



**PROVOST'S REPORT TO COUNCIL ON THE REVIEW OF THE SCHOOL OF
COMPUTER SCIENCE & STATISTICS**

1. INTRODUCTION

This report presents the outcome of a review of the School of Computer Science and Statistics. An external peer review visitation was undertaken on the 1st & 2nd May 2008 by Professor Nancy Amato (Texas A&M University), Professor Mike Titterton (University of Glasgow) and Professor Brian Warboys (University of Manchester). The internal member of the review team was Professor Mary Meegan, School of Pharmacy & Pharmaceutical Sciences, Trinity College Dublin.

The report is based on (i) feedback from the external Reviewers received on the 10th July 2008, (ii) a submission from the School of Computer Science and Statistics received on the 22nd October 2008 and (iii) a submission from the Dean of Engineering, Mathematics & Science received on the 26th September 2008.

The main purpose of the School review is (a) to provide a structured opportunity for the School to reflect on its activities and plans for development, while benefiting from a constructive commentary by senior colleagues external to College; (b) to ensure that quality and standards in teaching, research and administration are being maintained and enhanced; and (c) to ensure that areas of concern in this regard are identified and addressed within an eighteen month timescale. This review process ensures that each School in College is reviewed systematically once every seven years. The Department of Computer Science was last reviewed in October 2001 and the Department of Statistics, in April 2000.

2. OVERVIEW OF THE SCHOOL

2.1 Aims and Objectives of the School

The key objectives of the School of Computer Science and Statistics is (i) to educate the citizens and workforce of tomorrow to face the challenges of the 21st century Information Society, (ii) to develop high-quality, high-impact research focusing on areas of strategic importance, (iii) to provide life-long learning through continuous professional development, and (iv) to develop close collaboration with entrepreneurs, public services and commercial organizations.

2.2 Programmes to which the School provides teaching:

Undergraduate Programmes

- B.A. (Mod) in Computer Science – incorporating the former B.A. (Mod) in Information and Communications Technology;
- B.A. (Mod) in Computer Science, Linguistics and a Language (CSLL);
- B.A. (Mod) in Management Science and Information Systems Studies (MSISS);
- B.A. (Mod.) in Computer Engineering (D Stream);
- B.A., B.A.I. in Electronic and Computer Engineering (CD Stream);
- Diploma/B.Sc. in Information Systems (evening provision);

The School also provides a significant level of service teaching to the B.A. (Mod) in Mathematics.

Postgraduate Programmes

- M.Sc. in Computer Science (Networks and Distributed Systems);
- M.Sc. in Computer Science (Mobile and Ubiquitous Computing);

- M.Sc. in Computer Science (Interactive Entertainment Technology);
- M.Sc. in Computer Science (Technology and Learning);
- M.Sc. in Management of Information Systems;
- M.Sc. in Interactive Digital Media (formerly M.Sc. in Multimedia Systems);
- M.Sc. in Health Informatics;
- Postgraduate Diploma in Statistics.

2.3 Research

The School has established five research laboratories to reflect its key strategic research interests:

- Computer Systems Laboratory;
- Intelligent Systems Laboratory;
- Software Systems Laboratory;
- Statistics Laboratory;
- Information Systems Laboratory.

The School leads the Centre for Telecommunications Value-Chain Research (CTVR) which is a €25,000,000 Science Foundation Ireland (SFI) Centre for Science, Engineering and Technology (CSET). It is also a major partner in two other important CSETs, namely, LERO (the Irish Software Engineering Research Centre) and the Centre for Next Generation Localisation.

2.4 Summary Statistical Profile of the School for the Academic Year 2006/07¹¹

Full-time Staff FTE	Undergraduate FTE	Postgraduate FTE	School Staff: Student Ratio	Faculty Staff:Student Ratio
75	527	395	12	14

Figures from Senior Lecturer's Annual Report approved by Council at its meeting on 5th December 2007.

2.5 Accommodation and Facilities (Physical Resources)

The School of Computer Science and Statistics occupies 5,400sq metres of teaching, research and office space located across four sites – O'Reilly Institute/Westland Row, Lloyd Institute, Westland Square and Dunlop Oriol House (the last two are located off campus). The School has a total of 1,600 sq metres of teaching space consisting of one 150-seat lecture theatre, four seminar rooms, as well as teaching and project laboratories spread over three buildings. Pending the provision of dedicated undergraduate teaching space to support the ICT programme, two temporary project laboratories are housed in pre-fabricated cabins located beside both the O'Reilly and the Lloyd Institutes. Due to off-campus restricted access constraints, the classroom facilities in Westland Square are inaccessible to the School's regular undergraduate students. The School has about 1,700 sq metres of research laboratory space which accommodates almost all research staff and all postgraduate students. Office accommodation accounts for a further 1,600 sq metres of the School's space equating to 900 sq metres of academic offices and 700 sq metres for administrative and technical and systems support requirements. The School's fragmented space and former structures have resulted in common rooms being established in each of its main locations – O'Reilly Institute, Lloyd Institute and Westland Square. In addition to these rooms, the School has access to the foyer of the O'Reilly Institute and the basement of the Lloyd Institute for holding large social and research events. The School shares the use of two well-appointed conference rooms in the O'Reilly Institute – the Large Conference Room and the Small Conference Room– with College's Research and Innovations Services Unit which is also located in the O'Reilly Institute. The School has also one small meeting room in the Lloyd Institute. Each of the School's departments has its own small dedicated library.

¹ The staff FTEs include all Professors, Associate Professors, Senior Lecturers and Lecturers funded from the core HEA grant, or from self-financing courses, and all part-time and occasional staff and demonstrators, converted to an FTE, who are funded from core grant or from self-financing courses.

3. EXTERNAL PEER REVIEW REPORT

SUMMARY OF REPORT

The Reviewers state that *“The Trinity College School of Computer Science and Statistics still represents the best overall computer science program in the Republic of Ireland, as well as now incorporating an element of statistical excellence”* and that *“many of Computer Science courses continue to attract high quality students...”* The margin of advantage that the School holds over its competitors has declined since the last review due in part to the activities of rival institutions but also as a result of issues identified in the last review as well as *“some erosion of key staff in Statistics.”* Many of these issues have now been addressed and the Reviewers feel that there are signs that the School is recovering its position, stating that *“the necessary structures and processes have now been put in place to enable rapid progress as a research-led School to be achieved.”* They emphasize that *“...completion of this process will take some time and continued investment is necessary to sustain renewed growth and quality of research.”*

3.1 RESEARCH

The Reviewers report a *“growing feeling of a uniform commitment among the staff to high quality and high productivity in research.”* While they feel the *“quality of research programmes is uneven,”* they report that the *“teaching loads have recently been harmonized and reduced to a level to permit broad-scale attainment of research excellence.”* The formation of five research laboratories as focus points for the School’s research activities *“has already had a positive impact on research performance and cohesion,”* but has resulted in a feeling amongst staff of ‘belonging to a laboratory’ rather than to the School, and the Reviewers suggest that it would be beneficial to encourage School-wide collegiality more directly through School-based activities. There is a view amongst some staff that Heads of Laboratories should have a presence on the School Executive and the Reviewers support this as a way of enabling the Laboratories to have a greater say in School strategy. Some staff feel that laboratories should become administrative units with devolved budgets, but the Reviewers feel *“unable to recommend this, because it would encourage undesirable fragmentation and lack of balance...”*

The Computer Systems and Intelligent Systems Laboratories are acknowledged in the College Strategic Plan as major research themes which the Reviewers feel should aid the development of world class research in these areas. They also acknowledge the world-renowned research being done in Statistics. Although the School continues to engage in a variety of highly strategic multidisciplinary research programmes, these activities, apparently, have little external visibility and the Reviewers feel this should be addressed. The appointment of a Stokes Professor in Statistical Learning is an exciting development in what is *“a very important current research area at the interface between Statistics and Computer Science worldwide, so there is the prospect of both synergy within the School and substantial enhancement of the profile of the School and therefore of the College in the international research community.”*

The Reviewers feel that the targets set in the draft Strategic Research Plan are *“sensible and sufficiently ambitious to achieve medium-term progress towards a high international standing.”* Whilst publication and research student target numbers should be achieved and if possible, exceeded, expansion of student numbers may be limited by the value of the College studentships, which provide for only 50% of the stipend compared to external agencies, and ability to recruit students from outside TCD. The Reviewers also feel that *“another issue concerning the growth of the postgraduate-student population is that many students come through Trinity College courses, and any future growth is likely to depend mainly on recruiting from beyond this source.”*

The Reviewers commend the recent introduction of a proper research sabbatical scheme as *“an important part of moving towards a research-led culture”*, giving research-active staff an opportunity to focus on new research directions and allowing those who have yet to complete their Ph.Ds the time to do so. They stress the importance, however, of having *“universal staff debate”* and committed buy-in to the draft Strategic Research Plan and its research targets. With about 25% of staff research-inactive and five still due to complete their Ph.Ds,

the Reviewers feel that teaching contact hours should be distributed to reflect this. They suggest, however, “*if some staff remain research inactive in the longer term then this should be reflected in disparate teaching loads.*”

The speedy integration of new members of the academic staff into the School would, the Reviewers feel, be enhanced by “*some sort of welcome guide and a system of mentoring of new staff by senior members.*” They report that junior staff and research fellows would welcome better communications within the School and scope for more interaction and the Reviewers suggest that greater involvement in School meetings would be beneficial.

While SFI funding has been a rich source of research funding for the School, the Reviewers recommend that other sources such as EU and industrial support are maintained during this ‘golden era.’

3.2 TEACHING AND LEARNING

The Reviewers report that external examiners reports are positive and that “*most degree programmes have a high quality intake and are achieving good to excellent instruction and education.*” There has been “*excellent progress*” in rationalizing the teaching programme since the last review but the Reviewers add that “*...with the increased focus on research-led programmes it is important that ways are found to reduce the cost of teaching still more whilst retaining learning quality.*” They suggest that the “*examination of approaches to problem-based learning*” would be of some value. Both the undergraduate and postgraduate students interviewed “*expressed satisfaction with the quality and content of their courses and with the way they were delivered.*” According to staff, however, the quality of applicants to the M.Sc. courses is variable, with that of EU students “*at a more reliable (high) level compared with that of other overseas students.*” The Reviewers applaud the new joint course proposal with Business as a sensible development and, with the growing trend towards interdisciplinary programmes, they believe that “*exposure to the difficulties associated with such a programme is important.*”

Since the last review, the School has focused on increasing postgraduate numbers and the Reviewers feel that the plan is working – “*postgraduate education is currently reasonably buoyant.*” They support plans to continue this emphasis but recommend that “*funding of such programmes needs to be highly responsive as competition internationally is very fierce and the ability to offer support as early as possible in the recruitment cycle is crucial.*” They also recommend that the growing problem of harmonization with European Masters needs to be addressed if professional accreditation of these courses is to continue.

The Reviewers state that “*courses run by the Statistics group are well received but staffing on the MSISS is stretched and responsibility for the heavily-subscribed postgraduate evening diploma rests heavily on one recently retired member of staff.*” The Reviewers recommend that staffing levels in Statistics “*should not be allowed to decline further and indeed should be improved as soon as possible.*”

Undergraduate students are generally happy with their experiences at Trinity but the Reviewers report on a number of minor issues that were raised by them – results of Semester 1 exams are not released until the end of the academic year, laboratory demonstrators “*occasionally are not expert*” in the material being covered, some modules would benefit from small group teaching, and there should be more coordination of the timing of assignments. They note that attempts to resolve the last item are in progress.

Students on postgraduate taught courses were uniformly positive about their courses and the Reviewers feel that the plan to introduce taught modules on research methodology for research students is “*an excellent supplement.*” They feel that the average time to completion of a Ph.D degree is rather long, and report “*some feeling among Ph.D. students that they did not receive sufficient proactive mentoring and feedback.*”

With regard to the assessment of courses by students, the Reviewers believe that the College system which allows student reviews to be an optional feature on the part of the lecturer is “*highly undesirable*” and out of step with other institutions where “*formal student feedback is regarded as an essential component of the quality assessment of teaching.*”

3.3 SERVICE TO COLLEGE AND SOCIETY

The Reviewers acknowledge the School's "*long tradition of service to the College...and energetic role in Irish society generally,*" and note that the School has produced many College Officers over the years. They also commend the School's success in spawning spin-off enterprises which "*should be the springboard to increased industrial interaction and recognition, given improved self-promotion.*"

3.4 RESOURCES

The Reviewers note that in response to a comment arising from the last review of Computer Science in 2001 that the existing distribution of staff was excessively skewed to junior appointments. They welcome the fact that "*some senior appointments have been made*" and that "*a new Chair appointment is hoped for soon.*" The Reviewers report a feeling among some junior staff that the promotion procedures require clarification and caution that "*emphasis on senior appointments from outside of the School does not lead to disillusionment within the School at a perceived lack of career opportunities for the more junior staff.*" They recommend staff consultation as well as "*more active career-development mentoring of junior staff, probably coordinated with the existing annual review process.*"

The Reviewers note that proper administrative procedures have been put in place and there is general appreciation for the new structure and processes. They commend the work of the current administrative staff, noting that such "*talented and committed staff are in short supply.*" They recommend the appointment of extra staff, in order to retain key staff and remove the need to rely on short-term temporary staff. Such expansion, the Reviewers feel, "*would also make available administrative support for Heads of Laboratories...for publicizing research activities externally,*" and allow for the opportunity to review and improve administrative practices.

The Reviewers note the on-going issue relating to systems management and technical staff, whereby many technicians now undertake software tasks but the grading structure for technicians does not recognize this skill. They suggest that "*the sensible option would be to integrate the staff into one coherent unit covering all aspects of Systems (Software) Management and Technical support.*" They report that the group operates this way now and has shown great flexibility, however, the Reviewers feel that this will inevitably lead to further dissatisfaction with the current grading system. They note that a key problem remaining from the last Review is the "*chronic lack of sensible expansion space*" which they feel will impact on the School's ability to meet the ARAM financial targets. While the Reviewers note that students are happy with laboratory facilities, they nonetheless feel that "*the provision of equipment, including network infrastructure, is compromised by the lack of a planned budget for such items.*"

3.5 ORGANISATIONAL STRUCTURES AND PLANNING

The Reviewers state that although the School and indeed the Faculty are still quite new, "*...much has been achieved and the processes are now in place for most types of activity.*" As a result, the organizational ability of the School has dramatically increased since the last review. There are signs now, according to the Reviewers, that "*the structures are robust enough to support the rapid changes still to take place within the School and College.*"

3.6 CONCLUSION AND RECOMMENDATIONS

In conclusion, the Reviewers feel that the School has made "*excellent progress*" since its inception, but much remains to be done "*if the School is to attain a competitive international standing and if, within it, the Statistics Disciplines are to be reinforced.*" The Reviewers estimate that "*taken as a whole, the School would most probably be currently graded as a 4 in the UK RAE assessment, at least if only the research-active members of the staff were submitted for assessment...*" They believe that the necessary structures have been put in place to enable "*rapid progress as a research-led School to be achieved.*" It should be possible to fulfill the objectives laid

out in the draft strategic plan but this will require “substantial constructive effort and College support.” In conclusion, they state that “Computer Science is at the centre of economic development for the Republic of Ireland and Trinity should....invest in the continuing development of a high quality computer science program.”

The Reviewers make the following recommendations:

3.6.1 Staffing

- i) *The plan to appoint more senior staff to achieve more leadership and research potential needs to continue, through both new appointments and promotion of suitably qualified junior staff;*
- ii) *Junior staff need additional welcome/orientation material as newcomers, more mentoring and encouragement in the early years, and a clearer view of their career development potential; it is intended that the career prospects of research fellows are included within this. Proper annual staff development should be put in place, possibly at College level;*
- iii) *More permanent junior administrative staff are needed; the staff appointed so far have done a wonderful job but they desperately need some assistance, especially to support externally visible activities;*
- iv) *The new marketing post is crucial but, with so much catching up to do and the scope for a much wider range of potentially fruitful activities, more help needs to be provided, perhaps through (credited) contributions from other academic staff. Websites, in general, should be given major upgrades;*
- v) *Now that a system of fairly distributed staff teaching loads has been established, the same should be done for administrative and other staff duties;*
- vi) *Notwithstanding the above-mentioned re-distribution of teaching loads, a strategic view has to be taken about the variable degree of involvement of staff in active research. It seems highly unlikely that the number of research-inactive staff will be reduced to zero and it will be appropriate for this to be reflected in some variability in teaching loads, taking account of research productivity, supervision of M.Sc. theses and Ph.D. students, management of research fellows, and so on;*
- vii) *The Statistics Discipline must be strengthened to ensure that teaching loads are kept under control, especially for younger staff, to avoid the need for statistics courses to be taught by non-statisticians, and to protect the Stokes Professor from excessive teaching and administrative duties as this new research initiative develops;*
- viii) *Consideration should be given to the possibility of making joint appointments with other Schools or Faculties, based on existing or potential research contacts;*
- ix) *Establish a School-based seminar series or seminar-day, perhaps advertised as a Distinguished Lecturer Series, to encourage collegiality;*
- x) *The School should consider annual retreats, at some level, either for the whole School, or just academic staff, etc. in order to enhance community spirit;*
- xi) *Technical staff grades should be reviewed so as to reflect the software content of the work of a technician in the 21st century;*
- xii) *The management of Systems Support and Technician staff should be integrated without delay.*

3.6.2 Infrastructure/Space

- xiii) *Space is a real concern given the expansion plans. The School is distributed too widely and this will be a real inhibitor to developing the research-led culture.*

3.6.3 College Interface

- xiv) *The School should publicise its successes more energetically. Its work in interdisciplinary areas in particular should be given greater prominence;*
- xv) *The ARAM is not well understood by many in the School. Some priority should be given to explaining how it works and why it works this way. This would save a lot of energy being diverted from achieving the targets rather than arguing about the model;*
- xvi) *The situation concerning the use of the Higher Education Authority's £5M capital funding allocated to the Department of Computer Science in 1998 to provide purpose-built dedicated undergraduate teaching space for its ICT programme needs to be clarified.*

3.6.4 Organisation

- xvii) *It is far from clear why the notion of a department still exists. This issue should be resolved as soon as possible and any contracts which refer to Head of Department should be clarified to make it clear that the Head of School is now the responsible person;*
- xviii) *Staff still do not feel involved with School planning and strategy. There is a need for both Academic Staff and Research Staff fora to be established to ensure that staff are sufficiently involved in planning and strategy, and for full agendas and draft minutes for meetings to be made widely available as promptly as possible;*
- xix) *Although it is reasonable to expect that the School will share the worldwide upturn in undergraduate student numbers in Computer Science, consideration might be given to the introduction of a limited number of new degree programmes, probably interdisciplinary; many institutions in the U.S. offer examples of these;*
- xx) *A uniformly applied practice of gathering student feedback about courses should be implemented;*
- xxi) *First-semester examination results should be made available much earlier, if only as preliminary grades indicated as subject to certification by a meeting of Examiners later in the Session;*
- xxii) *Annual reviews of Ph.D. progress should be implemented; for an exemplar see <http://www.cs.tamu.edu/academics/graduate/Ph.D-review-Procedures>;*
- xxiii) *Efforts should be intensified to recruit more postgraduate students from outside Trinity, and even outside Ireland, with notice being taken of the possible need for language training, no doubt a College-level issue.*

4. RESPONSES FROM THE SCHOOL AND THE DEAN OF ENGINEERING, MATHEMATICS & SCIENCE

The School welcomes the External Review Report, which acknowledges the significant progress made since its formation in July 2005. The School acknowledges that the process of internal re-organisation and the establishment of five research laboratories to reflect its key strategic research strengths have led to management, organizational and leadership difficulties which need to be urgently resolved. According to the School, the Reviewers have not sufficiently taken into account the distinction between computer science and information systems in their report, and the contributions made by the latter to the School. While the information systems courses run by the School generate a healthy income, the School reports that *“there is a disparity between the number of information systems graduates and the level of information systems research”* which they are currently trying to address.

With regard to the recommendation ‘to merge the systems support and technical staff in to a single unit’, the School points out that this was one of the recommendations arising from the Department of Computer Science review in 2001. The School makes the point that in addition to the variety of interdisciplinary research programmes in which it is involved, it also participates in a variety of interdisciplinary teaching programmes, and in active research collaborations within College and with partners from other third level institutions: *“since the review visit members of staff have been actively engaged in improving our PR to help raise awareness of these School activities both inside and outside College.”* The School argues that comparisons with UK universities on the basis of their RAE ratings is *“inappropriate in the Irish context with no available data for possible comparators”* such as other Irish Institutions.” The School reports that prior to receiving the Review Report they had already dealt with or put in place processes to address 13 of the 21 key recommendations in the Report. The School recognises, however, that it will require Faculty/College support to progress the remaining issues and suggests that college:

- provide assistance to the School in finding ways to formalise its new research laboratory/discipline structures;
- establish a working group to find a suitable way to merge its systems support and technical staff into a single unit as a matter of urgency;
- support the Schools’ requests for a level of administrative staff commensurate with its size; and
- give a commitment to construct an additional floor on the O’Reilly Institute with the cost being partly funded from the balance of the £5M HEA capital monies allocated to the Department of Computer

Science in 1998 to provide purpose-built dedicated undergraduate teaching space for the ICT programme (but not yet drawn down) and partly from fundraising.

The Dean of the Engineering, Mathematics & Science welcomes the Review Report, which he feels highlights the substantial progress made by the School since the last external reviews of Computer Science and Statistics in 2001 and 2000 respectively. With regard to the Reviewers' belief that the School's advantage over other similar Schools in Ireland continues to decline, the Dean feels that the key to rebalancing this decline, particularly in relation to Computer Science, will be "*a balanced improvement in teaching and research with a major emphasis on increasing the undergraduate entry and its quality into key courses.*" He reports that the "*the School's strategies are starting to be successful in improving student numbers.*" With regard to Statistics, the Dean feels that "*the emphasis must be on increasing the staffing complement to build on the successful teaching components, providing more research intensive staff who will decrease the high teaching loads, and also increase and improve the research outputs of the Discipline and thus contribute to the improvement of the reputation of the Discipline which then will help in the recruitment of other research intensive staff.*"

The Dean is in agreement with the Reviewers on all aspects relating to research and scholarly activity and is confident that "*the School's plans and revised structures are well designed to achieve most of the recommendations on research in this Report.*" The Dean feels that the Reviewers' comments on staffing for the MSISS course are well taken, but that "*any improvements here will to a great extent be dependant on new recruitment...*" The Dean accepts the recommendation about making senior appointments and feels that the recommendation about developing junior staff careers should be taken into consideration by the School. He reports that the School is well-served with its current management and administrative structures, having a School Executive that is "*efficient, pro-active, and realistic in their plans and aspirations.*" The Dean agrees with the Reviewers that a reorganisation of technical support staff would give the School a major advantage in fulfilling their future plans for teaching and research. With regard to space, the Dean reports that he has commissioned a review of space usage and needs which will inform a Faculty Control Development Plan and a Capital Funding Plan in the coming months.

5. RECOMMENDATIONS TO COUNCIL AND BOARD

In light of the review report and the responses from the School of Computer Science and Statistics and the Faculty Dean it is recommended that:

1. The School of Computer Science and Statistics working closely with the Dean of the Faculty of Engineering, Mathematics and Science, and other relevant Academic Officers, should consider the detailed recommendations of the Review Report and draw up an implementation plan² for Council approval;
2. College should:
 - a. ensure adequate support for staff induction and development;
 - b. develop structures to support and encourage new teaching and learning strategies;
 - c. review its current system of student evaluation of course modules, and consider introducing evaluation of programmes.

Provost
20 November 2008

² See *Procedures and Protocol for Quality Review of Schools 2008/09* at <http://www.tcd.ie/vp-caol/qu/qopdf/adrpack2.pdf>