Macquarie University
Department of Computing Review

Final Report – February 2015

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1. Introduction

The Department of Computing is a relatively large department that provides undergraduate and postgraduate education in a broad range of Computing disciplines, conducts research across a number of areas of Computing, with a bias towards theoretical Computer Science, and supports a healthy number of Higher Degree by Research students.

The purpose of the present review is to cover a broad range of leadership and management, education, research, research training and staff and student profile issues, with a view to making recommendations about how the Department might address the challenges of contributing effectively to the University strategic directions. A detailed review of academic programs is not included, but reference is made to the undergraduate accreditation review carried out by the Australian Computer Society in 2013.

1.1. Terms of Reference

The Terms of Reference for the Review span some seven areas, expressed and explained below.

Governance, Leadership and Management

Review the effectiveness of the Department of Computing planning, leadership and management structure, processes and resources in responding to Faculty and University strategic planning directions.

Academic Program

Review the appropriateness of the degrees, programs, and units offered by the Department of Computing relative to Faculty and University priorities, employer and professional community demands.

Research

Review current research outputs, activity, and capability relative to Faculty and University objectives including opportunities for developing research and knowledge leadership.

Research Training

Review the HDR program, including admission standards, methodology and skills training, completion times and drop-out rates, supervision and reporting standards.

Staff and Student Profile

Review the alignment of academic, professional, and student profile relative to current and future objectives and plans.

Community Engagement

Review the scale, scope, and quality of community/industry engagement, including external/ professional contribution to and referencing of, curriculum and research development.

Future Directions

Recommend future development opportunities for the Department of Computing in terms of its resources, research, teaching and community/industry engagement activity.

This report will cover these areas in turn. A number of issues were identified which relate to the technical support required by the Department. Recommendations of that nature are presented in a separate section of the report.

1.2 Review Panel

Chair: Prof Doug Grant
Professor Emeritus
Department of Computer Science and Software Engineering
Swinburne University of Technology

External Discipline Expert: Prof Janet Verbyla
Senior Deputy Vice-Chancellor
University of Southern Queensland

Macquarie Peer: Prof Lucy Taksa
Head of Department of Marketing and Management
Faculty of Business and Economics

1.3. Review Process

The review panel received two forms of input from stakeholders: written submissions and interviews.

The Report of a Self-Evaluation Review (SER) was received from the Department of Computing, in line with the University Procedures for Reviews. Two short addenda to the SER were provided during the course of the review meetings.

The Acting Executive Dean of the Faculty of Science and Engineering (Professor Peter Nelson) also provided verbal input outlining the overall performance of the Department.

A general call for written submissions was sent via MQ Announcements to all university staff. There were no submissions prior to the review, and one submission was provided during the course of the review.

Interviews were conducted over three days – the schedule is provided in Appendix A. Input was sought across the seven broad areas relevant to the Terms of Reference, listed above in Section 1.1. Faculty level staff were interviewed separately from Department staff[1], and students separately from staff. Professional and academic staff were interviewed separately.

[1] Note that two Associate Deans (Hitchens and Mans) are in fact staff members of the Department. They were requested to take the Faculty perspective in the interviews held with them.

2. Executive Summary

The input to the Review Panel indicated that the Department has been travelling comfortably, albeit with a challenging staff profile and acknowledged budget limitations that are starting to escalate in their impact. The Review Panel confirms that this is indeed the case, the general impression being of a Department adopting a "Business as Usual" attitude, whilst gently exploring some developmental activities.

In view of the University's renewed vigour in its strategic development and the changing Faculty context, the Panel believes that the Department needs to step up, address its challenges, and adopt a more strategic approach to its future development.

It is recognised that the Department has many good achievements to proclaim as evident in the Self-Review document (SER) submitted for Panel consideration. It is to be noted that in the SER, the Department's staff have themselves recognised most of the major issues that are addressed in this Report.

In this Report, the panel provides a range of commendations and proposes a series of recommendations that are intended to support the Department's response to these issues and imperatives that it faces in each of the seven key areas of the terms of reference plus the additional area of technical support. A total of 19 commendations and 40 detailed recommendations are provided into these areas; the following table summarises the distribution of these commendations and recommendations.

Area	Commendations	Recommendations
Governance, Leadership and Management	4	9
Academic Program	6	6
Research	3	6
Research Training	2	5
Staff and Student Profile	2	6
Community Engagement	1	2
Future Directions	1	1
Technical Support	0	5

2.1. Key Recommendations

The chief recommendation, intended to drive the Department's response to the issues that it faces is:

1. STRATEGIC FOCUS
   The Department should identify a small core leadership group that will take responsibility, under the Head of Department, for driving departmental direction-setting, strategic planning and performance monitoring, in all areas of the Department's activities. This group needs to ensure that the Department is more intentional in its strategic planning and management, that the Department collectively delivers on its plans and that these align with Faculty and University directions.

Following on from that activated and engaged strategic focus, longer term (perhaps three year) and annual goals should be set; these should be agreed with and resourced by the Faculty. Agreed key performance indicators (KPIs) and targets should be established, and annual reviews of performance against these KPIs rigorously monitored. In particular the panel recommends that KPIs should be set and monitored for each of the issues presented in

the following six recommendations which are seen to be crucial to achieving the identified departmental directions.

2. COLLABORATIVE CULTURE
   The Department should address a perceived weak commitment to collaboration, aiming for more collaboration across Computing discipline boundaries within the Department, with Macquarie colleagues in other disciplines, departments and faculties, and especially with industry. This includes an improvement in internal communication and the level of both consultation and engagement, along with stronger support from all levels of the departmental leadership.

3. STAFFING PROFILE
   The Department must address the imbalances in its academic staff profile (seniority, age profile, Computing discipline profile, gender) through new staff appointments, and by increasing the volume of teaching undertaken by academic staff through management of staff activities and close adherence to the Faculty of Science and Engineering Workload Model. The Department should reduce its reliance on sessional teaching staff. The three vacant positions should be filled as soon as possible, subject to addressing strategic requirements; the Software Engineering position should be a priority in this respect.

4. COMMUNICATIONS CAPABILITY
   The Department needs to improve its ability to communicate systematically its achievements and capabilities as well as its identified strategies to all stakeholders both within and outside the University, across all areas of its operations.

5. RESEARCH PARTNERSHIPS WITH INDUSTRY
   The Department should seek to develop more partnerships with industry beyond existing individual collaborations on the part of relatively few Department staff members, with a view to achieving significantly enhanced research funding from industry sources. Relatedly, collaborations involving other areas of the University such as Engineering and Health Informatics should also be established / extended.

6. PORTFOLIO OF PROGRAMS
   The Department should proceed with its plans to introduce programs in Data Science, in collaboration with other Macquarie departments, and should also aim to ensure that obvious and recognised curriculum gaps in extant programs (especially Cloud Computing and software development for mobile devices) are filled as soon as possible.

7. ENROLMENTS
   The Department should pursue modest growth in its student numbers, particularly through enhanced marketing of its programs in domestic and international settings, carefully promoting the distinctive advantages of the programs. In alignment with University and Faculty objectives, the Department should agree clear KPIs for undergraduate, postgraduate coursework and HDR enrolments, and determine a strategy to achieve these.

3. Governance, Leadership and Management

Review the effectiveness of the Department of Computing planning, leadership and management structure, processes and resources in responding to Faculty and University strategic planning directions.

In short, the Panel assesses that governance of the Department by the Faculty has been compromised by its "business as usual" culture and the recent short-term Faculty deanship; and that there are issues with the Department's management of the profile of its academic staff, its teaching workload allocations, its excessive use of sessional staff and communication of its achievements and capabilities.

3.1 Commendations

C3.1: The Department has an efficient and effective team of professional staff who work well and collaboratively with the academic leadership.

C3.2: There is evident support for the current Departmental Head and his efforts since assuming the role.

C3.3: The recent efforts to build internal institutional collaborations, through the running of workshops which identified research capability are commended and should continue and perhaps be made more systematic.

C3.4: The Department is commended for their engagement in collaboration with the Department of Engineering on the BEng(Software Engineering) and with the Department of Marketing and Management in the Faculty of Business and Economics on the new Bachelor of Business Analytics.

3.2 Recommendations

R3.1: The Department needs to identify a small core leadership group that will take responsibility, under the Head of Department, for driving departmental direction-setting, strategic planning and performance monitoring. This group needs to meet regularly, and maintain a commitment to ensuring that the Department engages with University and Faculty strategic plans.

R3.2: The Department must be more intentional in its strategic planning and management. Three year and annual goals need to be set, key performance indicators (KPIs) and targets established, and annual reviews of performance against these KPIs rigorously monitored. An annual "retreat" should be held; the first one, preferably early in 2015, could be where the Department can focus on addressing the recommendations in this Report, including how it will collectively address the requirements of the University Strategic Plan and Strategic Research Framework 2015-2024.

R3.3: It is recommended that the Departmental management be provided with more direct support from the Faculty in addressing Faculty and University expectations, especially in relation to budget planning and allocation, research performance and staff teaching workloads. This includes the Faculty making more transparent, across the Faculty, its budget model and process along with academic staff workload and research productivity expectations. To enable effective, on-going engagement with the Faculty, the Department needs to establish an early, fruitful relationship with the incoming Executive Dean.

R3.4: The Department should rigorously adopt the Faculty workload model as applied across the rest of the Faculty. The Department needs to formalise role descriptions for its various administrative roles undertaken by academic staff, to allocate these in a manner that minimises the total workload required, and to ensure that full and effective use of the general 20% administrative allocation for those on a balanced pattern is carefully monitored.

R3.5: Judged by contemporary standards, too much academic time is spent in providing course advice to students. The Department should consider allocating the bulk of this responsibility to professional staff, who can be trained to do it or the Faculty could consider expanding its student support services.

R3.6: The Department needs to develop succession plans for all of its academic coordination roles, ensuring that as many academic staff as possible rotate through the positions of responsibility and ensuring that staff at levels B and C have the opportunity to serve the Department in this way.

R3.7: The Department needs to clarify its "story" so as to communicate its achievements, its capability and its distinctiveness. As an example, the Games Design and Development degree has such a story - it fully explains why Macquarie has the best games degree in Sydney, and what distinguishes it from competitor programs. This needs to be done for academic programs, research and industry and community engagement.

R3.8: There is an urgent need for the Department to work towards the development of a stronger collaborative team culture across the range of its activities.

R3.9: The Department should work closely with the Department of Engineering to develop and enhance synergies, both in the existing collaboration in the Software Engineering major in the BEng and in research; and with the Department of Marketing and Management to explore synergies in the area of Business Analytics. Opportunities should also be explored for collaboration with the Centre for Health Informatics.

3.3 Discussion

3.3.1 Governance

In respect of governance, which provides the framework under which the Department can manage its affairs, the Department operates under the oversight of the Faculty of Science and Engineering. Over the past three years there has been fluidity of leadership in the Faculty – a short-term deanship, followed by a year under an Acting Executive Dean - and the Department has expressed concern that this has led to considerable uncertainty, especially regarding its budget, which has prevented three academic vacancies being filled.

In interviews with the Panel, Department staff were particularly forthcoming about poor communication about budgets; they feel that there has been a lack of transparency of the budget model and process, and have struggled to understand why their budget allocation has not been adequate to fill three vacant positions at a time when their student load has been increasing significantly. Whilst the Acting Dean expressed concerns about the Department's academic staff workload and research outcomes (especially achievement of research funding), the Faculty has not effectively asserted its expectations regarding these. The Panel did not discern an evident Faculty strategic planning process within which the Department could frame its own planning. The Panel believes that the opportunities afforded by the commencement of the new Faculty Executive Dean in 2015 will enable stronger alignment

between the two organisational levels that will benefit all. It is essential that the Department establish a good, information-rich relationship with the incoming Dean.

3.3.2 Leadership

The Head of Department (Dr Christope Doche) has been appointed recently, following a 6-year term of the predecessor Head. It is premature to evaluate the effectiveness of the leadership of Dr Doche, but the Panel observes that he appears to have gained the confidence of his colleagues early in his tenure in the role.

The staff filling the most responsible oversight roles (Head, Deputy Head, Directors and Coordinators) meet together as the Department's Executive. Such meetings generally occur only every two months to address current operational issues. It was identified that the monthly Department meetings are the forum for strategic thinking at whole-of-department level. The Panel heard some evidence, however, that these Department meetings also generally discuss immediate, operational issues rather than strategic matters. The Panel accepts the need to continue current collegial practices but concludes that for reasons outlined below the Department needs to have a more formal approach to the establishment and functioning of strategic leadership and management in the Department. The Department seems to incorrectly assume the two are incompatible.

The Panel is of the firm view that the lack of strategic leadership and vision has inhibited the Department formally engaging with planning its response to the University's Strategic Plan. Throughout the Review interviews, responses to questions about Department strategy were in general vague, and indicative of a failure to take strategic planning seriously. It appears that individuals and groups within the Department have been left to plan independently. As a result, the Department as a whole has failed to align with University goals. There was no evidence provided to the Panel of the Department establishing formal goals, key performance indicators or review mechanisms.

The general commitment (and it is an intentional commitment) to relative autonomy has contributed to the emergence of a number of issues over time that leaves the Department with significant current challenges.

The Panel believes that the Department, whilst being subject to some stress resulting from its staff profile and budget compromises, is consciously attempting to continue "Business as Usual" (BAU) despite the changing landscape for higher education and research within Australia, and despite the University's own shifts in direction. The BAU mentality was pervasive throughout the two days of the Review interviews. Some individual academic staff have responded to change, but, as an example, a general view was expressed that senior academics should have the autonomy to direct their own research programs as they see fit, rather than submitting to a more directed, strategic approach. Accordingly, the instances of change within the Department have been sporadic, with little collective agreement evident.

The Department needs to confront this BAU mentality and it will require the Head of Department, supported by suitable senior staff with leadership ability to do this in order to affect change. This needs to be strongly supported by Faculty and University leadership clarifying their expectations of the Department and rigorously assessing the extent to which the Department is engaged with University and Faculty priorities.

Interestingly, given the Department's less than strategic orientation, several individuals within the Department have, in recent years, been elected or appointed to significant University or Faculty level positions of responsibility (Chair of Senate, Associate Dean), reflecting a

commitment to University collegiality through engagement in governance, management and leadership at higher levels.

3.3.3 Management

The Department has a well-structured management group, clearly identifying responsibilities for oversight (and tactical, operational management) of its main activities. There are effective processes in all of the main areas of the Department's engagement. The structure and processes enable the Department to engage reasonably effectively with the major Faculty structures for management of teaching and learning, research and quality management, albeit at some cost in terms of workload allocations. An efficient and effective team of professional staff, who enjoy good collegial relationships with the academic staff, supports the academic management activities.

There are, however, a number of management issues that need to be addressed, such as for example the unbalanced academic staff profile, the excessive reliance on sessional staff and a disappointingly low level of research interaction with industry. Recommendations regarding these issues are presented later in this report in the appropriate sections. Here we will comment on those issues that defy easy classification under the sections of this report - workload allocation, the Department's communication strategy (or lack thereof), and an observed lack of effective and strategic collaboration within the Department.

3.3.2.1 Workload Allocation

The Department uses the Faculty of Science and Engineering workload model, but with some local variations. The Faculty workload on-line system is not used, and a special Departmental spreadsheet is used instead. The Faculty has some concerns about the means by which the Department interprets the model, especially with respect to loads allocated in teaching and in service. The result of this approach to applying the model is that teaching loads in the Department are significantly lower than is normal in Computing in many Australian universities.

The various Director, Coordinator and Program Leader roles are shared between roughly half of the academic staff in the Department, mainly by those at Levels D and E. The Department might consider sharing these roles more widely, especially Program Leader roles, ensuring that staff at levels B and C have the opportunity to serve the Department in this way, and enabling greater involvement in teaching by the senior staff. Not all of these roles have formal role descriptions, so that there is a risk that the responsibilities are not guaranteed to be fully understood if there is a change of personnel. Given formal role descriptions, the time allocated to these roles in the workload model can be more carefully calibrated. Many of these allocations appear to the Panel to be on the high side, and the Department should ensure that they are aligned with Faculty norms.

Currently most program advice to students is provided by academic staff, using a roster system. Whilst effective, indeed commendable, this does consume academics' time that could be applied to teaching and research. In many universities, trained professional staff provide program advice, and the Department should consider enabling this.

3.3.2.2 Communications

Whilst effectively managing day-to-day affairs, it emerged that the Department has historically not been so successful in communicating its achievements and capability, in both education provision and research, internally within the University and externally. A recent workshop showcasing research capability to the rest of the University was described; it

appears that this has been successful. Given the well-designed programs, and their ready acceptance both by students and employers, it is disappointing that the Department has not developed a strong narrative commending their programs as "best of breed" within the competitive Sydney market. As an example, the advantages of the Games Design and Development degree were very well articulated to the Panel in a manner that would be persuasive to prospective students, and yet there appears to be no promotional material that is as compelling. The cross-disciplinary design and delivery of this degree, along with a curriculum that ensures broader potential employability of graduates mean that the award is already very successful in the marketplace, and has the opportunity to reach a wider audience with good marketing.

3.3.2.3 Collaboration

The Panel found there to be a good collegial ("talking together") spirit within the Department, yet at the same time, had explained to it several instances where there is apparent lack of effective "working together" and "taking directions together" collaboration. A number of people interviewed observed that a collaborative team culture is missing. It was observed that research groups have little interaction with one another, PhD students work closely with their supervisors, but do not engage much with each other, and there is little evidence of collaboration across the different Computing disciplines in the Department with a view to addressing real world problems that usually defy a narrow discipline focus. Senior staff who have a personal research relationship with an external organisation have generally not developed this into a wider relationship with the Department or University.

In order to present a more coherent picture of the capability of the Department to potential external collaborators, fostering greater internal collaboration within the Department would be very helpful. Contrary to this generally negative assessment, however, is the recent exercise mentioned above to communicate research collaboration capability internally within the University, and it is suggested that the Department build upon this to ensure that collaborations occur at all levels – within the Department, between different groups, across the University, and into the industrial community.

The Department should continue its current collaborations within the University notably with respect to the Games Design and Development and Business Analytics programs. As Engineering is developing a more influential role at Macquarie, reflected in the change of name of the Faculty, it is important that the Department of Computing continue to work closely with Engineering to develop and enhance synergies. The Software Engineering major in the BEng is a case in point, and represents an existing collaboration, but it would also be advisable to explore the development of synergies in research. An obvious opportunity for collaboration within Macquarie has developed, with the acquisition by the University of the Centre for Health Informatics from the University of New South Wales. The Department should explore opportunities with CHI in both education and research.

4. Academic Program

Review the appropriateness of the degrees, programs, and units offered by the Department of Computing relative to Faculty and University priorities, employer and professional community demands.

In this section we will also address some issues regarding teaching and learning that arose during the course of the review meetings. Because the accreditation review by Australia

Computer Society (ACS) was completed so recently, the Panel in this Review did not delve into matters about individual courses in any depth, enabling it to focus on other issues.

The undergraduate and masters programs cover several major areas of Computing, ensuring that the Department has a comprehensive offering of programs in the marketplace, all of them meeting an identified industry demand for graduates, and all of them suitably attractive to potential students. There are, however, some gaps in the curriculum in some of the programs, and the Department has inadequate evidence to be certain that its program mix will address future needs. Whilst the commitment to high quality provision of education programs is evident, the Panel was not made aware of any particularly innovative approaches to teaching and learning, and cannot judge the extent to which these exist.

4.1 Commendations

C4.1: The Department's programs are structured effectively, minimising the number of stand-alone electives and ensuring that all units have reasonable enrolments. The scheduling of units means that very few are offered more than once a year, enabling a wider range of offerings.

C4.2: The use of dual conveners and shared teaching ensures back-up coverage, and minimises the risk of not having the expertise to offer a given unit.

C4.3: The Department operates an effective advising system for students, rostering academic staff to ensure students can access available expertise. (The Panel is conscious that in tabling this commendation, it is at the same time asking the Department to consider whether the role of advising students might be transferred to trained Professional Staff – Recommendation R3.5.)

C4.4: The Department engages effectively with University and Faculty Quality Assurance processes at the unit and program level.

C4.5: The cross-disciplinary design and delivery of the Games Design and Development degree along with ensuring broader potential employability of graduates mean that the award has a good story to tell, and is very successful in the marketplace. (Note, however, that this needs to be communicated – see Recommendation R3.7).

C4.6: The Department is commended for the current move to formalise its collaboration with the Department of Engineering in offering the Bachelor of Engineering (Software Engineering). It is hoped that this might form the basis for partnership on a wider front, including research and industrial engagement.

4.2 Recommendations

R4.1: The Department needs to develop a stronger evidence-based assessment of program effectiveness. It should systematically obtain significant hard data on graduate destinations in order to evaluate the effectiveness of its various programs, and assess graduate capability through engagement with employers when it undertakes regular program review, to ensure that programs are producing graduates with appropriate knowledge and skills.

R4.2: The Department should ensure that important contemporary areas of Computing, such as Cloud Computing, Big Data and Development for Mobile Devices, are included in appropriate undergraduate and postgraduate programs.

R4.3: The Panel endorses the Department's goals of establishing a major in Data Science in the BIT and BSc, and to introduce a masters program in Data Science, and encourages that this be executed as soon as possible to exploit market opportunities.

R4.4: The Department needs to re-consider its staff teaching allocations in order to ensure that its postgraduate coursework students experience a greater involvement by Macquarie University academic staff.

R4.5: The Department should consider opportunities to share major learning resources (such as a series of lectures) between units in the undergraduate and postgraduate programs, enabling a more efficient use of staff resources.

R4.6: The Department needs to plan its use of technology more clearly, and to collaborate as partners with IT staff to ensure that technology provision supports learning objectives.

4.3 Discussion

4.3.1 Programs

The Department offers four undergraduate programs (the Bachelor of eBusiness, the Bachelor of Information Technology – Games Design and Development, the Bachelor of Information Technology with three majors available in Software Technology, Information Systems and Business Analysis, and Web Design and Development and the double degree Bachelor of Information Technology with Bachelor of Laws). There is one taught masters degree (the Master of Information Technology, which offers four specialisations in Information Systems, Internetworking and Cyber Security, Web Engineering and (IS) Management). The Department engages in the University-wide offerings of MRes and PhD. In addition the Department is largely responsible for the major in Software Engineering in the Bachelor of Engineering degree, and collaborates with Department of Marketing and Management in the Faculty of Business and Economics on that Faculty's new Bachelor of Business Analytics degree.

There has been significant recent growth in demand for the programs in the Information Systems and Games areas. Whilst the demand-side for the programs is healthy, the Department does not have good data about the employment of its graduates, and in particular does not know the extent to which graduates from particular programs gain employment in the area of their major studies. The Department is likewise not able to judge whether there is a differentiation in overall job outcomes for students of different majors. Accordingly, although the demand and supply sides for all programs appear to be healthy, there is a lack of knowledge to underpin faith that the mix of programs will remain appropriate in the future.

Although the Department has recently re-instituted an Industry Advisory Board to provide input into curriculum design, it currently has little formal feedback from employers of its graduates in relation to the appropriateness of the curriculum with respect to preparing graduates for employment. More could be done the close the loop between program design informed by industry, and program review, informed by industry's judgements about program outcomes.

In 2013 the undergraduate programs (with the exception of the Bachelor of Engineering in Software Engineering) were considered for accreditation by the Australian Computer Society, and were all granted accreditation subject to minor structural changes, which have been implemented. Because the accreditation review by ACS was so recent, the Panel in this

Review did not delve into matters about individual courses in any depth, enabling it to focus on other issues.

There are some gaps in the curriculum, especially in the software areas, which the Department acknowledges (Human Computer Interaction, Cloud Computing, Development for Mobile Devices, Big Data), and which ideally should be introduced into the curriculum even in the short term.

The Software Engineering major in the Bachelor of Engineering degree, a degree which is managed by the Department of Engineering, is taught largely by the Department. This program provides a significant opportunity to anchor collaboration between the Department and the growing Engineering Department. The Department is currently developing a formal agreement with the Department of Engineering to specify in detail that management and administration responsibilities for their partnership in the Software Engineering program.

The MIT degree has just been changed from a 1-year Masters aimed at students who already have a Computing background to a 2-year program which will admit students who do not have a Computing background, with exemptions of up to half a year being available for students who do have a Computing background. Particularly for those units intended to provide the Computing background, the Department could consider, where applicable, the sharing of learning resources for units, especially series of lectures, between programs. This may enable a more efficient utilisation of academic staff resources, and is common in Computing in many Australian universities. (Where this occurs, differentiated outcomes at undergraduate and postgraduate levels can be established on the basis of differentiated assessment mapped to the different AQF levels, with small group tutorial / laboratory work addressing different learning objectives.)

Teaching in the MIT is largely conducted by sessional staff, and whilst this enables all units to be offered based on expertise and often industrial experience, students in this program interact with very few Macquarie academics. The Department needs to re-consider its teaching allocations to ensure that its postgraduate coursework students experience a greater involvement by Macquarie University academic staff.

In terms of future developments, the Department has plans for the introduction of a major in Data Science in the Bachelor of Science and Bachelor of Information Technology degrees, and also for a coursework masters program in Data Science. The former can be mounted with assistance of other Macquarie departments, without the need for many additional units to be developed. These programs align with the University's growing multi-disciplinary interests in Data Science, an area of study that addresses projected needs across many industries, and they promise opportunities for staff in the Department to collaborate with colleagues from other disciplines.

Overall, the suite of programs offered by the Department is appropriate, and the planned introduction of programs in Data Science makes sense in the University context.

4.3.2 Teaching and Learning Issues

The Terms of Reference of the Review did not explicitly request that the Panel consider teaching and learning issues. However, the Panel judges that these are important.

Whilst the commitment to high quality provision of education programs is evident, the Panel was not made aware of any particularly innovative approaches to teaching and learning, and therefore cannot judge the extent to which these exist.

The learning spaces used are conventional lecture theatres, tutorial rooms and structured laboratories, and, despite the use of a Learning Management System, this is used largely as a conduit of traditional learning material.

It was suggested to the Panel that academic staff might benefit from a more collaborative partnership with technical staff in providing technical support for learning. Science IT would like to discuss learning objectives with staff, so that they can provide their technical expertise as input into determining appropriate laboratory support.

5. Research

Review current research outputs, activity, and capability relative to Faculty and University objectives including opportunities for developing research and knowledge leadership.

The Department has a strong research culture across very diverse areas of Computing, with all academic staff engaged in research. The Department's research is largely focussed on contributing to the fifth of the University's research priorities, namely, Innovative Technologies.

The Department has made a commendable attempt to structure its research capability under four themes, and whilst it might be judged that there are too many distinct themes or centres, this is a reflection of the diversity of research interests within the Department. It may be observed that there are no research themes or centres/groups that address two major curriculum areas, Computer Games and Information Systems, although individual academics in these areas have respectable research track records.

Despite the thematic structuring of the research profile, the Department has not succeeded in developing a compelling narrative about its research accomplishments and capability to convince peers within the University or the business community of its value. The recent "research capability awareness" workshops mentioned in Section 3 represent a first attempt to rectify this.

Most staff have achieved a sustained productivity in respect of publications. Over the last decade, a majority of staff have been awarded Australian Research Council (ARC) funding, and several have a sustained success record with ARC Discovery Project (ARC DP) funding. However, the Department has a less commendable record when it comes to receipt of external research funding other than through the ARC DP scheme. In seeking to understand why the Department's funding record seems to be poorer than one might expect in Computing, the Panel observed that several of Macquarie's greatest Computing research strengths appear to be in areas where nearly all funding nationally is derived from the ARC DP scheme, and that there are rarely many grants awarded in these areas. Accordingly, to achieve a significant lift in funding outcomes, an evolution in research profile may be required, with an increased commitment to locating theoretical research within a real-world problem-inspired context.

Overall, there is an individualistic flavour to much of the Department's research, which lacks an obvious strategic coherence. This perhaps explains the fact that there is no major organisational cooperation with industry, as opposed to a number of personal links between certain individual staff members with particular companies. As in a number of other areas, the Department is lacking a strategic approach to engagement with the University's research priorities.

5.1 Commendations

C5.1: The Department is commended for its intent to sustain a strong research culture: passion for research; leadership by example; commitment to ensuring reputation is enhanced; setting the bar high; commitment to quality; commitment to external collaboration.

C5.2: The Department has sustained a good publication record over the last several years.

C5.3: The ERA 2012 rating of 4 in the "Computation Theory and Mathematics" Research Code placed Macquarie alongside ANU as the most highly rated university in the country in that Code.

5.2 Recommendations

R5.1: The Department needs to formulate its research strategy, so that it clearly addresses the Macquarie Research Priorities, comprehended within the four objectives of the Macquarie Research Framework. This strategy needs to address growth in research collaborations – within the Department, with others in the University, and with industry, and should be led by senior staff who themselves have a history of successful collaborations. It should embed the cultural values commended in C5.1, and subject these to monitoring and review.

R5.2: As indicated more generally in R3.7, the Department needs to develop a narrative about its research accomplishments and capability for the University, and generally must improve its communication of these – it needs to tell its research story. The Department should showcase its research collaboration capability to local industry, along the lines of the recent research capability awareness workshops that were targeted within the University.

R5.3: The Department needs to target increasingly its ARC Category 2 & 3 research income, including the ARC Linkage scheme, by improving its collaborations with industry. These collaborations need to transcend individuals' collaborations, which should be considered as a potential basis for development of more extensive relationships involving other staff members. The Department should make full use of the (newly developed) capability of the Research Office and the Office of the DVC Corporate Engagement and Advancement to assist staff in making research contacts with industry.

R5.4: The Department should consider within its broader research strategy its approach to applying for internal Macquarie research grants, building on a communications strategy (R5.2) that better informs Faculty colleagues about research capability and the importance of research in Computing within the Macquarie Strategic Research Framework.

R5.5: It is essential that a strategic approach be taken to achieve better outcomes in ERA. To an extent this has been done for ERA 2015, but research being undertaken now will be submitted for the subsequent ERA exercise, and so preparations for this must commence now.

5.3 Discussion

5.3.1 Research Overview

The Department presents its research profile through a number of research centres and groups, spread across four broad research themes:

- _Cyber Security and Trustworthy Computing
- _Language Technology and Data Science
- _Software and Systems
- _Foundations in Computing.

Included are two Macquarie Research Centres – The Centre of Australian Category Theory and the Centre for Language Science, both of which involve collaboration with other disciplines within the University – and two Faculty Research Centres – the Centre for Advanced Computing – Algorithms and Cryptography, and the Centre for Language Technology.

Research leaders described the research culture in the Department by noting that: staff are passionate about research; research is led by example; there is a commitment to ensure reputation is enhanced; the bar is set high for expected research outcomes; there is a commitment to quality; there is a commitment to external collaboration. These characteristics are commendable and might form the basis for a new strategic orientation to research in the Department in the future. Note, however, that values such as these are ultimately only relevant if they are fully realised in practice. At this stage, these characteristics and values do not appear to produce a cohesive and strategic research culture or be linked to the Macquarie Strategic Research Framework. In future, the Department's research performance must be judged by reference to this Framework, articulated under four objectives:

1. Accelerate World-Leading Research Performance
2. Prepare World-Ready Higher Degree Research Candidates
3. Engage as a World-Recognised Research Collaborator of Choice
4. Deliver Research with World-Changing Impact.

These objectives identify strategic priorities that are not clearly evident in the current research engagement of the Department, with key words in each of the four points – "accelerate", "World-Ready", "Collaborator" and "World-Changing" – not obviously evident in the Department's research orientation.

The University objectives span five Research priorities:

1. Healthy People
2. Resilient Societies
3. Prosperous Economies
4. Secure Planet:
5. Innovative Technologies

In the Department of Computing research is largely focussed on contributing to the fifth priority. The other priorities are suggestive of the kinds of applications for Innovative Technologies that the University wishes to prioritise, and offer a wide range of contexts for application of Computing. Existing research collaborations in the Department can generally be comprehended within these priorities.

The standard measures of research performance are based on counting publications in highly ranked outlets, income won in competitive grant schemes, and PhD program completions. The Panel ranks Macquarie's performance in Computing to be above average in the first, just average amongst research-led universities in the second, and average in the third. All of these aspects contribute to ERA (Excellence in Research for Australia), where in 2012 Macquarie's overall score of 3 in Computing lay in the second quartile of Australian universities. Overall, these outcomes are disappointing, given the seniority of the staff profile.

Over the last two years, three professors have departed for positions elsewhere, and have not yet been replaced. The Panel notes the impact of this on research performance – all have been regular recipients of ARC DP grants, all have stellar publication records, and all supported a

number of research assistants / research fellows who also contributed to the Department's output. As a consequence, there has been a decline in performance of the Department, as measured by publication numbers and research income, translating into a slight decline on a per capita basis. There is no evidence to suggest that there has been a decline in performance of remaining staff.

5.3.2 Research Performance

The Department collectively has sustained a strong record of publication over many years, judged (informally) by the Panel as above average amongst Australian university Computing departments.

There has been a steady record of success in the ARC DP scheme, with annual variations similar to those achieved by other successful departments in the country. The level of research funding obtained from schemes other than ARC DP has been low. Overall there is a "Computer Science theory" flavour to much of the research, which at least partially explains the dominance of funding from the ARC DP scheme. The data on the Department's applications to the ARC DP Scheme since 2008 are given in the table below, extracted from the SERA.

	2008	2009	2010	2011	2012	2013	2014	2015
Applied	11	13	13	13	9	16	12	8
Successful	1	2	5	5	0	2	4	0
Total awarded	230K	742K	1,220K	1,943K	0	660K	2,243K	0

Table 3 ARC Discovery Project applications for funding starting between 2008 and 2015.

In assessing this data, it is necessary to judge research outcomes both within the Computing discipline standards and by reference to the senior staff profile.

Over the last three years, staff in the Department have won 6 ARC DP grants with Macquarie as the administering institution. In that time, the dominant institutions in terms of success are Melbourne and UNSW (with 15 grants each), QUT and University of Queensland (13 and 12 respectively). Macquarie sits in the second quartile of universities ranked in this way. In the most recent round, although no grants were won with Macquarie as administering institution, four grants administered elsewhere included Department staff as Chief Investigators.

In comparing the research funding of the Department with that achieved by other departments in the Faculty, we observe that in some other departments, a significant quantum of funding is derived through the ARC Centre of Excellence scheme. There are no ARC Centres of Excellence in mainstream Computing areas, often explained by the existence of NICTA as a separate government-funded research centre in ICT. Macquarie Computing staff have had only minor engagement with NICTA over the years.

Some interviewed staff expressed the view that it has been hard for Computing staff to succeed in the Macquarie internal grants schemes. They judged that they found it more difficult to persuade the multi-disciplinary panel that awards these grants of the merits of their projects than the discipline-based ARC panel. Since such schemes are often a first stage in building a research initiative that can contend for national competitive grant funding, especially for new and junior staff, it is important that the Department not abandon these

schemes, but rather develop their engagement with peers in the University so that their Computing research capabilities are better understood.

At present Computing Department staff have good collaborations with colleagues in other universities, but there is not much internal collaboration, nor collaboration with colleagues from other disciplines within Macquarie. The recent research capability awareness workshops might accelerate the latter.

Comparative performance in grant success was matched by a similar outcome ERA 2012, where Macquarie's overall rating of 3 in Computing was disappointing. Macquarie was placed with a large number of universities rated 3, with all but the University of Western Australia of the G8 universities (and just these) being rated 4 or 5. Commendably, however, Macquarie rated 4 in the "Computation Theory and Mathematics" Research Code, alongside ANU as the most highly rated university in the country in that Code.

5.3.3 Industry-Linked Research

One of the most disappointing aspects of research performance is the weak achievement in respect of receipt funds from industry (more generally, ARC Category 2 and 3 funds). There has been little engagement with the ARC linkage grant scheme, although Prof Varadharajan has received three Linkage grants over the last 10 years and apart from some funding for Prof Varadharajan and Prof Mark Johnson from Microsoft and Google respectively, very little industry-funded research. There has been some engagement with NICTA and the CRC for Capital Markets – again Professors Varadharajan and Mark Johnson have been to the fore in this regard.

The Panel observes that the individual relationships that senior staff have with major multi-national companies has not translated into more extensive company/University collaborative initiatives of the scale recently achieved by a number of other Universities. Recent examples of new, significant university collaborations in applied research in Computing include Deakin's partnership with IBM in Business Analytics, RMIT's partnership with NICTA and industry partners in Data Analysis, Swinburne's partnership with NICTA and industry partners in Software Innovation, and the UTS initiative in developing the "Hatchery" for student entrepreneurship, supported by Microsoft and others.

6. Research Training

Review the HDR program, including admission standards, methodology and skills training, completion times and drop-out rates, supervision and reporting standards.

The Department offers the MRes degree (replacing the previously offered honours degrees) and the PhD. The standard route to the PhD includes completing MRes first – a five-year integrated program that includes substantial advanced coursework in the first year of the MRes, training in research methods, and preparation for the PhD thesis through writing an MRes thesis in the second year of that program.

In general, admission standards are firm, the selection processes sound and progress monitoring effective.

Overall, the Panel concludes that the Department has a well-managed HDR program, but as with other areas of Department operation, there is a lack of effective strategic collaboration, a

lack of connection to industry, and a lack of a shared strategic direction that could lead to increased activity.

6.1 Commendations.

C6.1: The PhD completion rate over the last 10 years of 70% is well above the Australian average in Computing.

C6.2: Several staff have established a good reputation for the quality of their supervision, suitable to attract students to Macquarie. A feature is the ability for students to frame their own research, rather than just fit into a research team and work on others' projects.

6.2 Recommendations

R6.1: We recommend that the Department introduce a formal MRes alumni program by which it will retain connection with its MRes graduates in industry, with the goal of facilitating future research collaborations with their employers. KPIs in line with targets elaborated in the University's Strategic research framework 2015-24 should be set around this program, and performance should be monitored.

R6.2: The Department should develop features of its MRes program to persuade a greater flow of the MRes students into the PhD program, whilst recognising the benefits of seeding research-aware graduates into local industry.

R6.3: The Department should plan for the introduction of more dedicated MRes coursework units as soon as possible, and it must ensure that MIT units made available are just those at the higher AQF levels that are appropriate for a research masters.

R6.4: The Department should ensure that taught MRes units are subject to the same quality expectations, and are subject to the same quality assurance processes as undergraduate and MIT units. This includes ensuring that the first time a unit runs, a detailed unit outline is available at the commencement of the unit, and that the unit conforms to this.

R6.5: HDR students do not seem to interact across research groups, as exemplified by what was described as limited student engagement during the whole annual research students' conference (MCDC). The Department should ensure that all students attend for the whole conference. Particular attention needs to be paid to ensuring that female HDR students are fully engaged in the daily life of the Department.

R6.6: In order to meet University targets, the Department needs to increase the number of PhD students by a significant quantum over the next few years. A strategy, including making greater use of the cotutelle program, should be developed and monitored in order to achieve this. In particular, this strategy should aim to recruit a greater proportion of female students.

6.3 Discussion

6.3.1 MRes

The MRes program enrolled 5 students in 2013, and in 2014 there are 10 students in Year 1 of the program and 10 in Year 2. (Note: There are additional routes into Year 2 of MRes through completion of honours or coursework masters degrees.) The program combines a research thesis in Year 2, preceded by education in research methods and advanced coursework in Year 1. Currently the Department offers a limited number (5) of MRes units, but students do have the option of enrolling in a number of units from the coursework MIT degree, or MRes units from other departments. Some students reported that the academic level of some

available MIT units is too low, and that some of the dedicated MRes units seemed not to have been planned well. As noted in the recommendations above, the Panel urges that these issues be addressed forthwith.

At this stage, the Department is uncertain of the flow-through from MRes to PhD, as several final year MRes students have expressed a desire to enter employment in 2015. The Department hopes that retaining connections with their MRes graduates in industry might be a means by which future research collaborations with their employers are facilitated.

The Department has some concerns about the requirement that a student complete the two-year MRes program before progressing to the PhD. Competing institutions offer the 1-year honours plus 3-year PhD alternative, so that the Macquarie program might appear uncompetitive to international students seeking a shorter duration. Only time will tell whether this becomes a real issue. Despite these concerns, the Department is supportive of the MRes initiative.

6.3.2 PhD

Currently the Department has 42 PhD students – below 2 per academic staff member, and University research goals, applied to the Department, challenge the Department to double this. The supervision load of staff is shared very unevenly (almost half the staff do not have a principal supervisor role, and a third are not supervising at all) as is typical in Computing departments across Australia.

Given the staff profile, the number of PhD students is disappointingly low; however, the capacity to supervise more students is constrained by the number of scholarships available (from all sources) to support students, and by the theoretical nature of the research interests of several staff, which are in general not very popular amongst potential students. Interestingly, almost 50% of the PhD students are domestic, a relatively high proportion by comparison with many other Australian universities, although few are Macquarie graduates.

The Department recognises the challenge to increase the number of PhD students. Given the scarcity of scholarships available, strategies need to target students who already have a portable scholarship that might be taken up at Macquarie. It is proposed that the cotutelle scheme will be an effective way to realize this. There is a low proportion of female PhD students, as is common in Computing in Australian universities. Along with other strategies to increase female participation in Computing, the Department should develop strategies to recruit and support more female PhD students.

The Department has a number of sound processes in place to manage the recruitment and supervision of its research students. Students interviewed spoke highly of the quality of supervision received, and there was a general indication that the reputation of potential supervisors was a major attractor of these students to Macquarie, as well as the opportunity for students to base their PhD study around their own choice of research project, rather than simply working on others' projects.

Over the last 12 years, the Department has graduated an average of about 10 PhD students per year. The long-term completion rate for PhD students is approximately 70%, well above the Australian average of 51% in Information Technology reported in the recent report on the

Health of Australian Science by the Chief Scientist[2]. The Review Panel was not made aware of time-to-completion statistics.

Disappointingly, there appears to be little engagement between students in different research areas. Whilst an annual PhD student conference, the Macquarie Computing Doctoral Conference (MCDC), offers all students the opportunity to present the details of their research to the Department, and hence to one another, it was suggested to the Panel that the reality is that few students attend presentations outside their own area. There appears to be little collegiality across the whole body of PhD students.

PhD students interviewed expressed a generally positive impression of their life as members of the Department, but had some concerns about access to travel funds for international conferences, about their preparedness for future non-academic employment and about their accommodation. The Panel notes these comments, but observes that Macquarie does facilitate the development of generic skills in their PhD students, and is not ungenerous with respect to student conference funding, by comparison with many other Australian universities.

7. Staff and Student Profile

Review the alignment of academic, professional, and student profile relative to current and future objectives and plans.

The staff profile of the Department is out of balance. It is top heavy (2 Acad Level B, 8 C, 8 D, 8 E). There are three vacancies, currently suspended, at levels B, B and D. Just 15% of academic staff are female. As well as being top heavy, the staff profile demonstrates an ageing staff – all current staff are over 40 years of age, with most over 50. This is not atypical in Australian Computing departments, despite the general societal understanding that Computing is a "young persons' game". The Department has barely adequate staff resources in the major teaching areas of Information Systems and Computer Games Design and Development, although the most recent appointments have been in these areas. There is an over-dependency on sessional teaching staff particularly at the post-graduate coursework level.

On the other hand, the student profile is healthy, and student performance is acceptable. Growth in international students in the Master of Information Technology should be possible through clearly targeted marketing, based on a clear value proposition. Arguably successful marketing of the undergraduate degrees domestically might target raising the ATAR cut-offs (enabling Computing to match the cut-offs of several other Macquarie degrees) rather than increasing student numbers.

It is evident to the Panel that efforts need to be taken to lower the student/academic staff ratio, and to maximise the actual time available for university staff engagement in teaching, subject to the constraints of the Faculty workload model.

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[2] Office of the Chief Scientist 2012, *Health of Australian Science*. Australian Government, Canberra., page 65.

7.1 Commendations.

C7.1: The diversity of the Master of Information Technology student body, with a breadth of cultures and ICT disciplines mirroring the industry, offers students a good insight into practice in local industry.

C7.2: The Department is commended for recognising the need to increase gender balance in the student body and particularly in its HDR cohort.

7.2 Recommendations

R7.1: The Department needs to develop a strategic staff profile development plan to ensure that, over time, appropriate balance is achieved in a number of critical areas (staff grades, gender, sub-disciplines of Computing prevalent in teaching).

R7.2: The in-progress recruitment to the Level D in Software Engineering needs to be completed as soon as possible in order to provide leadership in Software Engineering, including maintaining and growing the collaboration with the Department of Engineering in this discipline area.

R7.3: It is recommended that the two remaining vacant positions be filled as soon as possible, but only after the Department has developed a strategic staff profile development plan that identifies priorities for strengthening staff numbers in particular discipline areas. Care needs to be taken to ensure that there is adequate staffing in all areas, especially in Information Systems and Computer Games Design and Development.

R7.4: The Department should take action immediately, with Faculty support, to reduce the reliance on sessional staff. Some immediate actions that have the potential to increase the proportion of units taught by staff, and which might be considered for adoption, include:

a) Fill the 3 vacant academic positions as recommended above. (This will expand the total teaching load available from the academic staff cohort and increase research outcomes.)
b) As recommended elsewhere (R3.4), apply the Faculty workload model with rigour, ensuring that administrative duties are allocated to academic staff in a manner consistent with the rest of the Faculty. (This may allow for increased teaching allocations for a number of academic staff.)
c) The policies on granting of OSP, and consideration of OSP reports should be followed with utmost rigour, to ensure that the University gains maximum benefit from the granting of OSP. Applications from staff whose previous OSP did not deliver satisfactory benefits should be scrutinised very carefully. (This has the potential to reduce the number of staff on OSP over a period of time, and thus increase teaching availability.)
d) Review both undergraduate and postgraduate programs to investigate whether it is possible to share learning resources (such as series' of lectures) between undergraduate and postgraduate units. (If lecture series are shared, the total teaching load applied to the relevant units might be reduced.)
e) Engage in discussions with the Faculty to ensure that when student load in the Department increases, this is accompanied by an appropriate increase in budget enabling creation of new positions.

R7.5: It is recommended that there be clear and systematic quality control over sessional teaching appointments and performance, both of conveners/lecturers and tutors.

R7.6: The Department should pursue modest growth in its student numbers, particularly through enhanced marketing of its programs in domestic and especially in international settings, carefully promoting the distinctive advantages of the programs. The Department should determine clear KPIs for growth in undergraduate, postgraduate coursework and HDR enrolments, and determine a strategy to achieve these.

7.3 Discussion

7.3.1 Staff Profile Issues

The various imbalances in the Staff Profile mentioned above have evolved over time:

- the top-heaviness has occurred partly as a result of staff being successful in gaining promotion(s);
- the increase in student load enjoyed by the Department has not been accompanied by commensurate increases in budget allocations to enable new appointments to be made;
- there has been growth in student numbers in Information Systems and Computer Games Design and Development, and although appointments have been made in these areas, staffing is still below ideal;
- the gender imbalance has been persistent at Macquarie, and throughout the sector, for decades, with little improvement despite many initiatives.

Over the last two years, three professors have departed for positions elsewhere, to an extent reducing the staff imbalance. In Section 5 we noted the impact of these departures on research outcomes. To date, these staff have not been replaced.

The vacant level D position is in Software Engineering, and is intended to provide leadership in the discipline, especially with respect to engagement with the Department of Engineering in the Software Engineering major in the BEng degree. Shortlisting has occurred for this position, but no appointment has been made, for funding reasons. The other positions have been advertised, and applications have been received, but at this stage there is no agreement that the positions can be filled, also for funding reasons.

The Panel recommends that the vacant positions be filled, with due care taken to ensure that where possible, the appointments made will reduce the imbalance on a number of fronts. Further comments on this matter are made in the following section.

7.3.2 Priorities for New Appointments

In the longer term, the staffing balance needs to be restored to a more normal profile. This means that in general new appointments have to be at junior level (Academic A or B), even when replacing a senior staff member. An exception to this general principle should be made in respect of the current vacant position in Software Engineering, as an appointment at Level D is required to inject appropriate experience and leadership into the Software Engineering discipline, to anchor a sustainable relationship with the Department of Engineering in respect of the Software Engineering major in the BEng degree and in research. It is recommended that this appointment proceed forthwith.

A feature of the staff at Macquarie is the concentration of expertise in areas of theoretical computer science and software development. Whilst enabling good research outcomes over time, a consequence of this has been the appearance of gaps in expertise in some key areas of modern Computing practice. This has led to such areas being absent from the curriculum, although in some cases the use of sessional staff has mitigated the lack of staff expertise. The

choice between consolidating existing strengths, with a view to enhancing research performance through the development of critical mass in research centres, and ensuring broad expert coverage of essential curriculum areas is a difficult one. In making new appointments, the Department must plan strategically to ensure that curriculum needs are covered, whilst respecting the importance of ensuring good research outcomes.

In recent years student interest has been growing (and is now highest) in Information Systems and Computer Games Design and Development. Staff numbers in the latter two areas remain low, despite the most recent appointments being in these areas. In particular, the popular Games area is supported by just two staff members. As with the comments above about gaps in expertise, care must be taken to plan strategically when making new appointments, again being careful to ensure sustainability and curriculum coverage in areas of high student interest.

Finally, as is common in Computing Departments, there is a large gender imbalance in the staff profile; just 15% of academic staff are female. Gender imbalances in staff tend to reinforce – perhaps even contribute to the cause of – the serious gender imbalance in the student body in Computing. In making future appointments, the Department should seek, where possible, to address this imbalance.

7.3.3 Sessional Teaching Issues

With the staff profile being top heavy, a result is a higher than normal student / staff ratio (number of student EFTS to the number of *employed* staff EFTS), a consequence being that the number of sessional staff in convenership/lecturing roles is higher than normal in Australian universities.

Sessional staff provide 80% of the convenership / lecturing load in most units in the MIT degree, as well as 37% of the load in undergraduate units. This is an extraordinary level of teaching conducted by sessional staff. No other university in Australia comes close to such a large percentage of mainstream teaching in Computing conducted by sessional staff; it is likely that no other university would permit this, according to their staffing standards. The University and Faculty must decide what is an acceptable percentage, and aim for the Department to reach that within a relatively short time period.

The growth in the percentage of units taught by sessional staff has resulted in an issue whereby the composition of the sessional staff workforce has been changing, with a growth in the number of appointments of sessionals who have had no previous connection with the Department. This has caused a number of acknowledged issues with teaching quality; the appointment process for sessional conveners / lecturers should be adequately discriminating.

The high reliance on sessionals has been exacerbated because (a) staff teaching loads are low by national standards, (b) there is a high uptake of the generous study leave opportunities (OSP) by academic staff in the Department, with three staff typically absent in each teaching semester, and (c) recent increases in student load have been accompanied by decreasing staff numbers, with three resignations in the last two years (creating the three unfilled vacancies mentioned above).

In relation to the staff teaching loads, the Department follows the Faculty workload model to a degree, but with modifications and what appear to be generous administrative allocations that result in teaching loads below those in the rest of the Faculty. Typically staff are teaching the equivalent of at most 1.5 units per year, which is extremely low by national standards in Computing.

In relation to OSP, the uptake by staff is almost the maximum allowed for the Department by the University policy. The Panel notes that the Department needs to adhere to strict policies of assessing applications for OSP, and assessing post-OSP reports, to ensure that the OSP scheme is delivering good value. It heard some anecdotal comments that the current process was less than rigorous.

In relation to student load and staff numbers, in the last several years, the number of EFTS taught by the Department has been steadily increasing. Some details of this are presented in the *Student Profile Issues* section below. At the same time, the number of academic staff has been decreasing. The table below, taken from the Department's Self-Evaluation Review (SER), indicates the extent of the problem.

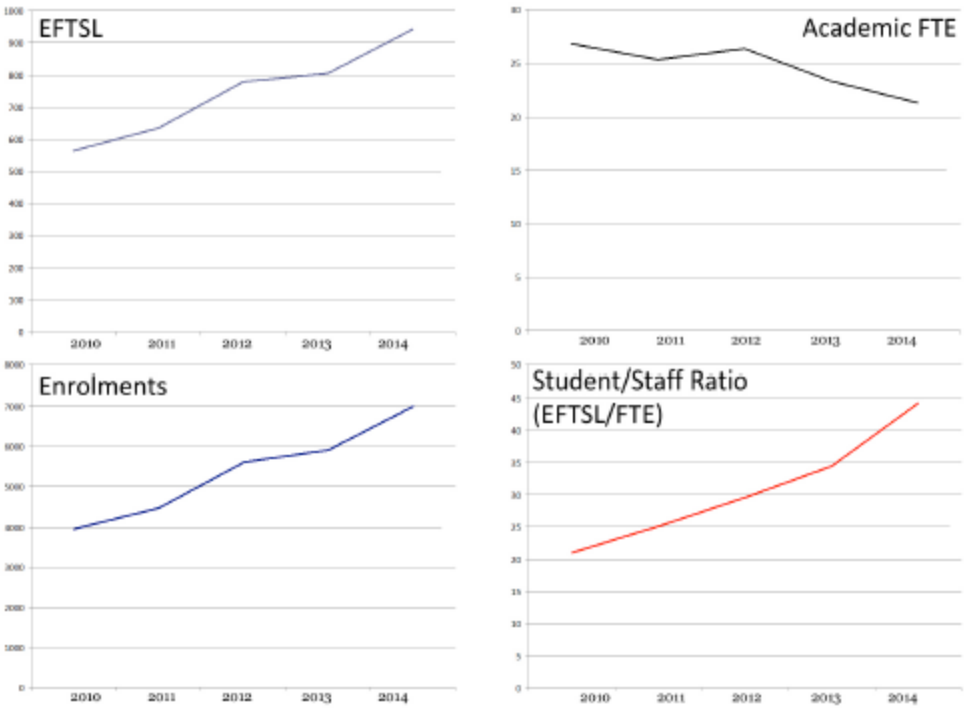

Figure 17 Enrolments, EFTSL, FTE and Student-Staff ratio between 2010 and 2014.

Whilst it is acknowledged that there are many ways to compute a student/staff ratio, involving allowances for the use of sessional staff, it is inevitable that when the ratio of student to employed staff numbers increases, there will be an increasing imperative to increase the use of sessional staff.

It is evident that efforts need to be taken to lower this student/staff ratio, and to maximise the actual time available for staff engagement in teaching, subject to the constraints of the Faculty workload model.

In relation to the actual deployment of sessional staff, it is suggested that the extent of use of sessional conveners / lecturers in the MIT be reduced to ensure that students gain greater interaction with the Department's academic staff. In the short term, the Department might

consider the use of sessional staff to enable the introduction of material in important areas of contemporary Computing, particularly into the undergraduate programs.

7.3.4 Student Profile Issues

There has been a steady increase over the last 6 years in commencing student numbers across the Department's undergraduate degrees, resulting in an increase in total student numbers. The diagram below, taken from the Department's Self-Evaluation Review, illustrates this growth, as well as indicating the dominance of domestic students and male students in the profile.

Figure 19 Computing UG students population between 2009 and 2014.

The proportion of international students in the Department as a whole (including coursework masters students) has been in the range 15% to 20% over that 6-year period. This is significantly lower than the proportion in many other Australian universities, and suggests that the Department might be able to increase its student numbers through strategic development of its international student profile.

The dominance of male students is typical of the field of Computing in Australian universities, and this imbalance recurs despite significant national, state and individual university initiatives undertaken over the last 25 years. The Department is aware that this gender imbalance needs to be addressed, and indeed has been engaging in a number of initiatives to promote the study of Computing to females. It remains committed to progress in this area. Noting the paucity of female academic staff in Computing, it is particularly important to promote an increase in the number of female HDR students, and the Department is also committed to this.

Enrolment in postgraduate coursework programs has declined by about 10% over the last 3 years. The enrolment is relatively low by comparison with many other metropolitan universities. Commencing student numbers are in the low 40s, with international students representing significantly more than half the total. The Department judges that the lack of growth is most likely due to weak marketing initiatives over the last few years, and the Panel concurs. Typically domestic part-time students and international full-time students constitute

the MIT cohort. Students appreciate the diversity of the student body, with breadth of cultures and ICT disciplines mirroring the industry. The international students appreciate the opportunity to study with domestic students who are working in the local ICT industry.

The increase in student load resulting from the growing number of undergraduate Computing students has been supplemented by the successful offering of two service units, including a "Planet" unit, to the general Macquarie community – almost 250 EFTS are enrolled in 2014 in these units. The Department employs a sessional staff member to convene these units, and tutorials are also staffed largely by sessionals. This has meant that in the short term, the very significant load increase has been obtained efficiently; nonetheless the Department needs to manage these offerings effectively, ensuring it can sustain the offerings and their quality. Additionally, the Department offers a number of first year units of interest to many non-Computing students in the Business and Science and Engineering faculties, which contribute significant student load.

The success rate of students in Computing units in the last three years has been around 83%, just below the rate in Science units as a whole. Whilst it is hard to obtain comparable data across the Australian University sector – this data is often a closely-guarded secret - this rate is reasonably high by comparison with that in several other universities known by the Review Panel Chair.

8. Community Engagement

Review the scale, scope, and quality of community/industry engagement, including external/ professional contribution to and referencing of, curriculum and research development

The Department's principal avenues of community engagement are through outreach activities in secondary schools and engagement with a variety of organisations which provide projects for the undergraduate PACE student project units. In addition, members of the Department participate in events organised by others to promote ICT, targeted at the general public.

Overall, the Department's activities are low key, and for the most part involve contributing to events that have a wider scale, and are organised by others – for example, the Macquarie "Uni in a Day" event, which is University wide; the Macquarie University Open Day; and the activities associated with the "Digital Careers" program organised by NICTA. The Department also engages regularly in a number of other events organised by the University.

In relation to outreach in local schools, although the Department is regularly involved in school visits, there appears to be no strategic plan to promote ICT in local schools from a distinctly Macquarie perspective, with a view to encouraging students to choose ICT study, and then to choose Macquarie as the preferred university for that study. Given that the ATAR cut-off for Computing programs is a relatively low 75 by Macquarie standards, and that the Department covets both an increase in quality of entrants and in student numbers, it would be wise to be more intentional about outreach to the local secondary school communities.

In relation to engagement with industry, this Report has already indicated that the extent of *research* engagement with industry is low. That is not the case in relation to working with industry (comprehended broadly as any organisations who use ICT) to provide project opportunities for students. There is an impressive range of organisations providing projects.

However, it is not evident that interactions with these organisations are leading to wider partnerships.

In 2014, following a recommendation of the ACS accreditation Panel in 2013, the Department's Industry Advisory Board was re-constituted. As yet, this Board has met just once, and its impact is yet to be measured. However, there are thirteen senior representatives from a wide range of industry perspectives now available to provide advice to the Department in relation, in particular, to program development and review.

8.1. Commendations

C8.1: The Department is commended for the establishment of an external advisory body with industry representation.

8.2. Recommendations

R8.1: The Department needs to plan its own outreach activities more consciously, as well as participating as a partner in regular events organised by others. In particular, it needs to develop an outreach to local (ie north shore) schools that identify clearly why Macquarie should be the University of choice to study in its Computing areas of particular strength.

R8.2: The Department is encouraged to think strategically as to how it may be able to exploit links with organisations which provide projects for students in the PACE program, and the organisations of the members of the Industry Advisory Board, especially in the context of research and educational partnership opportunities. To that end, the Department might consider elevating the importance and commitment to the role of Director of Industry and External Liaison.

9. Future Directions

Recommend future development opportunities for the Department of Computing in terms of its resources, research, teaching and community/industry engagement activity.

In its Self-Evaluation Review (SER), the Department indicated a range of priorities for the future. These priorities arise out of consideration of the challenges facing the Department enunciated throughout the SER.

If there is one pervasive theme underlying the recommendations in this report, and which is missing from the Department's own list of priorities, it is that the Department must be much more intentional and committed in its strategic planning and review, with a view to achieving strong alignment with University and Faculty priorities. As indicated earlier in this Report, the Panel has identified this as its main recommendation. Following consideration of the Report, it is essential that the Department document its priorities, identify how success will be measured and establish Key Performance Indicators (with appropriate achievement dates).

9.1. Commendations

C9.1: The Department is commended for assembling a thoughtful collection of future priorities.

9.2 Recommendations

R9.1: Following receipt of this Report, and consideration of its recommendations, as part of the process recommended in Recommendation R3.3, the Department should review its list of

priorities, and for each identify how success will be measured and establish Key Performance Indicators (with appropriate achievement dates).

9.3 Discussion

In its Self-Evaluation Review, the Department indicated the following priorities for the future:

- Through any recruitment opportunities, address the age profile and gender balance of the academic staff
- Achieve continuous improvement in its processes
- Invest in research opportunities in Data Science, including the establishment of collaborations with other Macquarie centres and departments
- Establish research collaborations with Engineering
- Increase the number of international students in the Department
- Offer a major in Data Science in the BIT and BSc, and introduce a masters program in Data Science
- Introduce the opportunity of industry internships as a component of the MIT program
- Strengthen links with industry, including development of industry training programs
- Improve links with local secondary schools, with a view to promote IT as an area of study for young people, especially women.
- Strengthen the influence of the Industry Advisory Board with respect to support of curriculum design, especially in new programs.

These priorities arise out of consideration of the challenges facing the Department enunciated throughout the SER. The Review Panel is pleased to endorse all of these priorities, many of which are in accord with specific recommendations made in this report.

The priorities listed above constitute desired outcomes. The commitment to a strategic approach will be necessary in order to realise these. As indicated earlier in this Report, following consideration of the Report, it is essential that the Department document its priorities, identify how success will be achieved and measured and establish Key Performance Indicators (with appropriate achievement dates).

10. Technical Support Issues

A Department of Computing has special needs with respect to the provision of technical facilities. Whilst the Department requires the standard facilities supplied to all departments, students and staff in a Computing department require extensive access to specialist Computing facilities for their learning, teaching and research.

Provision of such facilities, and their management in an effective and efficient manner, is germane to the good running of the Computing department. As with the specialist, discipline-specific technician support required for science and engineering departments, the closer the people providing the service are to the department, generally the better the service as perceived by students and staff.

At Macquarie University, some computer services are provided centrally, and some at Faculty level by the Science IT group. The Panel was informed of some issues relating to IT provision, and a number of recommendations are made below in relation to these. They focus on the needs of staff and students, and not on the means of provision.

Comments were made both in relation to an inadequate level of support, and the current approach which seems to be reactive, responding to problems when they occur, rather than pro-active, putting strategies in place to ensure that as far as possible, problems do not arise. These comments were made both by Department staff and service providers, and relate more to overall resourcing than to dysfunctional organisational structure, indicating that agreement to change ought to be realisable.

10.1. Recommendations

R10.1: Since improving support services is one of the University's strategic priorities (No. 7 Framing of the Futures) it is recommended that the University and Faculty need to work with the Department to ensure that adequate and efficient support services are available in respect of the especially demanding technical nature of teaching and research in Computing.

R10.2: The development of a Faculty / Department roadmap for technical support in place of the current reactive approach is recommended. Again, this speaks of the need for long-term planning, with identification of technical support needed to achieve goals. It is not clear the extent to which this requires change across the Faculty and University.

R10.3: Given the nature of teaching hours in Master of Information Technology program (evenings and Saturday), it is recommended that better 24/7 access to lab facilities be provided for students, and technician support should be provided at very least during the times of formal laboratory classes.

R10.4: It is recommended that the Department advocate for at least some of their teaching space to be transformed. ICT laboratory spaces are "old fashioned" (this refers to the actual teaching spaces, and not to the equipment), and they do not conform to the expected design paradigm of contemporary learning spaces. The Panel was informed that there is no coordination between ICT support and University Learning Services. Collaborative learning spaces, re-configurable spaces and spaces to support project work physically located near the Department's offices are all desirable.

R10.5: WIFI coverage across the campus needs to be improved, to ensure student (and staff) access at all times. This is clearly a University issue but it has particular implications for a technically based discipline.

Appendix 1

The interview schedule and stakeholders interviewed were as follows:

12th November 2014

Events	Attendees
Dinner with Executive Dean	Review Panel and Executive Dean

13th November 2014

Events	Attendees
Meet with Head of Computing	Dr Christophe Doche
Meet with Associate Dean of Research	Prof Bernard Mans
Meet with Department Executive	Dr Christophe Doche, Head of Computing
	A/Prof Steve Cassidy, Director of Teaching
	Dr Peter Busch, Director of PG Coursework Program
	A/Prof Annabelle McIver , Director of Research
	A/Prof Yan Wang, Director of Higher Degree Research
	Prof Jian Yang, Director of Industry and External Relations
	A/Prof Mark Dras, *MRes Convenor*
	Melina Chan, Executive Officer-Team Leader
Lunch, all Computing staff	Panel and all Computing staff
Meet with Faculty General Manager	Imtiaz Bhayat, Faculty General Manager
Meet with Program Leaders	
	A/Prof Steve Cassidy (BIT and BeBus)
	Dr Malcolm Ryan (BIT-GDD)
	Dr Peter Busch (MIT)

Events	Attendees
Meet with Professional staff	Melina Chan, Donna Hua, Sylvian Chow, Jackie Walsh, Fiona Yang, Andrina Brennan
Meet with student groups:	
• MIT student	MIT students

14th November 2014

Events	Attendees
Meet with Research Group Reps	Prof Vijay Varadharajan
	Prof Mark Johnson
	A/Prof Annabelle McIver
	Prof Michael Johnson
Meeting with Science IT Manager	Natalia Salzberg
Meet separately with student groups:	
• PhD students	PhD students
• MRes students	MRes students
Lunch with Associate Deans	Dr Christophe Doche, Head of Computing Prof Bernard Mans, Associate Dean of Research(TBC) A/Prof Michael Hitchens, Associate Dean of Quality and Standards (TBC)
Meet separately with staff reps:	
• Level B	Dr Stephen Smith
• Level C	Dr Len Hamey
• Level D	A/Prof Tony Sloane
• Level E	Prof Deborah Richards

Implementation Plan for Review of Computing

Implementation of Findings and Recommendations

1. Governance, Leadership and Management

Rec No.	Recommendation	Responsibility	Response and Status
1.	The Department needs to identify a small core leadership group that will take responsibility, under the Head of Department, for driving departmental direction-setting, strategic planning and performance monitoring. This group needs to meet regularly, and maintain a commitment to ensuring that the Department engages with University and Faculty strategic plans.	Head of Department	The core leadership group will comprise the existing Department executives (Director of Teaching, MIT, Research, HDR, Industry & External Relations, and MREs coordinator). Any other member of the Department with a significant Faculty or University portfolio is invited to join. Bernard Mans, AD Research, Michael Hitchens, AD FSQC and Dominic Verity, Chair of Academic Senate have all accepted to be part of this group, which is going to meet monthly. Status: Completed
2.	The Department must be more intentional in its strategic planning and management. Three year and annual goals need to be set, key performance indicators (KPIs) and targets established, and annual reviews of performance against these KPIs rigorously monitored. An annual "retreat" should be held; the first one, preferably early in 2015, could be where the Department can focus on addressing the recommendations in this Report, including how it will collectively address the requirements of the University Strategic Plan and Strategic Research Framework 2015-2024.	Head of Department Core leadership group	An annual retreat will be organised during the first week of the Easter break. Some strategic directions will be explored by the Core Leadership group beforehand to maximise the value of this exercise. Clear goals and annual KPIs will be developed for all the executives and all the academics. These will be implemented as part of the PDR process. Status: In progress

3.	It is recommended that the Departmental management be provided with more direct support from the Faculty in addressing Faculty and University expectations, especially in relation to budget planning and allocation, research performance and staff teaching workloads. This includes the Faculty making more transparent, across the Faculty, its budget model and process along with academic staff workload and research productivity expectations. To enable effective, on-going engagement with the Faculty, the Department needs to establish an early, fruitful relationship with the incoming Executive Dean.	Faculty Manager Executive Dean Heads of Department	We are very much looking forward to working with our new Executive Dean, Faculty Manager and the other Heads in relation to budget, research performance and workload. The University is currently reviewing its budget process. The definition of research productive status is to be released by the University any time soon. A working party tackling workload issues will be created soon. The new Executive Dean and the Head of Computing have met several times and have started to address the recommendations raised in this document. Status: In progress
4.	The Department should rigorously adopt the Faculty workload model as applied across the rest of the Faculty. The Department needs to formalise role descriptions for its various administrative roles undertaken by academic staff, to allocate these in a manner that minimises the total workload required, and to ensure that full and effective use of the general 20% administrative allocation for those on a balanced pattern is carefully monitored.	Head of Department	The teaching allocation for 2015 has been finalised. It strictly complies with the Faculty workload model. A formal description of all the administrative roles is underway. It involves all the executives and all the academics. We expect it to be completed in time for the retreat. Once this is done, administrative tasks will be allocated to staff, in much the same way as teaching duties. Status: In progress
5.	Judged by contemporary standards, too much academic time is spent in providing course advice to students. The Department should consider allocating the bulk of this responsibility to professional staff, who can be trained to do it or the Faculty could consider expanding its student support services.	Head of Department Executive Dean	Most of the time spent on advising by academics consists in fact in checking that a student has fulfilled all the requirements, or is on track, to graduate. This advice is much needed by students because of the flexible and often confusing nature of Macquarie programs together with the inadequacy of some systems such as Student One, which are

		Registrar	supposed to provide support to students. This advising task could indeed become the responsibility of additional professional staff specifically trained, as it is the case in some other Faculties. In fact, proper systems should be in place to provide appropriate guidance to students. A proof of concept of such a system has been developed by the Department of Computing but it has not generated much interest yet. Status: In progress
6.	The Department needs to develop succession plans for all of its academic coordination roles, ensuring that as many academic staff as possible rotate through the positions of responsibility and ensuring that staff at levels B and C have the opportunity to serve the Department in this way.	Head of Department Department Executives	We plan to identify a deputy for each executive role. This has proved to be difficult in the past because the reward for staff to accept that role was not clearly established. We expect this will be much easier this time around because of the introduction of an administrative allocation, similar to the teaching allocation, see 4. We will make sure that junior staff are allocated to these roles. Status: In progress
7.	The Department needs to clarify its "story" so as to communicate its achievements, its capability and its distinctiveness. As an example, the Games Design and Development degree has such a story - it fully explains why Macquarie has the best games degree in Sydney, and what distinguishes it from competitor programs. This needs to be done for academic programs, research and industry and community engagement.	Head of Department Director of Industry & External Relations	The Department agrees that it needs to develop a narrative addressing its achievements, capabilities and distinctiveness, which is consistent with the University. This will be an important item of our upcoming retreat, as part of the wider discussions around our vision for the future of the Department. This has been discussed with the Marketing Faculty Manager and we expect to get some support from them. Status: In progress

8.	There is an urgent need for the Department to work towards the development of a stronger collaborative team culture across the range of its activities.	Head of Department Department Executives	We very much agree with this recommendation. The amount of collaboration across our teaching activities is satisfactory but could be improved. We need to greatly improve our team work effort regarding administrative duties. The establishment of stronger committees with compulsory attendance and active participation expected from members will greatly contribute towards that goal. A dedicated strategy to encourage research collaborations will be investigated separately. Status: In progress
9.	The Department should work closely with the Department of Engineering to develop and enhance synergies, both in the existing collaboration in the Software Engineering major in the BEng and in research; and with the Department of Marketing and Management to explore synergies in the area of Business Analytics. Opportunities should also be explored for collaboration with the Centre for Health Informatics.	Head of Department Program Leaders Director of Teaching and Research	The Department enjoys an ongoing and fruitful relationship with the Department of Engineering. We are currently involved in several teaching and research initiatives with Engineering, e.g. the accreditation of the Software Engineering program. We have engaged with the Department of Marketing and Management to explore possible collaborations in business analytics. We expect to have more opportunities in future with the possible introduction of a Bachelor of Digital Business. We will develop our relationship with the Australian Institute of Health Innovation and in particular, the centre for Health Informatics through the links which already exist. Indeed, some staff have existing collaborations with members of this group. Status: In progress

2. Academic Program

Rec No.	Recommendation	Responsibility	Response and Status
10.	The Department needs to develop a stronger evidence-based assessment of program effectiveness. It should systematically obtain significant hard data on graduate destinations in order to evaluate the effectiveness of its various programs, and assess graduate capability through engagement with employers when it undertakes regular program review, to ensure that programs are producing graduates with appropriate knowledge and skills.	Head of Department Directors of Teaching and Industry & External Relations	We agree that we need more evidence to assess the effectiveness of our programs. Our efforts to develop a stronger Alumni program will prove useful in that instance. Also, we will investigate tools such as datamart and other sources of information, e.g. the Graduate Destination Survey in order to obtain hard data on the future of our graduates. Our Industry Advisory Board will play a crucial role during our regular program review. Status: In progress
11.	The Department should ensure that important contemporary areas of Computing, such as Cloud Computing, Big Data and Development for Mobile Devices, are included in appropriate undergraduate and postgraduate programs.	Directors of Teaching and MIT Head of Department	We are aware of several gaps in our curriculum. A comprehensive review of our curriculum will be carried out at the occasion of the retreat and completed during 2015. We have an in-principle agreement for the introduction of a new unit for 2017 whose aim is to cover Cloud Computing and Big Data. Status: In progress
12.	The Panel endorses the Department's goals of establishing a major in Data Science in the BIT and BSc, and to introduce a masters program in Data Science, and encourages that this be executed as soon as possible to exploit market opportunities.	Executive Dean Head of Department	After fruitful discussions with our Executive Dean, the Department has made a submission for the introduction of a major in Data Science that will be a qualifying major in the BIT and in the BSc from 2016. Status: Completed (pending approval of other Faculty and University instances)
13.	The Department needs to re-consider its staff teaching allocations in order to ensure that its postgraduate	Head of Department	The teaching allocation for 2015 was to a large extent finalised when the Department received the report of the

	coursework students experience a greater involvement by Macquarie University academic staff.	Directors of Teaching and MIT	review. When possible, additional Computing academics have been allocated to certain PG units (for instance ITEC833 and ITEC844). Status: Completed
14.	The Department should consider opportunities to share major learning resources (such as a series of lectures) between units in the undergraduate and postgraduate programs, enabling a more efficient use of staff resources.	Directors of Teaching and MIT Head of Department Associate Dean FSQC	We are a bit puzzled by this recommendation. The University has enforced that teaching of a postgraduate coursework unit must be appropriate for the relevant AQF level which is notably different to that of an undergraduate unit. Hence sharing major resources is not an option. We will seek clarification with FSQC regarding the nature and the extent of the sharing that can occur in that space. Status: In progress
15.	The Department needs to plan its use of technology more clearly, and to collaborate as partners with IT staff to ensure that technology provision supports learning objectives.	Head of Department Director of Teaching and MIT Science IT Manager	We agree that a stronger collaboration with Science IT when it comes to planning the use of technology supporting our teaching activities is necessary so that our students enjoy a better outcome. The Manager of Science IT is on the same page. We expect that in the near future, the appropriate use of technology is going to be key in our success to deliver quality programs. This is an important item that needs to be included in our strategic discussions. In any case, our evolution in teaching should be informed by the upcoming University learning and teaching plan. Status: In progress

3. Research and Research Training

Rec No.	Recommendation	Responsibility	Response and Status
16.	The Department needs to formulate its research strategy, so that it clearly addresses the Macquarie Research Priorities, comprehended within the four objectives of the Macquarie Research Framework This strategy needs to address growth in research collaborations – within the Department, with others in the University, and with industry, and should be led by senior staff who themselves have a history of successful collaborations. It should embed the cultural values commended in C5.1, and subject these to monitoring and review.	Director of Research Core leadership group Head of Department	A strategic reflection regarding research is clearly needed and will be done in relation to other crucial items such as staffing and teaching. The core leadership group will be in charge to define how the Department addresses the directives in the Research Framework. The details of the strategy will be developed collaboratively with the entire Department. The strategy will include a plan to enhance our collaborations within the Faculty and Engineering is the perfect partner for us. Status: In progress
17.	As indicated more generally in R3.7, the Department needs to develop a narrative about its research accomplishments and capability for the University, and generally must improve its communication of these – it needs to tell its research story. The Department should showcase its research collaboration capability to local industry, along the lines of the recent research capability awareness workshops that were targeted within the University.	Director of Research Director of Industry & External Relations Head of Department	The Department agrees that it needs to develop a narrative addressing its achievements, capabilities and distinctiveness, in research as well as improving its communication inside and outside the University. This item will be part of the wider effort to tell the narrative of our Department, see recommendation 7. Status: In progress
18.	The Department needs to target increasing its ARC Category 2 & 3 research income, including the ARC Linkage scheme, by improving its collaborations with industry. These collaborations need to transcend individuals' collaborations, which should be considered as	Director of Industry & External Relations	We completely agree with this recommendation and have started to enhance our engagement with the Industry and Government Agencies. We are committed to evaluate every opportunity offered by the Research Office, the office of the DVC Corporate Engagement, or any other entity and pursue

	a potential basis for development of more extensive relationships involving other staff members. The Department should make full use of the (newly developed) capability of the Research Office and the Office of the DVC Corporate Engagement and Advancement to assist staff in making research contacts with industry.	Director of Research Head of Department	those that represent a value to the Department. Early leads include SingTel, Optus, Squiz, NSW fire brigade, NSW electoral commission, and some local companies. Another option to develop a durable relationship with local companies would be to run short courses of interest to them and tailored to their needs. Status: In progress
19.	The Department should consider within its broader research strategy its approach to applying for internal Macquarie research grants, building on a communications strategy (R5.2) that better informs Faculty colleagues about research capability and the importance of research in Computing within the Macquarie Strategic Research Framework.	Director of Research Head of Department	That is a very good point. We need to determine the most effective way to inform our University colleagues about our research capabilities. We also need to be proactive in trying to better understand the needs of other Departments. There are opportunities for real collaborations with engineering, medical sciences, media, arts, business and human sciences. Status: In progress
20.	It is essential that a strategic approach be taken to achieve better outcomes in ERA. To an extent this has been done for ERA 2015, but research being undertaken now will be submitted for the subsequent ERA exercise, and so preparations for this must commence now.	Director of Research Head of Department	As part of our strategic reflection regarding research, we will investigate ways to increase the quality of our research output and achieve more relevance. Clear goals and KPIs will be established in conjunction with the upcoming release of the definition of the research productive status. These will be implemented via the PDR. Status: In progress
21.	We recommend that the Department introduce a formal MRes alumni program by which it will retain connection with its MRes graduates in industry, with the goal of facilitating future research collaborations with their employers. KPIs in line with targets elaborated in the University's Strategic research framework 2015-24 should	MRes Coordinator Head of Department	The University has recently increased its interest towards its alumni community. It is not completely clear at this stage what the form of the activities will be but the there is a real effort to reconnect with our alumni. As part of this effort, we should definitely develop a strategy regarding our alumni in the MRes. However, we may have to wait until the

	be set around this program, and performance should be monitored.		programme has firmed up before we implement this strategy. Indeed, the experience of our first cohort has been less than ideal at times because of some issues associated with the introduction of a new program. In particular, the delays and the arbitrariness in the thesis examination process have been bitterly felt among students. We should also include the MIT in that reflection as alumni may be an effective way to recruit local students. Clear goals and KPIs will be developed after the retreat. Status: In progress
22.	The Department should develop features of its MRes program to persuade a greater flow of the MRes students into the PhD program, whilst recognising the benefits of seeding research-aware graduates into local industry.	MRes Coordinator Head of Department	Most of the students enrolled in the MRes are interested by a PhD. The challenges seem to be attracting undergraduate students to do an MRes in the first place and also to having enough PhD scholarships for good MRes students. As of 2016, the attribution of PhD scholarships will be competitive and not based on a simple results threshold. We have developed initiatives to attract more undergraduate students in the MRes, for instance via the offering of Research internships. We will investigate other options. Status: In progress
23.	The Department should plan for the introduction of more dedicated MRes coursework units as soon as possible, and it must ensure that MIT units made available are just those at the higher AQF levels that are appropriate for a research masters.	MRes Coordinator Head of Department	Certainly, offering more dedicated MRes courses will greatly help to establish the program but it is not clear that we can afford to do that in the present financial situation. Regarding the MIT, we have modified its structure to make it a two year program, which comprises the equivalent of a semester of introductory material for non-cognate students. ICT students can obtain exemptions and complete the program in 18 months. All the other units offered in the

			program are true postgraduate units. In any case, we will reflect on the MRes as part of the holistic review of our programs that we will begin shortly. Status: To investigate further
24.	The Department should ensure that taught MRes units are subject to the same quality expectations, and are subject to the same quality assurance processes as undergraduate and MIT units. This includes ensuring that the first time a unit runs, a detailed unit outline is available at the commencement of the unit, and that the unit conforms to this.	MRes Coordinator Head of Department	Dedicated MRes units are treated much like other units at Macquarie. Although unit guides for MRes units are optional, convenors in Computing publish a detailed unit guide in advance and are expected to stick to it during the semester. The results are discussed during an examination meeting and we make sure that the decisions closely follow the unit guide. We seek feedback from our MRes students during the MIT liaison committee. In the recent past, some interesting proposals have been suggested by our MRes students regarding ways to improve the program. Thus, MRes units are subject to the same expectations as any other unit offered by the Department. Status: Completed
25.	HDR students do not seem to interact across research groups, as exemplified by what was described as limited student engagement during the whole annual research students' conference (MCDC). The Department should ensure that all students attend for the whole conference. Particular attention needs to be paid to ensuring that female HDR students are fully engaged in the daily life of the Department.	HDR Director MRes Coordinator Head of Department	We agree with the observation that PhD students do not tend to interact with each other outside their research group. We have started to address this cultural issue by encouraging MRes and PhD students to attend the Department staff seminar, a seminar given by an academic on a topic that may well be outside their research area. The results were quite promising but we need to do more and promote more collaboration among students. The lack of engagement of students to MCDC probably results from the fact that they see it as an exercise with limited relevance to them. We will get our students' input on

			this question in order to design an event or a process which allows us to monitor their progress while being more meaningful to them at the same time Status: In Progress
26.	In order to meet University targets, the Department needs to increase the number of PhD students by a significant quantum over the next few years. A strategy, including making greater use of the cotutelle program, should be developed and monitored in order to achieve this. In particular, this strategy should aim to recruit a greater proportion of female students.	MRes Coordinator HDR Director Head of Department	We see an increase of our number of PhD students as one of the main ways to increase our research output. In 2014, we have started to offer internships to selected undergraduate students to give them a taste of research with the hope they will enrol in the MRes. But even if this approach is successful, the number of PhD scholarships will remain limited. Thus it is crucial to be able to attract students with their own scholarship or as part of a cotutelle program with an overseas institution. Fortunately, many of our staff come from overseas or have worked overseas for a long period of time. We plan to ask staff to reactivate those links (or to engage with research collaborators overseas) in order to increase the number of cotutelle opportunities. At the same time, we need to clarify and streamline the whole process, which seems a bit opaque at the moment, with the help of the University. We have started to witness positive signs from the University on that front. Status: In progress

4. Staff and Student Profile

Rec No.	Recommendation	Responsibility	Response and Status
27.	The Department needs to develop a strategic staff profile development plan to ensure that, over time, appropriate balance is achieved in a number of critical areas (staff grades, gender, sub-disciplines of Computing prevalent in teaching).	Head of Department	Given the staffing profile of the Department, we rate this recommendation as one of the most important of the review. The Department will engage in a strategic reflection regarding its staffing during and immediately after the retreat. We will then devise a plan with the Faculty, focusing on the conditions for the successful implementation of that plan. Status: In progress
28.	The in-progress recruitment to the Level D in Software Engineering needs to be completed as soon as possible in order to provide leadership in Software Engineering, including maintaining and growing the collaboration with the Department of Engineering in this discipline area.	Head of Department Faculty Manager Executive Dean	The recruitment of the Level D in Software Engineering has been finalised. A/Prof Franck Cassez joined the Department in January 2015. Status: Completed
29.	It is recommended that the two remaining vacant positions be filled as soon as possible, but only after the Department has developed a strategic staff profile development plan that identifies priorities for strengthening staff numbers in particular discipline areas. Care needs to be taken to ensure that there is adequate staffing in all areas, especially in	Head of Department Faculty Manager	One of the two Level B positions has already been filled. Dr Young Choon Lee, expert in Cloud Computing Infrastructures, has joined the Department in February 2015. The Department will engage in strategic reflection regarding its staffing. We note Dr Lee is a DECRA holder until the end of 2016. Thus his salary will have no impact in our budget in

	Information Systems and Computer Games Design and Development.	Executive Dean	2015 and in 2016. Once our strategy is determined, we want to investigate with the Faculty the possibility to hire the second Level B position, as recommended in the review. Status: Partially completed
30.	The Department should take action immediately, with Faculty support, to reduce the reliance on sessional staff. Some immediate actions that have the potential to increase the proportion of units taught by staff, and which might be considered for adoption, include: a) Fill the 3 vacant academic positions as recommended above. (This will expand the total teaching load available from the academic staff cohort and increase research outcomes.) b) As recommended elsewhere (R3.4), apply the Faculty workload model with rigour, ensuring that administrative duties are allocated to academic staff in a manner consistent with the rest of the Faculty. (This may allow for increased teaching allocations for a number of academic staff.) c) The policies on granting of OSP, and consideration of OSP reports should be followed with utmost rigour, to ensure that the University gains maximum benefit from the granting of OSP. Applications from staff whose previous OSP did not deliver satisfactory benefits should be scrutinised very carefully. (This has the potential to reduce the number of staff on OSP over a period of	Head of Department Faculty Manager Executive Dean Chief Financial Officer	As noted in our response to recommendation 4, the Department has rigorously followed the Faculty workload model for its teaching allocation in 2015. A further analysis of our offering based on last year enrolments (not contained in the self-evaluation report) reveals that the Department needs 15,465 hours to convene, lecture, prepare assessment and mark examinations for all our undergraduate and postgraduate units. This load corresponds to tasks that are normally carried out by academics as this total does not account for running tutorials/practicals and marking assignments. Furthermore, an analysis shows that our teaching availability is equal to 10,540 hours only. This amount is based on the patterns of each academic, taking into account teaching relief for administrative duties. The time needed to supervise PhD and MRes students is 1,647 hours leaving a difference of 8,893 hours. The different Department executives get a total of 1,228 hours of teaching relief. If we were to discount this teaching relief, we would only cover 65% of our teaching needs. Also, the OSPs in 2015 corresponds to 1,575 hours. Even if we did not grant any OSP, we would only cover 75% of our needs. (It is to be noted that the approval of OSP applications is not handled by the Department, it is a decision of the Faculty.)

	time, and thus increase teaching availability.) d) Review both undergraduate and postgraduate programs to investigate whether it is possible to share learning resources (such as series' of lectures) between undergraduate and postgraduate units. (If lecture series are shared, the total teaching load applied to the relevant units might be reduced.) e) Engage in discussions with the Faculty to ensure that when student load in the Department increases, this is accompanied by an appropriate increase in budget enabling creation of new positions.		A review of our undergraduate and postgraduate programs may be a way to reduce our teachings needs and thus reduce our reliance on casual staff. But as noted elsewhere, major sharing resources between undergraduate and postgraduate units is not allowed by the University. Also, reducing our offering will definitely decrease our teaching needs but it will also affect our teaching load since students usually take more Computing units than they are required to. This may affect our budget in later years. Since the end of 2014 and seemingly for the next three years, the budget of Faculties is decoupled from their respective teaching loads. In this context, it seems that the Faculties need to engage in talks with the University to ensure that they receive a funding that takes into account their actual teaching load before this item can be addressed at Department level. Clearly, this lack of funding is preventing us from running activities, which we think are valuable to students. In case, this situation continues it seems that a radical change in our teaching approach is the only way to durably address this crisis. Status: In progress
31.	It is recommended that there be clear and systematic quality control over sessional teaching appointments and performance, both of conveners/lecturers and tutors.		There are already mechanisms in place to ensure quality control of sessional staff. They include systematic use of teaching evaluations to select staff, centralised selection of tutors, on-going feedback from our students during liaison committee meetings, and review of results in examination

			meetings. Perhaps this needs to be formalised further with maybe the introduction of KPIs for sessional staff as well. Status: In progress
32.	The Department should pursue modest growth in its student numbers, particularly through enhanced marketing of its programs in domestic and especially in international settings, carefully promoting the distinctive advantages of the programs. The Department should determine clear KPIs for growth in undergraduate, postgraduate coursework and HDR enrolments, and determine a strategy to achieve these.	Chief Financial Officer Executive Dean Faculty Manager	The Department has currently no control of its undergraduate intake. The IT discipline is one of the top priorities of Macquarie International office in order to attract more international students and the Department has fully participated to an increased marketing effort to meet that goal. Nonetheless, the Department wants to engage in a strategic reflexion regarding its students' profile and it would be highly desirable if the outcome of that reflection be considered by the University when dealing with our intake. Regarding local students, the Department has shaped, over the years, programs that have proved to be attractive to students. We expect that our efforts to reach out a number of schools will raise the profile of our future students. Also, a clear strategy to attract local postgraduate students is needed and will be discussed at the occasion of the retreat. Status: In progress

5. Community/Industry Engagement

Rec No.	Recommendation	Responsibility	Response and Status
33.	The Department needs to plan its own outreach activities more consciously, as well as participating as a partner in regular events organised by others. In particular, it needs to develop an outreach to local (ie north shore) schools that identify clearly why Macquarie should be the University of choice to study in its Computing areas of particular strength.	Director of Industry & External Relations Head of Department	We have obtained from marketing a list of schools and contacts of particular relevance to Macquarie. We plan to allocate to each academic staff in the Department a particular school with the mission to establish a connection with ICT teachers over there. Staff will be expected to run a range of activities including the promotion of IT in general and our programs in particular, especially to female students, support to local teachers, participation to events /competitions, etc. These tasks will count towards the new administrative allocation and will be managed through the PDR. Status: In progress
34.	The Department is encouraged to think strategically as to how it may be able to exploit links with organisations which provide projects for students in the PACE program, and the organisations of the members of the Industry Advisory Board, especially in the context of research and educational partnership opportunities. To that end, the Department might consider elevating the importance and commitment to the role of Director of Industry and External Liaison.	Director of Industry & External Relations Head of Department	We are open to investigate this option further. We have a number of PACE partners and contributors to our Industry Advisory Board. This may lead to further collaborations with the Department. The role of Industry and External Relations may be split to better address the distinct needs of the Industry and of the public/schools. We will finalise our strategy after the retreat. Status: In progress

6. Future Directions

Rec No.	Recommendation	Responsibility	Response and Status
35.	Following receipt of this Report, and consideration of its recommendations, as part of the process recommended in Recommendation R3.3, the Department should review its list of priorities, and for each identify how success will be measured and establish Key Performance Indicators (with appropriate achievement dates).	Head of Department	The list of priorities will be finalised before the retreat. A large part of the retreat will be dedicated to establishing suitable KPIs. Status: In progress

7. Technical Support Issues

Rec No.	Recommendation	Responsibility	Response and Status
36.	Since improving support services is one of the University's strategic priorities (No. 7 Framing of the Futures) it is recommended that the University and Faculty need to work with the Department to ensure that adequate and efficient support services are available in respect of the especially demanding technical nature of teaching and research in Computing.	Head of Department Science IT Manager Faculty Manager Executive Dean	We propose to work with the Faculty and Science IT to streamline every process that can be and review the support that we receive regarding teaching and research. Status: In progress
37.	The development of a Faculty / Department roadmap for technical support in place of the current reactive approach is recommended. Again, this speaks of the need for long-term planning, with identification of technical support needed to achieve goals. It is not clear the extent to which this requires change across the Faculty and University.	Head of Department Science IT Manager Faculty Manager Executive Dean	A long term plan for technical support is an excellent idea. We used to have a Faculty committee with overall review responsibility and ability to make recommendations to the Faculty regarding technical support. Re-establishing this committee may be a good idea. In any case, for this to work, we need some clarity regarding the funding of the support activities in the long run. This goes back to the need for a more robust budget process. The University seems to have acknowledged this fact, as it is working towards a new funding model and a true three year budget cycle. Status: In progress
38.	Given the nature of teaching hours in Master of Information Technology program (evenings and Saturday), it is recommended that better 24/7 access to lab facilities	Head of Department	We agree in principle with this recommendation; however what can actually be done relies very much on the amount of resources that will be available.

	be provided for students, and technician support should be provided at very least during the times of formal laboratory classes.	Science IT Manager Faculty Manager Executive Dean	Status: In progress
39.	It is recommended that the Department advocate for at least some of their teaching space to be transformed. ICT laboratory spaces are "old fashioned" (this refers to the actual teaching spaces, and not to the equipment), and they do not conform to the expected design paradigm of contemporary learning spaces. The Panel was informed that there is no coordination between ICT support and University Learning Services. Collaborative learning spaces, re-configurable spaces and spaces to support project work physically located near the Department's offices are all desirable.	Head of Department Faculty Manager Executive Dean	The question of our laboratories needs to be part of a wider reflection regarding our teaching approach overall. The Department agrees that the configuration of most of our laboratories is quite old fashioned. From time to time, an opportunity arises to redesign and reconfigure teaching spaces. That is how our new Games Lab was created. We will make the most of these opportunities and we will try to bring together LTC and Science IT as much as we can. Status: In progress
40.	WIFI coverage across the campus needs to be improved, to ensure student (and staff) access at all times. This is clearly a University issue but it has particular implications for a technically based discipline.	Chief Information Officer	We are aware of this issue and welcome this recommendation. The Department consistently monitors our students' satisfaction in relation to the WIFI coverage during our regular liaison committee meetings with them. We will continue to provide feedback to Science IT and the University on this issue. Status: In progress