QARC Review of Undergraduate Teaching in Computing

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Summary

What follows is an individual report contributing to a periodic five-year Institutional Review of the programmes offered by the Department of Computing at Imperial College London. The assessment is based on an evaluation of a written submission, combined with information gathered on a one-day visit to the Department on 13 June 2008 and other details available on the Department's website. The visit included a briefing from Professor Julia Buckingham, Pro Rector (Education), meetings with relevant staff and students, and a tour of the teaching facilities.

The overall conclusion is that the courses and their delivery appear to be up to an excellent standard, with the only significant recommendations for improvement being in the management of the joint programmes with Mathematics and in the arrangements for the Institutional Review itself.

The report is divided into three sections. The first offers some general observations on the Computing programmes at Imperial in relation to those provided in other institutions. In that context, the second section addresses the six main questions recommended for consideration in this report. A final section then comments on the Institutional Review process, considering in particular and its relationship to other reviews performed by professional bodies.

General Observations

The Computing programmes offered at Imperial College are distinctive in a number of respects:

- Computing at Imperial is clearly very successful in terms of the metrics currently used to assess the quality of teaching provision across UK institutions, particularly as reflected in its excellent position in the national league tables published in the UK press. Such success suggests that the basic approach of the Department is correct. Also, members of the Department seem to have good awareness of what is contributing to their high rating and, importantly, are working to preserve and/or improve that position.
- In the 1990s, many UK Computing departments were encouraged to increase student numbers to improve teaching income for their institutions. The Department at Imperial does not seem to have been subject to such pressure and so has suffered less than most in the worldwide downturn of student applications to Computing since 2001. Certainly there has been some drop in the number of applications received and the resulting UCAS point average of those admitted, but Computing at Imperial College remains in a very strong position.
- The Computing Department receives a significant number of high quality applications from overseas but would be happy to admit more, if suitable candidates could be found.

- One consequence of some institutions struggling to maintain student numbers in Computing is that there has been substantial innovation in the content and variety of programmes on offer in recent years. As a result of avoiding the swing in student numbers experienced elsewhere, however, the programmes at Imperial have largely remained unchanged in the past five years, with very little future change anticipated in the next period. This is consistent with Imperial simply continuing to offer a demonstrably successful 'product' but can leave the programmes looking 'dated'. It may be worthwhile, therefore, to monitor this threat periodically, perhaps through the newly formed Industrial Liaison Board or informal contact with Alumni.
- It is a strength that the Department, on its website, gives details of the individual courses offered and the people associated with them. Effectively, this information supports the marketing of the programmes so the Department may want to review the material periodically from that perspective. At present, for example, there is considerable variation in the level of detail provided[1]. Also, it would be better to omit the copyright date from each page (currently 2003).
- The programmes in Computing at Imperial have a greater mathematical requirement and content that is typical within the UK. This gives a distinctive character to the programmes and is consistent with the requirements of the Financial Sector to which the majority of graduates are recruited. One obvious threat to admissions, however, is the reducing emphasis on mathematics in secondary schools. This does not seem to be an immediate concern, as the number of applications is substantially beyond the admission level required, but this risk should perhaps be monitored routinely and programme content reviewed periodically as a result.
- The programmes have a strong practical emphasis, built around "laboratory and problem solving classes". The students say they are "worked hard" in these classes and that is reflected in the strong technical skills that appear to be developed and in the high employability of graduates. This is a substantial strength of the programmes. One area which appears to have less emphasis, however, is the development of 'soft' skills, which are important because of a growing recognition of software engineering as a socio-technical activity. There may be some benefit in reviewing the content of the programmes currently provided in terms of their hard-soft balance.
- The Department has submitted two set of programmes for review: a BEng/MEng suite of programmes in Computing and a similar BSc/MSci combination of joint Mathematics and Computing degrees. Ownership and management of joint combinations is notoriously difficult so it is perhaps not surprising that more issues have been raised by the associated External Examiner than for the straight Computing degrees. It seems to have been an advantage for the Computing Department to take over recruitment of students to the joint combinations and perhaps it should also consider taking responsibility for programme descriptions and the website to achieve greater uniformity. Discussions with the students also revealed that joint students felt disadvantaged with respect to full Computing students because of various operational difficulties that they typically experienced, including timetable clashes, communication issues, and access problems.

[1] http://www3.imperial.ac.uk/computing/teaching/undergraduate/computing/lectures

Review Questions

This section comments on the six questions recommended for consideration in the review brief.

- *Are the educational objectives of the programmes appropriate and are they achieved?*

  Yes, the Department has a clear understanding of the types of programme that it wishes to offer, each providing a path to either employment or further study. Details on the success of graduates and responses from the students interviewed confirm that the educational objectives of the programmes are appropriate and are achieved. Some of the students also identified the availability of joint math-computing programmes as a strength, particularly as the computing component is still sufficient to allow graduates to pursue a career in the computing industry. This was reflected recently in the British Computer Society giving accreditation to the joint programmes.

- *Are the learning outcomes appropriate to the educational objectives and are they achieved?*
- *Do the curricula allow the learning outcomes to be achieved? What are the strengths and weaknesses?*

  Yes, the learning outcomes seem well matched to the educational objectives and their location within the curriculum for each programme is clearly identified. There don't appear to be any significant weaknesses, with strength in the depth and breadth of the provision, especially in the mathematical foundations in first year and the breadth of final year options available.

- *Are the assessment methods appropriate to the achievement of the learning outcomes? What are the strengths and weaknesses?*

  Yes, the assessment methods seem appropriate. Again there are no obvious weaknesses, with particular strengths in (i) the use of an integrated laboratory course to develop practical skills; and (ii) attempts to move away from the marks-oriented approach to course / laboratory work, emphasising its role in developing skills and understanding.

- *Are the students adequately supported by the learning outcomes, study skills help, personal tutoring etc? What are the strengths and weaknesses?*

  Yes, the students seem very well supported overall. Again, no significant weaknesses were evident, with strengths in (i) extra support in first year; (ii) use of other students to support pastoral care, 'surgeries' and deliver additional lectures; and (iii) the quality of computing facilities available.

- *Are the procedures for maintaining and enhancing the quality of provision and the academic standards effective? What are the strengths and weaknesses?*

  Yes, the totality of procedures for maintaining and enhancing the quality of provision and the academic standards seem effective. The minutes of the staff-student meetings suggest they, in particular, are very effective, and therefore a strength. Similarly, student participation in the SOLE surveys is impressive. Some thought might be given, however, to target levels of response to each question so that action would be triggered if performance was below expectations. For example, it seems like an issue if 'strongly disagrees' are reported to any question. Possible improvements in the efficiency of the Institutional Review are discussed in the next section.

Institutional Review Process

Currently, there is conflict between Institutional Reviews and professional reviews in Computing at Imperial. Each is covering similar ground, using a similar process, both within a 5-year review cycle. In practice, this has meant that the Computing Department was reviewed by the British Computer Society two weeks before the Institutional Review, reusing much of the same preparatory material and offering the same set of students and staff for interview. The timing was chosen by the Department to minimise the total work involved but means that there is then duplication of effort among the assessors. This is a difficult problem to resolve but some options to consider include:

1. Rely on the results of the BCS Accreditation Visit and discontinue the Institutional Review. It might even be possible to negotiate with the BCS to have their panel answer the six specific questions associated with the Institutional Review.
2. Combine the BCS Accreditation visit with the Institutional Review, preferably using the same submission materials.
3. Redefine the scope of the Institutional Review when used in conjunction with BCS Accreditation.

Another small suggestion for improvement to the Institutional Review cycle is to carry recommendations from one review through to the next so that the second panel can confirm that any significant issues raised by the first have been addressed.

Finally, I would like to thank the staff and students of the Department for the very open and helpful way that they approached the review. The students were particularly impressive and very positive about their overall experience at Imperial.

David Bustard

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