Advancing ICT Research: A Discussion Paper

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July 2013

Introduction

Recently, there has been several discussions within CORE and ACHPIS regarding the review of conference rankings in preparation for the 2015 ERA exercise. Several other reasons have also been adduced for the rationale of undertaking the exercise, including providing publication guidance to early career researchers. One may also argue that the ranking of conferences is one in the mix of criteria that peer reviewers will take into consideration during ERA assessment. However, the purpose of this discussion paper is not to debate the value or otherwise of the conference ranking exercise. Rather, in line with a recent posting to CORE forum urging the community to focus on improving the quality of Computer Science research in Australia, this discussion paper proposes a way forward in this direction. It proposes to widen the debate on improving the quality of research to include all ICT disciplines. More specifically, we propose to establish a series of workshops or "schools" on advanced topics in ICT research so as to provide a forum to sustain and improve the quality of Australian ICT research.

Australian ICT Research

The state of Australian ICT research as measured by the ERA has been improving since the 2010 exercise. As a quick overview of the state of things, we provide a comparative summary

of the 2010 and 2012 ERA exercises (see Table 1). In the 2010 ERA[1] exercise Information and Computing Sciences (08) accounted for approximately 7% of the national research outputs. Seventy-five (75%) of the discipline's outputs were conference papers. Twenty-four (24) UoEs (unit of evaluation) were assessed at the two-digit FoR code level, and 23 at the four-digit FoR code level. Ninety-one per cent (91%) of assessed UoEs in Information and Computing Sciences received a rating at or above world standard. The 2012 ERA[2] reconsidered and changed the assessment for Information and Computing Sciences (08) to a peer-reviewed regime. Conference publications were also taken into consideration for assessment purpose. The discipline accounted for approximately 6% of the research outputs submitted to ERA 2012; a lower figure albeit comparable to the 2010 figure. Approximately 2% of the Information and Computing Sciences research outputs were also coded to Engineering (09). Hence one needs to include the relevant 09 code at the four-digit level (0906) in considering the performance of the ICT in general. Of the 96 UoEs submitted for assessment, 65 received received a rating at or above world standard. It is noteworthy that in 2010 ERA only 2 UoE were rated at level 5 while in 2012 5 UoEs were rated at level 5 - a significant improvement. These comparisons have been made despite the difference in basis of assessment between ERA 2010 and ERA 2012. However the comparisons hint at the state of ICT research nationally. How does this performance correlate with worldwide ranking?

Table 1: Comparative distribution of ratings of UoEs for 08 FoR code.

Rating	1	2	3	4	5	**Total**
2010 UoEs	0	2	11	8	2	**23**
2012 UoEs	7	28	35	20	5	**95**

For this exercise, the QS ranking by subjects[3] has been used. Again, the basis of assessment is different from ERA. The QS ranking has the number of citations per publication, among other criteria[4], as one of its components of assessment. Using the number of citation

[1] `http://www.arc.gov.au/era/era_2010/outcomes_2010.htm`
[2] `http://www.arc.gov.au/era/era_2012/era_2012.htm`
[3] `http://www.topuniversities.com/subject-rankings`
[4] The other criteria are academic and employer reputations respectively

Table 2: Summary of QS Ranking by subject (Computer Science and Information Systems): Number of ranked Australian universities from 2011 - 2012

	Top 200	Top 50	Position of topmost ranked
2011	12	5	19th
2012	12	5	21st
2013	15	6	13th

per publication as basis, Table 2 summarises the QS University ranking by subject (for Computer Science and Information Systems), of Australian universities in 2011, 2012 and 2013 respectively.

The result of 2013 QS ranking is an impressive improvement and achievement. Could this have anything to do with ERA? Has ERA modified the behaviour of researchers in computer science and information system? How do we sustain and improve upon this result? What needs to be done to place at least 30% of Australian universities in the top 50 and at least 60% in the top 200?

A measure that assesses the aggregated outcome of a series of activities is a "lag measure" [1]. When considered as a measure, the ERA ranking is a lag measure as it measures the outcome of research activities. It is "after the fact". Lead measures are the indicators of contributing factors in the ERA assessment that we can control. Admittedly, the ranking of a publication outlet is important and can be determined by the ICT research community. Perhaps a more important factor that is within the control of the community is the quality of research activity. How do we raise the quality of ICT research activity?

Proposal

A significant amount of the research output in the ICT discipline emanates from the work of higher degree research students - Masters by Research and Ph.D. The level of preparedness of the student underpins the quality of the research being undertaken. One can measure the degree of preparedness in terms of exposure and depth of understanding of research methodologies and advanced concepts required for rigorous problem formulation and solution.

NICTA is addressing the problem of inadequate preparedness through its program of coursework on advanced topics for PhD students enrolled under its scholarship scheme. This program can be extended, albeit in a modified form, to cover the needs of a wider spectrum of ICT research.

This proposal aims to establish a series of workshops or "schools" that provide tutorials on advanced topics that underpin ICT research. The series will focus on specific topics that are considered as contemporary tools required by ICT researchers to formulate and solve some of the grand challenges already identified in [2] elegantly. For example, researchers in computer vision will benefit from advanced tutorials on graphical models, group representation and 3D computer vision, convex optimization, etc. Researchers in information systems will benefit form advanced tutorials on statistical survey methodology, statistical analysis, etc. The defining difference between this proposal and a coursework provided by a university is that the tutorials provided during the workshops are led by acknowledged world experts wherever they can be found. And this does not exclude our Australian experts.

Implementation ideas

The concept of Doctoral Consortium is already part of the research training culture in Computer Science and Information Systems. Hence, a Doctoral Consortium could be leveraged as a platform to offer discipline-relevant advanced topics in the form of a workshop or "school". There are discipline-based national conferences that could serve as vehicle to organize the workshops. To name a few, we have ACSW, ACIS, DICTA and ASWEC.

On the other hand a separate workshop or "school" held bi-annually could be established. For instance, there could be a "Summer Workshop or School on Advanced Topics in ICT Research" and a "Winter Workshop or School on Advanced Topics in ICT Research". Suitable dates could be chosen in January or February and June or July. These workshops will be residential and open primarily to PhD students and Early Career Researchers. However, other researchers who believe they could benefit from the topic being offered could also attend.

Workshops

Each workshop will have an organizing committee and will be hosted on a rotating basis by various universities. The organizing committee will have a budget and will be responsible for choosing topics, organizing venue and inviting guest lecturers. There may be a Board that has an oversight of the whole program.

Budget and Funding

The Australian Council of Deans of ICT (ACDICT) has established a Learning and Teaching Forum that funds and support the development of tools and methods for learning and teaching ICT related subjects. It is proposed that ACDICT partly fund these research training workshops on a basis similar to the Learning and Teaching Forum. Another suggestion is for CORE and ACPHIS to contribute some negotiated percentage towards the workshops. There is also the possibility of seeking sponsorships from the ICT corporate sector - Google, IBM, Microsoft, HP, etc. It is expected that attendees will be responsible for their funding. There may be a limited number of scholarships that partly fund the attendance of PhD students.

Conclusion

Doubtlessly the ICT discipline in Australia enjoys an enviable position worldwide as evidenced by the QS University ranking by subjects and others. This proposal seeks to establish a series of workshops or "schools" that provide tutorial-type presentations on advanced topics in ICT as a means of further preparing Australian ICT higher degree research students. It addresses the debate of how to sustain and improve upon the world-wide reputation of ICT discipline in Australia. Furthermore, a workshop series of the type being proposed also addresses the innovation debate. The efforts we have placed on improving the learning teaching of undergraduate curriculum has direct impact on producing industry-ready graduates that contribute to productivity of the economy. This proposal is about the innovation discussion.

References

[1] Chris McChesney, Sean Covey, and Jim Huling. *4 Disciplines of Execution*. Simon & Schuster Ltd, 2012.

[2] Australian Academy of Science. Future Science: Computer Science, Meeting the Scale Challenge. `http://science.org.au/policy/documents/fs-computerscience.pdf`, 2013. [Online; accessed 21-June-2013].