

Approved by Senate: February 8, 2012

**Final Assessment Report
Academic Review**

Computer Science

A. Summary

1. The Department's Self Study was considered and approved by the Academic Review Committee of Senate on February 10, 2011.
2. The Review Committee consisted of two external reviewers: Wolfgang Banzhaf (Memorial University) and Deborah Stacey (University of Guelph), and an internal reviewer, Jean Bridge (Visual Arts).
3. The site visit occurred on March 23 – 25, 2011.
4. The Reviewers' Report was received on April 26, 2011.
5. The Department's response was provided on June 7, 2011.
6. A decanal response, from Interim Dean Rick Cheel, was received on August 4, 2011.

The academic programs offered by the Department, which were examined as part of the review included:

BSc Computer Science (Co-op and non-Co-op)
BSc Computing and Network Communications
B Computing and Business (Co-op and non-Co-op)

This is one of the first reviews conducted entirely under the terms and conditions of the IQAP approved by Senate on May 16, 2010.

B. Strengths of the Program

The reviewers' report states:

The Department of Computer Science undergraduate program has evolved over the past 26 years into a comprehensive and well structured series of curricula resulting in a variety of degree programs, each of which provides students with foundational knowledge, diverse theoretical and methodical perspectives, professional practice and experience that prepare them to develop and apply computational solutions to problems in varied domains.

The report goes on to say “students are exposed across the program to the full range of learning that includes not only discipline-specific knowledge and concepts but also to diverse methodologies and applications, communication skills, understanding of contexts and limitations and professional practice.” The reviewers support their conclusion by describing the department’s curriculum, teaching strategies and collaborations with other departments:

This program has given considerable thought to the balance between theoretical learning and its application in practice - something we see evidenced in the practice and application of concepts in projects carried out in tutorial and lab components for most courses. ...It is also evident that many courses give students a relatively wide range of opportunities to work in teams and to develop transferable skills that will make them better able to exercise personal responsibility, work effectively with others where such abilities as collaboration, accountability and decision-making are carried out in complex context. The availability of such innovative interdisciplinary programs such as the Center for Digital Humanities affords many opportunities for senior students to participate in project courses that expose them to real-world teamwork situations and allows them to collaborate with other senior students from the creative arts. This is a unique opportunity to distinguish Brock’s Computer Science students and programs from others in the province and country.

The Reviewers assigned the Department the outcome category B, “Good Quality”.

C. Opportunities for Improvement and Enhancement

The reviewers provided 27 discrete recommendations grouped in four categories, along with a number of “observations.” These are considered as follows:

1. Recruitment and Retention

1. The Department should work on increasing its reputation - this will aid in attracting students and faculty. This can be done through better outreach, continuing improvements to the undergraduate program and through research excellence.

The Department noted that: “Ultimately the problem is with marketing and advertising—getting the message out. The Department has had a difficult time “blowing its own horn”. We are Computer Scientists not marketing people. We have the technical expertise but not the advertising savvy. It will be necessary to tap outside expertise either through secondment or remuneration, to develop a marketing plan for the Department.” Also, it proposed the creation of “Research Groups—communities of research interest—whose joint results can be communicated.”

Dean Cheel’s response indicated that:

The Faculty Advancement, Communications and Alumni Officer will work with the department to develop a plan to enhance the efforts of the department to publicize its achievements. In addition, our Faculty Retention and Recruitment Committee will continue to develop new strategies for success in these areas. The Dean’s Office will support the creation of viable Research groups that are proposed by the department.

ARC considers that this recommendation has been accepted and is in the process of implementation. It notes that support from units such as University Marketing and Communications and Office of the Registrar (Undergraduate Recruitment) will be essential to such implementation.

Implementation Plan (First Priority)

Responsible for approving:	Dean and Provost
Responsible for resources:	Provost/VP, Academic
Responsible for implementation:	Dean, Department Chair, University Marketing and Communications and Office of the Registrar (Undergraduate Recruitment)
Timeline:	Dean to report by December, 2012.

2. The Office of the Registrar, Admissions and Recruitment should provide more effective data, analysis and strategic facilitation to enable better recruitment efforts.

The Department indicated that “The lack of access to [admissions] data and the ability to make *ad hoc* queries makes decision-making regarding admissions criteria next to impossible.” Dean Cheel’s response was:

The Deans Office will encourage the offices of the Registrar and Institutional Analysis to develop means of providing more useful institutional data that will enhance recruitment efforts. Lack of availability of data is a problem that is pervasive across the University and is a problem that has been under consideration by the Senior Administration.

ARC has been informed of the fact that the institutional analysis function at Brock is currently under review by the Senior Administrator’s Council (SAC). The results of the SAC review will positively impact the provision of “more effective data, analysis and strategic facilitation” and the recommendation noted above will be acted upon in due course.

Implementation Plan (Third Priority)

Responsible for approving:	Provost/VP, Academic
Responsible for resources:	Provost/VP, Academic
Responsible for implementation:	Provost/VP, Academic
Timeline:	Provost to report by end of the 2012-13 academic year.

- 3. The department should seize the opportunity in the area of robotics, for recruitment, retention of students and general increase in the attractiveness of the program. Since Brock does not have an Engineering school, COSC has the flexibility to explore areas such as robotics and automation, optimization, etc. that might traditionally be seen as the domain of engineering.**

The Department notes that “a complete Robotics program would be an expensive endeavour. While not having an Engineering program means that the Computer Science Department could have flexibility in program design, it also means that there is no existing expertise, infrastructure or equipment base upon which the Department could draw.”

Dean Cheel indicates that:

This recommendation requires a faculty replacement position(s), renovation of existing space, and equipment purchases that may be significant. The recommendation also would require a commitment by the department to develop this area of instruction and research and such a commitment would be more reasonably made after it develops its own strategic plan. Such a significant Decanal commitment should await the arrival of the incoming Dean.

ARC accepts the need to postpone consideration of this recommendation until such time as the incoming Dean has had an opportunity to consider the issue.

Implementation (On Hold)

ARC would ask that the new Dean provide advice on the disposition of this recommendation by December, 2012.

- 4. Recruitment efforts should involve students more, possibly by sending them out as COSC ambassadors, to high school science fairs, etc. and also rewarding them for this activity. This should help both recruitment and retention.**

In its response, the Department reported:

The Department has made use of students for recruiting with mixed success. We established a Computer Science Ambassador's program where we had current students go back to their High Schools to promote Computer Science... The subsequent year we had little success attracting Ambassadors. The same year we established a peer mentorship program (called the Overlords) where we matched incoming majors with a senior student in the program. We had an orientation session and then we left it to the incoming students to contact their "Overlord" at their discretion. While initially promising, few students contacted their "Overlord" and again, the next year we had difficulty attracting any senior students to the program. We have always involved students in Open House activities, usually with good success. Unfortunately, student engagement seems to have declined over the last few years so recruiting initiatives involving students have not been overly successful. Whether this is due to the nature of the current student cohort or a symptom of some deeper problem in the Department is unknown.

In any case, the Department will investigate approaches increasing student engagement and continue its attempts to involve students in recruitment activities.

Dean Cheel reports that: "The Faculty Recruitment and Retention Committee will work with the Department to [develop] the proposed strategy".

ARC understands that the recommendation has been accepted.

Implementation Plan (First Priority)

Responsible for approving:	Dean and Department
Responsible for resources:	Dean
Responsible for implementation:	Dean and Faculty's R&R Committee
Timeline:	Dean to report by December, 2012.

- 5. The department should review its web content and revamp it as the primary means of effective and contemporary self-promotion. The current website is very thorough - though information on research by faculty, graduate and undergraduate students is lacking as is a lively news section and listing of events. The area for prospective students has much useful information but it is in no way compelling.**

The Department responds that “a website redevelopment requires both a marketing analysis to determine what prospective students are looking for and then a graphic design that is attractive to students. While the Department has the technical expertise to develop the site, it lacks the marketing and design abilities” while Dean Cheel indicates that “The Faculty Advancement & Communications Officer and the Faculty Recruitment Officer will work with the department on improving its web presence. Funding will be available to pay for reasonable costs associated with web improvement.”

ARC considers this recommendation to have been accepted and in the process of being implemented. It notes that support from University Marketing and Communications will be essential to such implementation.

Implementation Plan (First Priority)

Responsible for approving:	Dean and Department
Responsible for resources:	Dean
Responsible for implementation:	Dean, Faculty’s R&R Committee, and University Marketing and Communications
Timeline:	Dean to report by December, 2012.

6. 50% attrition in co-op is a concern. This issue needs to be studied by the department and a plan developed to attack the problem.

The Department points out that:

While it is true that attrition in Co-op is high, it is no higher than attrition in the program as a whole. It is also the case that most of the students who leave Co-op simply change to the non-co-op program, so they are not actually lost to Computer Science.” However, the Department also point to a number of areas for possible improvement that are beyond the department’s immediate control, including the structure of Spring and Summer academic terms.

Dean Cheel agrees, suggesting that “Senate needs to consider a revamping of Spring and Summer terms in light of problems that arise every year over these two terms.”

In ARC’s view, the issues at play in this recommendation are University-wide and need to be addressed at that level. ARC thus recommends that Senate examine the issue of the structure of the Spring and Summer Sessions.

Implementation Plan (Third Priority)

Responsible for approving:	Senate
Responsible for resources:	Senate
Responsible for implementation:	Senate
Timeline:	Chair of Senate to report by end of 2012-13 academic year

7. Students should be introduced to the interdisciplinary areas of digital media and computer games and courses and programs should evolve to allow for more innovative, interdisciplinary work.

The Department responded that it “is currently in discussions with IASC and Niagara College on an inter-institutional interdisciplinary program in Gaming with hopes that such a program could be rolled out in 2011 or at least 2012” and, in fact, a draft Statement of Intent for such a program has been submitted to ARC. The Department also noted that a Bioinformatics program was under consideration.

Dean Cheel reports that “the Dean’s Office will support such initiatives at the appropriate time in their development (e.g., supporting reasonable changes in regulations at Senate) and budgetary requirements will be considered within the context of the funding climate at Brock at that time.”

This recommendation is obviously being pursued and ARC looks forward to future developments.

Implementation Plan (Second Priority)

Responsible for approving:	Dean and Department
Responsible for resources:	Dean
Responsible for implementation:	Dean and Department Chair
Timeline:	Dean to report by end of 2012-13 academic year

2. Faculty, Staff and Infrastructure

8. A plan for faculty retirements and replacements should be developed by the department and the Faculty of Science in consultation with the higher administration.
9. Any new faculty hiring plans should look forward, and not backward. Questions like: Where are the growth areas?, or, Where are the student numbers? could lead to new initiatives and ideas with an alignment of interests of the department, the Faculty of Science and higher administration.
10. The department should review its commitments in terms of long-term sustainability. Running an undergraduate program, and one or two graduate programs, plus large sections of APCO courses without access to an equivalent faculty complement would not be possible in the long term.
11. The department should use the renewal process as a chance to occupy new niches, rather than to defend old areas. New faculty hires should be expected to have an innovative research agenda/area (such as gaming, mobile/wireless, robotics, security, etc.), yet should be able to teach core courses of COSC.
12. Interdisciplinary work, notably in areas where there is investment elsewhere at Brock, e.g. with the Centre of Digital Humanities, should be considered and embraced by faculty as an opportunity to expand the reach of the department.
13. The department should study the possibility of cross appointments in strategic areas.

Both the Department and the Dean consider these six recommendations as “intrinsically linked.”

The Department “fully supports the need for a faculty replacement plan” and “will strike a Hiring Committee to begin the process towards hiring including the requisite Employment Equity plan, setting of priorities, drafting job advertisements etc.” It goes on to state that: “Should the University decide not to support faculty renewal in the Department the Department will have to begin a retrenchment exercise and decide which programs/courses can no longer be supported and whether any new initiatives are viable.”

Dean Cheel responds that “A plan for retirement and replacement is needed for the entire Faculty. However, it would be entirely inappropriate to do so without the leadership of the incoming Dean. It is expected that once our new Faculty Strategic Plan has been developed, and the future funding is better known, that such a plan will be developed.”

ARC accepts the need to postpone consideration of these recommendations until such time as the incoming Dean has had an opportunity to consider the issue.

Implementation Plan (On Hold)

ARC would ask that the new Dean provide advice on the disposition of these recommendations by December, 2012.

14. We recommend that faculty start a process whereby faculty CVs are collected in a common format, such as provided by the CommonCV platform, or by NSERC requirements.

The Department reports that the recommendation “will be considered,” while Dean Cheel notes that it is “a trivial but reasonable recommendation.”

ARC agrees that a consistent CV format is important for the reviewers and will require such consistency in self studies in the future. In addition, ARC believes that this particular recommendation should be part of a larger discussion regarding standardisation of CV formats at Brock.

Implementation Plan (Third Priority)

Responsible for approving:	Provost/VP, Academic
Responsible for resources:	Provost/VP, Academic
Responsible for implementation:	Provost/VP, Academic
Timeline:	Provost to report by end of the 2012-13 academic year.

15. Faculty should reconsider becoming more active in funding initiatives. Young faculty - where eligible - should consider applying for CFI funding.

The Department indicates that this recommendation “will be individually considered and supported by the Department” and Dean Cheel states:

The department should seek input from Research Services to explore the possible options that are reasonable given their areas of expertise. The Office of the Dean will support any reasonable applications for such funding, within the context of the Faculty’s overall priorities.

ARC asserts that this matter is best addressed on an individual basis since the decision to seek research funding relates to the research plan of the faculty member. Thus, ARC deems this recommendation to have been both accepted and implemented.

Implementation Plan

ARC notes that the Department has implemented the recommendation and no further action is required at this time.

16. The department has a 4-year plan for renewal of computer hardware and labs. The university should improve this by given greater priority to the department in its hardware renewal program, e.g., by giving machines after 1 year to COSC, rather than to administration, or otherwise finance a 2-3 year lab equipment renewal cycle in Computer Science.
17. It is particularly important that the Faculty of Science and the university understand the importance of maintaining the department servers. This equipment is essential to the smooth functioning of the computational infrastructure that is necessary for the students regardless of whether they are working in the labs, on their laptops on campus, or on their laptops or desktops at home or in residence. A sustainable funding model for their support should be developed as a priority.

The Department reports that it has “argued for a commitment to lab hardware upgrade on a 4-year cycle” and that “Server replacement is also necessary on a planned cycle.” Dean Cheel notes:

The Office of the Dean has provided funds for computer replacement/upgrade over the years and those funds, combined with the redeployment of University computers, have allowed a regular turnover of student computers and servers. However, this practice has become less reliable over the years and has depended on the availability of University machines (which we find that we cannot count on) and discretionary funds from the Dean’s Office. The situation is complicated by the fact that the Department of Mathematics now has a smaller, but technically comparable, need for computer replacement due to the success of the MICA program. It is entirely reasonable to consider computer/server replacement as an ongoing budget line for both of these departments and the Interim Dean will recommend that the incoming Dean consider this as a change to current budgeting practices.

While appreciating the complexities of priority setting, ARC strongly believes that renewal plans should not be problematic, that the Dean should establish (in conjunction with ITS) a long-term plan for the replacement of computing equipment. This is especially true when such resources are integral to the academic plan of a department. Further, it is incumbent on the University to ensure that the needs of existing programs are addressed with the same fervor as those of new programs. That said, ARC accepts the need to postpone consideration of these recommendations until such time as the incoming Dean has had an opportunity to consider the issues.

Implementation Plan (On Hold)

ARC would ask that the new Dean provide advice on the disposition of these recommendations by December, 2012.

18. The Faculty of Science should consider the introduction of a transparent way to switch funding to a resource allocation model and to make this clear to the departments so that they know what is expected and how they will be rewarded.

The Department notes that:

Clearly planning and setting of priorities requires clear knowledge of the effects of decisions, especially with respect to provision of resources. The current situation where there is no knowledge of the effect of decisions (e.g. committing resources to service courses), results in departments trying to commit to everything, just in case.

Dean Cheel reports that “The University awaits the adoption of the Brock Resource Allocation Model (BRAM) that is expected to clarify the relationship between Faculty funding and activities. How such a model could be implemented at the Faculty level must await the larger model.”

ARC is not convinced that the development of a Faculty resource allocation model is dependent upon the existence of a university-wide one. However, it sees this issue as yet another one which must await the arrival of the new Dean.

Implementation Plan (On Hold)

ARC would ask that the new Dean provide advice on the disposition of this recommendation by December, 2012.

3. Undergraduate Courses

19. The undergraduate curriculum is at a point where it should be reviewed. Possible issues to be considered include

- a. taking a “learning outcomes” perspective when revising the program
- b. adapting the curriculum to new ACM recommendations
- c. reviewing all courses to determine which need to be revised (modernization of the *robotics* course) or removed (a general reduction of the number of 4th year courses on the books to allow for new, more modern senior courses) and to identify possible new courses that could be added to create more student engagement (e.g. mobile applications, wireless technologies, security, game development)
- d. exploring the possibility of taking advantage of some of the Applied Computing courses such as the hands-on hardware course which is not currently available for CS students

The Department reports that “the [Departmental] Curriculum Committee has already begun the process of a complete Curriculum review. It has engaged CTLET to assist in curriculum development, especially in a top-down design based on learning outcomes. The ACM Curriculum guidelines will also be consulted.” The Dean advises that: “These are all very reasonable suggestions and the department’s Curriculum Committee is moving forward with their consideration.”

ARC deems this recommendation to have been accepted and in the process of being implemented.

Implementation Plan (Third Priority)

Responsible for approving:	Department
Responsible for resources:	Chair of Department
Responsible for implementation:	Chair of Department
Timeline:	Chair to report by December, 2012.

20. The department has made a very large investment in its service courses (Applied Computing), but it is at a disadvantage because none of those courses won the designation of a context course within Brock. The department should consider the introduction of a sustainable resource model for these courses, in consultation with the Faculty of Science and the higher administration.
21. The department should look into defining at least two courses that would be acceptable as context courses, at least one for non-programming-oriented students and one for students who can be taught principles of programming. At least one of these courses should be a COSC major course so that students of Computer Science are not disadvantaged with regard to their context course requirements and the number of allowable 1st year credits. The committee thinks that the current ethics course is a candidate context course - useful and interesting for CS and non-CS students alike. It would provide a home for early collaboration between CS students and students from other disciplines.

Dean Cheel summarizes the situation as follows:

Under the current funding climate, and under BRAM in future, there will be benefits to having one credit of context courses from COSC. Even more importantly, the relief of COSC students from taking a Science context credit would be beneficial because of the number of year 1 courses that are commonly required for them to fulfill their degree requirements. While the future of context courses at Brock is always in some doubt (the question of abolishing these requirements is periodically revisited by Senate) it is worth exploring the inclusion of a COSC credit among the Science context courses. The department should consult with UPC and other relevant committees to get some sense of what it will take to achieve this goal.

ARC would point out that FHB I: 6.2.C. says: “The designation of any course for which Core and Context designation is sought, shall first be approved by the Deans of the related Faculties.” At the same time, it is aware that these recommendations are currently being addressed through the UPC process. Thus, these recommendations have been accepted and are in the process of being implemented.

Implementation Plan (Second Priority)

Responsible for approving:	Dean and Department
Responsible for resources:	Dean
Responsible for implementation:	Dean
Timeline:	Dean to report by end of the 2012-13 academic year

22. The department should continue to make more active use of electronic procedures for teaching.

- a. The submission process for student assignments could be streamlined, so that submissions are either electronic or paper but not both. An investment in SVN or CVS technology could both teach students useful software engineering principles as well as allowing for electronic submission of assignments and course work.
- b. The teaching expertise of many Brock COSC faculty is well known and thus the department should make sure that all pedagogical advances by Brock faculty are disseminated throughout the entire program (even if they are pioneered in the service courses). A good example of this is the providing of podcasts of lectures to the students. This can aid the teaching enterprise as well as facilitating increased student retention.

The Department reports that: “Electronic marking has been pioneered in a few courses and extension to additional courses can be considered” and Dean Cheel advises that: “The department is investigating the possibility of implementing these recommendations. Once a plan is in hand, along with some idea of the cost, they should approach the new Dean for funding.”

ARC sees that the Department is moving forward with the development of a plan for the implementation of appropriate procedures but the question of funding support must wait until such time as the incoming Dean has had an opportunity to consider the issue.

Implementation Plan (On Hold)

ARC would ask that the new Dean provide advice on the disposition of this recommendation by December, 2012.

23. The number of evening courses in the program seems to be unnecessarily high for the student population. This scheduling aspect should be evaluated by the faculty.

The Department advises that:

The Department has had a long-standing policy of supporting part-time study by committing to offer at least 1 credit at each year level in the evening. Additionally, staffing problems have [led] to increased reliance on part-time instructors who typically can only teach in the evening. This has [led] to a significant number of COSC courses being offered in the evening. The Department will investigate the number of part-time students in the program to determine if the policy is outdated. Hiring of new faculty (see 8. above) would help reduce the reliance on part-time instructors. Of course, should there be a decision not to replace retired faculty, even more reliance on part-time instructors and thus an increase in evening courses would result.

Dean Cheel states that “it may be necessary to continue many night courses until the programs are revised and/or additional faculty may be hired.”

ARC sees this recommendation as being under consideration but not ready for implementation.

Implementation Plan (First Priority)

Responsible for approving:	Department
Responsible for resources:	Chair of Department
Responsible for implementation:	Chair of Department
Timeline:	Chair to report by December, 2012.

24. With the transitioning from senior undergraduate students as TAs to graduate students as TAs, the department should look to improve TA quality by arranging for the students to attend workshops and training sessions. There should also be better supervision, evaluation and feedback by relevant faculty.

The Department indicates that it “began a training program for TAs last year in support of the transition from undergraduates as TAs to graduate students as TAs. This program should be extended and improved”, while Dean Cheel notes that:

The reviewers point to a problem that has become evident across Brock with the growth of new graduate programs. The department’s plans to expand their current TA training should help, as will the development of new TA training programs through CTLET.

ARC deems this recommendation to have been accepted and in the process of being implemented.

Implementation Plan (First Priority)

Responsible for approving:	Department
Responsible for resources:	Chair of Department
Responsible for implementation:	Chair of Department
Timeline:	Chair to report by December, 2012.

4. Graduate Program

As Dean Cheel points out, “While this review was directed at the undergraduate programs of the Department of Computer Science, the reviewers took the opportunity to make recommendations related to the Graduate Program.” ARC accepts that the recommendations may relate, indirectly, to the undergraduate program and is prepared to deal with them in that context.

- 25. Faculty should strengthen collaboration with the cognate disciplines to increase potential in interdisciplinary areas of cooperation, joint teaching and joint research projects.**
- 26. The department should study the establishment of a PhD program after the review of the MSc program. We recommend that work on a potential PhD program should start now, not after the review of the MSc program, as there are many delays in this long process.**

While the Department notes that: “Some faculty are interested in interdisciplinary research and they should be encouraged. Unfortunately, both interdisciplinary and collaborative research are not necessarily counted as equal to individual and focused research by University committees and granting agencies”, Dean Cheel urges that the Department give consideration to the recommendations (particularly with regard to a PhD program, which the Department also supports).

ARC notes that these recommendations are outside the purview of the current (undergraduate) review and should be considered at the time of the review of the Department’s graduate program in 2014-15.

Implementation Plan

Recommendations NOT accepted at this time.

27. The department should regularly meet with 4th year students to encourage them to think about enlisting in the COSC grad program at Brock. Even if students decide to do graduate work at other institutions, they will enhance the reputation of Brock's COSC undergraduate program.

Dean Cheel, with the support of the Department, states:

This is an excellent suggestion that would provide benefit to senior COSC undergraduate students and to the reputation of undergraduate programs and the department, in general. It is likely within the department's budget to schedule an event for senior students to learn more about graduate studies at Brock or elsewhere.

ARC sees this recommendation as being under consideration but not ready for implementation.

Implementation Plan (First Priority)

Responsible for approving:	Department
Responsible for resources:	Chair of Department
Responsible for implementation:	Chair of Department
Timeline:	Chair to report by December, 2012.

D. Recommendations to be Implemented

The IQAP requires that ARC “set out and prioritize the recommendations that are selected for implementation.” In this particular situation, there are a number of recommendations which are awaiting the arrival of the new Dean before they can be considered. These are as follows:

Recommendations Implemented:

Recommendation 15.

Recommendations on Hold:

Recommendations 3, 8, 9, 10, 11, 12, 13, 16, 17, 18 and 22.

Concerning the remaining recommendations, the following priorities are proposed:

First Priority:

Recommendations 1, 4, 5, 19, 23, 24 and 27

Second Priority:

Recommendations 7, 20 and 21.

Third Priority:

Recommendations 2, 6, 14 and 19.

E. Recommendations that Will Not be Implemented

Recommendations 25 and 26.

January 31, 2012
/pb