienced significant growth and development in its faculty and academic programs. This is reflected in the external consultants report (CR) and the School's rise from #7 to a #5 ranking within Canada.

Based on our meetings with the faculty, students and external consultants we have found broad agreement on the strengths, weaknesses and threats to the School. To a great extent we concur with the ranking of these concerns by the external consultants and their recommended responses. These responses are prudent steps to manage and stabilize the growth that has occurred.

We stress three recommendations.

Issue 1. Space

The primary weakness of the School is physical space. Concerns about space are prominent in the Unit Self Study (USS), the report prepared by the Computing Students' Association (COMPSA), and the Consultants' Report. The tour of the facility taken by the Review Team confirmed these reports. Computing is not the only unit on campus struggling with inadequate space. However, Computing is the unit under review, and it is truly constrained by both the quantity and quality of space available. Lack of appropriate physical space is a threat to the research environment and each academic program as well as student safety and equal access.

The single best response from the University to this IAR would be to work with Computing in its efforts to adapt existing space and to acquire new space. As a minimum response, we fully endorse the recommendations made in the Consultants' Report:

- ▶ **Move the Jackson Hall undergraduate laboratory to Goodwin Hall**
- ▶ **Separate the functions of graduate student office space from experimental laboratory space [we have raised the priority of this recommendation]**
- ▶ **Unlock staircase doors during regular hours**
- ▶ **Find additional space for biomedical research**
- ▶ **Find space for students to meet casually outside of laboratories or offices.**

Issue 2. Faculty Complement in Core Fields

The second key concern is the faculty complement in core areas of computing. Unlike many units over the same time period, the School has increased its full-time faculty since its last IAR. The growth has been in applications of computing, i.e., cognitive science and biomedical computing.

The USS lists 15 research groups spread over 23 regular and 10 cross-appointed faculty members. Applications of computing are like spokes on a wheel with the shared science and methods of computing at the hub. For the number and range of applications there are too few faculty members remaining in core areas, and several of them are nearing retirement. In addition, the appeal of applications versus core topics is not the same in undergraduate and graduate students.

There are signs that the growth in applications threatens faculty cohesion and workload balance. The Consultants' Report states that several researchers in core areas feel isolated in the wake of the expansion.

The second most important response from the University and the School is a commitment to maintain the faculty complement within the core of computing in the face of retirements and other faculty turnover. The School should focus on integrating the expanded research groups into a cohesive department.

Issue 3. Curriculum

A suite of concerns surround the curriculum in both the graduate and undergraduate programs. In a way, each program is a victim of its own success in that the issues relate to the rapid growth of degrees offered and imbalances which have resulted. Enrolment in computing programs is one of the most cyclical on campus because of the relative youth of the field and its close links to the volatile technology sector.

At the graduate level, the COMPSA report provides a strong and constructive message about the program that echoes concerns in the USS but raises new issues picked up by the Consultants' Report. A key issue raised by COMPSA is availability of required courses housed in other departments (in Psychology for the Cognitive Science degree and in Life Sciences for the Biomedical Computing degree). *The mundane yet complex issue of course scheduling and registration threatens Computing degrees that cut across traditional boundaries. This is a University-level issue.*

COMPSA also reports that “many students” do not find the undergraduate degree challenging enough. To have a unit’s majors worrying in print about the challenge of their courses should serve as a warning sign. In addition, the Consultants express concern about the level of support given to the Cognitive Science Degree.

The Consultants rank the graduate program as strong. The shift towards applications in research has created some concerns. For example, 25% of graduate students specialize in networking or databases yet there are only 2 faculty members, well below 10% of the faculty. The USS notes the existence of a Graduate Seminar Series, but the Consultants recommend creation of a joint faculty/PhD seminar. This suggests a disconnect between the faculty and the PhD students concerning the strength of this series.

In response to issues surrounding the curriculum, the University should:

- ▶ **Guarantee coordination and cooperation between Computing and its partner units to ensure that Computing students in multi-disciplinary degree programs have fair access to required courses.**

The School should,

at the undergraduate level promote:

- ▶ **Coordination within multi-section courses to ensure consistency**
- ▶ **Coordination across courses to prevent too much overlap in content**
- ▶ **Introduction of more programming projects/assignments;**

and at the graduate level introduce and/or invigorate:

- ▶ **A seminar where students present research and faculty regularly attend**
- ▶ **Department-wide seminars to foster cohesion across laboratories.**

Overall

Beyond these three primary recommendations we support the recommendations made by the Consultants’ Report. Below we point to a few places where we would place different emphasis than the CR.

Undergraduate Program

According to the USS, undergraduate enrolment in Computing peaked in 2000-1 along with the dot-com bubble. Then enrolment declined sharply. Since then the Biomedical Computing degree program was introduced and the market for computing graduates has picked up. It is likely that Computing is entering a new phase of high enrolment at the undergraduate level. One early sign is enrolment of 60 students in COGS 100 in Fall 2006. We note that the Consultants praise both Biomedical Computing and Cognitive Sciences as innovative and unique offerings.

As emphasized in all documents, the Jackson Hall undergraduate computer lab is wholly inadequate. There are very serious access and safety concerns that must be followed up at the University level. COMPSA report states that the Jackson Hall lab does not even have a computer projector and screen. The School has created a new undergraduate lab in Goodwin Hall but it is not large enough on its own.

Beside the overarching concern about space, there are concerns about the undergraduate program that should be addressed. The dominant theme is managing variability and growth in enrolment across cohorts and across the various programs offered by the School. For example, while 60 first year students in COGS is wonderful, only 2 faculty members are associated with this program and they are teaching in this program on overload. Is the School prepared to manage larger cohorts in the coming years?

There are three other concerns raised in the reports of both COMPSA and the Consultants' that we also highlight:

- ▶ Difficulty in scheduling classes between Arts & Sciences and Life Sciences
- ▶ Inconsistency in course content and marking both across years and across sections
- ▶ A perceived lack of depth in the Biomedical Computing degree and too little emphasis on programming in general.

The first issue must be addressed by the University in cooperation with the units involved. The second issue is something to take seriously but might be said by students in many units. The third issue is a potential warning sign that the School should ensure is not a sign of a weakened curriculum.

Graduate Program

The Consultants rate the graduate program as strong. While undergraduate enrolment fell

after 2001 the graduate program has grown. This is not unexpected, since Bachelor degree holders with poorer job prospects are more likely to choose graduate school to bolster the skills and ride out a downturn.

Addressing the main issues of space and faculty in core computing would make a significant difference in the graduate program. However, graduates use space quite differently than undergraduates. Thus, much more needs to be done than simply moving the Jackson Hall laboratory. At least three newly renovated labs are relatively spacious and equipped for mixed use. The same cannot be said for other labs and for the general office and seminar space. For example, experimental work with patients in biomedical computing is carried out in the same space as graduate students have desks. At the least this is inefficient (if students must leave during experiments). At worst it is inappropriate (if other students continue to work while experiments go on).

All signs point to high morale and cohesion among undergraduates, but there are signs pointing in the opposite direction for graduate students. The Consultants' report that some supervisors discourage students from doing anything but their own research, including going to seminars. The USS lists just 6 outside seminars last year, which seems a small number given the size of the faculty and the PhD program.[†] Establishing regular seminars in different areas that several groups commit to attending each time is one method to create cohesion.

A key issue in both the USS and the Consultants' Report is funding for international graduate students. This appears to be addressed already by Dean Deakin's proposal, but we note that Computing is seriously affected by the existing scheme that makes international students difficult to attract.

Scholarship and Research

As emphasized in the Consultants' Report, the School has become stronger in research since its last IAR. The record of awarded grants is excellent. Faculty have received funding from all three councils and multiple CFI grants.

Since the last IAR, faculty in Computing have received prestigious research awards, including the Premier's Research Excellence Award and the Queen's Research Award.

[†]By way of comparison, Economics hosted 15 outside speakers spread over 5 seminar series in September-October 2006. Annually it hosts 2 endowed public lectures.

Teaching and Learning

Our comments in this area can be found in the previous sections.

Service

The School offers important programming courses for the rest of campus, including the newly introduced CISC-081. Faculty members participate in university committees.

Resources

Space has been discussed earlier. Overall, the support staff situation is good with some issues that need to be looked at carefully by the School.

The staff position to support grants is uniformly seen as an excellent approach.

Several staff positions are funded on soft money without the benefit of continuing appointments. While the department appears comfortable with the current situation (based on the USS and follow-up discussions), concerns are raised in the Consultants' report. The issue is whether lack of job security could affect morale and continuity if staff leave to take up more stable positions on campus. Also, there are concerns about the distribution of the workload across staff. The expanded graduate program has placed a heavy burden on the graduate coordinator.

Plans for the Future.

The major planning issue is space. While renovations funded by CFI have been very helpful, at this point the School must address space from its own perspective. We applaud the School for making the most out of what it has and for maintaining morale in the face of imperfect facilities.

What seems to be missing from the USS and from discussions with the School leadership is a longer-term plan to address the resource issue. Renovating and re-organizing existing space can only go so far. New space is clearly required, and the University must help the School obtain it in order to protect the academic programs threatened by crowded and ill-suited conditions. But for its part the School appears to have no plan for accumulating funds which, in effect, would meet the University half-way. The close connections to industry and the improved high tech sector would seem to make this possible.

Review Team Activities

October 4, 2006	Organizational meeting; discussion of the Unit Self-Study.
October 25, 2006	Tour of the Facilities, including a meeting with Jim Cordy, Pat Martin and Dean McKeown to discuss the USS.
November 17, 2006	Meeting with the External Reviewers. Student members meet with student groups.
February 7, 2007	Meeting to begin drafting this report.
March 9, 2007	Submission of the report to the Senate IAR Committee.

Please find the External Consultants Report attached.

**External Academic Review
School of Computing
Queen's University
December, 2006**

Executive Summary

The School of Computing is central in providing specialist programs in computing and multidisciplinary programs that study computing as an enabler for other disciplines. These programs provide an education for students interested in other disciplines and computing specialists.

The School of Computing has significant research strength in software engineering and theoretical computing science and there is strong evidence of emerging strengths in biomedical applications and human-computer interaction. There are strengths in system related areas that could become significant strengths with appropriate hires. There are several expected retirements in core areas. The School needs to be able to replace these positions to maintain its ability to teach courses in core areas.

The undergraduate program is strong but between the retirements and the increased expectations of new faculty members there is a reduced amount of time spent on the undergraduate curriculum. There are concerns about the quality of space assigned to undergraduate students that must be addressed.

The graduate program is strong. There were two concerns. The first is the lack of social cohesion. The second concern is the rejection of international students due to a lack of funds.

The most immediate concern identified is space. Assigned space is either not enough for the purpose the space was assigned for or does not suit the purposes it was assigned for. There are problems with student space and research laboratory space.

The staff are excellent but the graduate coordinator appears to be overworked as the result of the large increase in graduate students in the last several years. The soft positions should be made permanent.

The School has relatively high female enrollment.

The School has made great progress towards achieving a 5th place ranking in Canada. However, we believe that space is a major issue that could impact graduate recruitment which could make it difficult to achieve and maintain the 5th place ranking. The competition for 5th place is strong and the primary weakness of the School is space.

1. Introduction

The external academic review of the School of Computing at Queen's University was carried out following the process initially described in the senate document of April 30, 1998, and amended in January 22, 2004 and November 18, 2004. The external consultant team was composed of:

Dr. Hanan Lutfiyya, The University of Western Ontario

Dr. Yelena Yesha, University of Maryland – Baltimore County

The external consultants visited the University on November 16 and 17, 2006.

The external consultants had at their disposal the self study prepared by the school, results of interviews with Dr. James Cordy, Director of the School, Dr. Patrick Martin, Associate Director, members of the school, Dr. Tom Harris, Dean of Applied Science, Dr. Alistair MacLean, Dean of Arts and Science, Dr. Greg Lessard, Associate Dean of Arts and Science, Dr. Janice Deakin, Dean of Graduate Studies, Dr. John Dixon, Associate Vice-Principal (Academic) members of the internal review team, members of departmental technical support staff, members of the departmental secretarial staff, undergraduate students and graduate students. The external consultants found all members of the school, faculty, staff and students to be very cooperative.

The external consultants reviewed the School from the perspective of its undergraduate and graduate programs, research activities and interactions with other departments. The self study report provided an excellent basis for the review.

2. Undergraduate Education

The School offers a traditional program that allows students to specialize in computer science. This program has been accredited by the Canadian Information Processing (CIPS). The School also offers a program that has been accredited by CIPS based on software engineering criteria. A major in computing is defined that is used to support multi-disciplinary combinations through the Major/General and Major/Minor programs offered by Queen's University. The School offers several innovative programs that appear to be popular with the students. One of the few undergraduate programs of its kind in Canada, the Cognitive Science program explores the integration of computing, psychology, philosophy and linguistics. The Biomedical Computing program provides students with the background needed to develop and analyze algorithms for biological and medical

applications. What makes this program unique in Canada is that most related programs primarily focus on bioinformatics while this School's program also looks at algorithms for medical applications. As research in biology and medicine becomes increasingly more computational the Biomedical Computing program is both innovative and timely.

The School offers several courses to enhance communications skills (CISC-499, CISC-497, CISC-498 and CIS-499). These courses require students to write and present. Each student must take at least one of these courses. This is an excellent idea especially considering the importance of team work in much of industry including collaboration with team members that are remote.

A concern relayed to the external consultants is that there are two faculty members essential to the Cognitive Science program. One is from Computer Science and one is from Psychology. The program rests on these two people who teach the courses developed especially for the program as overload teaching. These faculty members are due to retire in the foreseeable future which would impact the ability to offer these courses. Additional teaching support needs to be provided to the Cognitive Science program.

Undergraduate students' comments exhibit a strong sense of community. The students praised the faculty for their willingness to interact and work overtime to help them. However, the students indicated that the loss of the use of space that belongs to the Department of Electrical and Computing Engineering may impact the strong sense of community. Another possible contributor to the weakening of the sense of community are the locked staircase doors (these are locked on the side that is by the staircase) on the 6th and 7th floors of Goodwin Hall.

Other concerns expressed by the students are summarized as follows:

- The timetabling does not always take into account that courses needed for the specialized degrees (where courses are needed from multiple departments) conflict with each other making it more difficult for students to complete their degree in a timely fashion.
- There are large differences between different sections of the same course even when those sections are taught in the same term. Students also expressed concern about a specific course that changed between two separate years. One student remarked that even though she had failed the course the previous year she had learned much more than what she was learning this year.

- There is concern about the lack of depth in the biomedical computing program. Students are not convinced that they have enough knowledge of either computer science or biology.
- The laboratory in Jackson Hall has a number of problems including wheel chair accessibility, student safety especially for female students and the lack of equipment (e.g., project and screen) to support tutorials taught in the Jackson Hall laboratory.
- Some of the courses could be more challenging. Suggestions included getting rid of the overlap in several courses and provide more opportunities for programming.
- There is a lack of confidence in programming. Students appreciate the theory taught in their courses but feel that there can be more assignments that allows them to apply the theory and boost their programming skills. The course that students feel that this would be most useful is the third year algorithms course.
- There were comments about the inconsistency of marking and feedback by the teaching assistants.

The students provided the external consultants with a report of their views based on a meeting that the students held on November 16th. The students indicated a strong desire that the report be read by us and the internal review team. The student report is being included with our report.

There appears to be good cooperation between the School of Computing and the Department of Electrical and Computer Engineering in sharing the teaching of several courses in software engineering and systems.

The following recommendations are made.

1. We share the students' concerns about the safety and accessibility of the Jackson Hall laboratory. This laboratory should be moved. Preferably it should be moved to Goodwin Hall.
2. Coordinators for a course or a set of related courses should be assigned to ensure that there is consistency between different sections of the same course and to prevent too much overlap of the contents of multiple courses.
3. Introduce more programming projects/assignments in courses where the programming would re-enforce the concepts taught in class e.g., operating systems, algorithms.
4. Examine approaches to providing consistency in marking.
5. Have curriculum reviews more often.

3. Graduate Education

The Department offers MSc and PhD programs. Both programs have seen large increases in the last seven years. The Department has a high student to faculty ratio. This is reflected in the weighted MSc and PhD student enrolments. The influx of new faculty members that includes a large number of those in the application areas suggests that the School ask for accreditation in more areas by OCGS. The third category labeled *Applications in Computing* is a little vague. Two possible areas are biomedical applications and software engineering.

A biomedical graduate degree would be of great interest to potential students and would increase the size of the graduate applicant pool.

Comments from graduate students suggest that there is a lack of strong community spirit. Several factors were suggested for this: (1) Several students would find offices more conducive for working on campus. The lack of offices has had students working at home. (2) Despite the larger size of the graduate student body there are fewer graduate student seminars. Students report that some supervisors discourage them for doing anything but their own research. This includes not going to seminars. (3) The locked doors from the staircase. (4) Lack of social activities. We understand that there is a tea time every Friday but it would appear that this is not sufficient.

Students also expressed concern about space. Several labs have had furniture replaced so that the labs can take in more additional students. Students feel much more squeezed in.

Students expressed concern about large class sizes.

PhD students would like more teaching experience. In the past there were more opportunities for teaching as a result of the large undergraduate enrollments. The students understood this but thought that they should be given more priority than “outsiders”. To increase the competitiveness of PhD students with respect to getting a sessional adjunct position, students should be encouraged to attend teaching workshops.

The School has limited funds for international students. New initiatives by the provincial government to attract graduate students focus on domestic students. Computer Science traditionally gets most of its applications from international students. This problem is not unique to Queen’s but there are efforts at other Ontario universities to address this problem. It is recommended that Queen’s look at initiatives at other Ontario universities.

The following recommendations are made.

1. Provide a lounge for graduate students.
2. Enhance the social activities of the graduate students.
3. Discuss with faculty the importance of attending seminars. Students should not be actively discouraged from doing so.
4. Introduce a required graduate research seminar where faculty and students present research results. This should be coordinated jointly by a faculty member and a one or more students.
5. Open hallway doors in the during regular work hours.
6. Encourage PhD students to attend teaching workshops (assuming these workshops exist).
7. Study approaches to funding international students.

4. Research

The School lost several senior people in the mid 90's. The School has replaced the losses and has added four new positions. The hires were junior to mid-career. All have been involved in building research groups and laboratories. The School has reached out to several departments to enhance and compliment its research strength. This is especially true of software engineering and biomedical applications. However it is not limited to just these two areas. This interdisciplinary focus is increasingly becoming important in order to remain competitive. The funding brought into the department includes federal, provincial and industrial funding.

The School has research strengths in software engineering and systems, theoretical computer science, human-computer interaction and is emerging as a leader in biomedical applications. This is reflected in the funding levels especially in the biomedical applications area with money from the health sciences granting councils e.g., Canadian Institutes of Health Research (CIHR).

There are several researchers in core areas who feel isolated since they do not have collaborators in the department especially since most of the new hires are in the biomedical area. Ideally future hires will complement different research interests. Related to this is the observation that 25% of the graduate students are in networking or databases yet there are

only two faculty members in these areas. The School should consider hiring more people in these areas.

Recommendations:

1. Hire faculty in whose research interests are in the core areas of computer science especially in databases and networking.

5. Faculty

The School hired four new faculty members in the biomedical application areas and software engineering. The four new faculty members appear to be collaborating with each other, more senior faculty and faculty in the other departments. They are either PIs or co-PIs on CFI, OIT and CIHR grants. With the faculty hired in the late 90's and the four hired recently the number of graduate students has tremendously increased and appears to be approaching steady state. Research funding is high.

As the School loses faculty to retirements or other reasons it is important that the School be allowed to replace those positions. The next wave of retirements is expected to be in the core areas of Computer Science. Not replacing these faculty members not only hurts the research profile of the department but also would negatively affect the teaching of courses.

An observation made from the reading of the CVs and discussions with faculty members is that many faculty members (especially junior faculty) are not doing much service work. This can be attributed to the following: (1) Agreements that new faculty not be given committee work right away. (2) Increased workload on faculty through graduate student supervision and the effort expended on getting grants especially by junior faculty. The impact includes less time to participate in recruitment activities (e.g., attending the university fair in Toronto) and curriculum reviews. One suggestion was that administration makes a list of tasks that need to be done throughout the academic year. This list would be provided to the faculty in the summer. Faculty would choose at least one task.

Recommendations include the following:

1. Replace faculty when a position is freed up as a result of retirement or some other reason.
2. Plan the list of administrative tasks as early as possible and allow faculty to choose from the list.

6. Space

The School has done an admirable job of dealing with the space allocated to it. However, the School badly needs new space. The School has increased the number of graduate students in the last seven years reversing a trend of a decreasing number of students in the 90s. The School has been unable to properly accommodate them. Another factor contributing to the School's space woes is that many faculty members require experimental research laboratories. This type of laboratory consists of specialized equipment used for a specific camera, equipment being used in such a fashion that would not be appropriate in a general environment (e.g., loading a network switch), or equipment associated with experiments dealing with human subjects. This is in addition to laboratory space needed to provide desk space for graduate students. The School is unable to properly support either type of space. We were especially concerned with the same lab space being used for graduate student desks and experiments involving human subjects. The School has tried to make this up by converting some undergraduate laboratory space to research laboratory space but this is insufficient and the loss of undergraduate laboratory space will negatively impact undergraduates when the enrollments start to increase. The lack of space could impact graduate student recruitment since many universities in Ontario have accommodated graduate student and faculty growth with either new buildings or additional space in existing buildings that have been renovated.

The computer-aided surgery group needs additional laboratory space that is easy to clean.

Concerns were expressed by undergraduate students, graduate students and faculty about the locked staircase doors. All felt that this had a negative impact on the sense of community.

There were concerns about the undergraduate laboratory in Jackson Hall and the lack of lounge space.

Recommendations include the following:

1. Move the undergraduate laboratory in Jackson Hall to Goodwin Hall.
2. Provide "lounge" space adjacent to the undergraduate laboratory.
3. Unlock staircase doors from 9 to 5.
4. Find more space to allow the separation of student laboratory space and experimental laboratory space.
5. Find additional space for biomedical research.

7. Staff

The School's staff is categorized as follows: (1) Administrative or secretarial support staff and (2) Technical support staff.

The staff members are excellent. We were impressed with the enthusiasm and general happiness that the staff had with the work environment. This is evident with the awards they are winning. We find the research administrator position to be innovative. The increasing number of sources of funding along with complexity of rules governing spending is becoming overwhelming. We were concerned that this was a soft position as well as two other staff positions. The loss of these positions would tremendously increase the already busy workload of faculty.

The Graduate Studies Assistant has seen her workload increase as a result of the increase in graduate students. It is recommended that help be provided to her to deal with the increase.

Recommendations include the following:

1. Find ways to help the Graduate Studies Assistant
2. Make the soft positions permanent.

8. Equity

The School has special strength in attracting women in the field. As far as we know the School has the highest percentage of female students in Canada and one of the highest percentages in North America. The decline in female students in the last several years is small compared to other schools in Canada. Relatively speaking there is strong female representation on the faculty including two full professors. The School aggressively pursues a policy of accessibility for the handicapped.

9. Summary

The School has made great progress towards achieving a 5th place ranking in Canada. However, we believe that space is a major issue that could impact graduate recruitment which could make it difficult to achieve and maintain the 5th place ranking. Renewal of faculty is an absolute must. The competition for 5th place is strong with the current primary weakness of the School being space.