KEYNOTE ADDRESS

POSTGRADUATE RESEARCH RE-IMAGINED: A BALANCE BETWEEN THE PURSUIT OF EXCELLENCE AND REAL WORLD NEEDS OF STUDENTS

Doug McEachern
University of Western Australia
Australia

Introduction

There is no doubt that the PhD program is under challenge. It is equally clear that the PhD will survive but it will be significantly changed, and, if we seize the opportunities in an appropriate way, it will be modernized and enhanced.

The Research Ph.D program is one of the most important inventions of the modern university. The image of researchers at work on major research projects which take years in laboratory, library or ‘the field’ may seem as old as the renaissance (or older) but its incarnation as the PhD program is a relatively recent development. The title of Doctor (of a university) predatesthe PhD program by a considerable period. It was a university title awarded to indicate a highly learned person able to speak/teach with authority on a subject or discipline (as broadly defined as Law or Theology). It was the PhD program as a course of study resulting in a thesis which was examined to award the title of doctor which was the significant creation.

In its initial version, the PhD was a major rite of passage in the career of aspiring researchers, a successful thesis defense was proof of the ability of the researcher to make an original contribution to knowledge which was something more than a routine engagement with a field of study. The thesis had to show originality: it had to deliver something that was ‘new’ and challenging; it had to move disciplinary knowledge forward in a way that was acknowledged to be significant. The test of originality, of innovation, was such that it meant that undertaking a PhD was a minority enterprise. Only a few aspiring to be the best undertook the PhD and were then judged by their academic peers and were awarded the degree, often after long years of research and thesis writing.

In recent years, the system has moved towards more of a mass PhD program than ever before. This expansion of the PhD program has its critics. Significant academic figures, have argued that there has been a substantial decline in the quality of research being done as part of the PhD. They assert that most theses being examined now make little contribution to knowledge and are of little interest to anyone other than the students writing them. Grumpy ministers, their staffers, tabloid journalists, DEST bureaucrats and independent think-tank hacks will all complain at times that there are too many PhD students working on inappropriate topics which will never result in national benefit or improved employment prospects for themselves. The number of Phd students who end up driving taxis or who do not work in their area of expertise will be cited as evidence of the over-production of PhDs.

Needless to say, these are not views I endorse. I am impressed by the quality of the research produced through the present PhD program. The test of an original, innovative contribution to knowledge is still being met in a substantial number of cases. Indeed, the range of what is judged to be innovative has broadened to include new research techniques and methods, new interpretations and reconfigurations of topics and fields of study, the creation of new research resources, and the synthesis of materials and interpretations across a number of fields. Sufficient
of the work which is being produced matches the need to operate at the international cutting edge of research to undermine the claims of the mean-spirited critics.

The other reason why the PhD will not fail is that the knowledge economy and an increasingly sophisticated understanding of the requirements of innovation demands an increasing number of ‘workers’ with the skills and cultural attributes which come from completing a well-designed PhD program. The voracious appetite of the new economy will call forth for consumption these new resources of human and cultural capital – just as ruthlessly as land was cleared for agriculture, people and products moved around the globe, and mineral resources extracted and consumed in industrial and post-industrial production. The ordinary interactions between politics and the economy will be sufficient to keep a focus on funding (and even expanding) a significant number of postgraduate research students in the system for some years to come.

The present challenge

The PhD has come under challenge in recent years in much the same way as the university education system as a whole. Cuts in university funding and the tightening regulatory framework (which continues unabated despite claims about producing a more deregulated system) has added to the pressure on the PhD program. The three year ‘time limit’ has meant that the nature of the PhD program has had to be rethought and the process of ‘getting’ a PhD has had to be made more professional with a greater emphasis on the ‘training’ side of research training than had been the case before. Improving the professionalism of the PhD program has certainly had its benefits. PhD candidates are not harmed by having to have a better idea of their proposed topic before they commence. The expectation that supervisors should at least be good at thesis supervision is not a serious impediment to the quality of the program. A heightened awareness of the costs of research and the link between the research plan and the production of a thesis text is no bad thing either.

As governments fund more and take a greater interest in the PhD program, the level of bureaucratic regulation increases. In the Australian system, PhD students pay no fees and are not charged HECS. Scholarships (or a significant number of them, are also funded by the government directly (both for international and national students) and indirectly through a variety of national competitive research schemes, including the CRC program. The very high cost of one-on-one supervision (or the even more costly supervision panel) represents a significant government investment in the PhD. Such government funding means regulation and the prospects of increased regulation. So far we have seen a kind of quality driver in the government’s concerns – limiting the number of available RTS places and seeking to promote a closer alignment between places and individual institutions claimed (demonstrated?) fields of research excellence. We should expect in the coming years greater government regulation, not less on the topics the government will fund for post graduate research. Institutions wishing to remain at the international cutting edge in humanities, social sciences, and cultural studies or simply wishing to preserve a comprehensive range of disciplines are likely to have to find creative ways of funding such programs.

As government funding tends to promote increased reporting and regulation over time, so other processes have also driven an increased bureaucratic regulation of PhD programs. Most of these have come from within the universities themselves and are driven by management, academics, and students in various combinations and with differing levels of self awareness and enthusiasm. (I admit that I have played a part in these moves and support many if not all of them.) It is hard not to note the way in which a code of practice over supervision, annual progress reports, and processes...
The examination

Although reforming the PhD tends to increase its bureaucratic regulation, I am going to take the risk of discussing some further parts of the PhD process which should be reformed. For example, we need to return to the examination process and consider what we have been trying to achieve in the Australian system. Up to now, Australian PhD theses are subject to ‘external examination’, often including an international assessor. The number of these assessors may vary (two, three or more) and candidates may or may not have a part to play in the selection of their assessors. Confidentiality abounds over the identity of the assessors and their reports, although actual practice may frequently vary from the official regulations. The assessors produce written reports which are sent to a committee (with advice from the supervisor, Department, school, faculty) and a decision is made as to what the reports mean and what the assessors have recommended and, as the committee decides, a PhD may be awarded.

I want to propose some variations to these processes with some very simple aims: to align the assessment process for the PhD with the traditions of the PhD in its earliest inspiration; to cast off the colonial cringe – that our students’ work can only be properly assessed by those working overseas; and to produce a more transparent process to serve the needs of the contemporary PhD while limiting the bureaucratisation of the examination (and appeals) process.

The purpose of the examination is to establish whether the extent of innovation and new knowledge in the theses is sufficient for the award of the PhD and the title of ‘Doctor’. Given the time constraints, there needs to be some adjustment to the terms of the examination process to indicate that it is a task undertaken within that constraint and should be judged accordingly.

The second task is to construct the examination panel. In Australia, the chief rule is that the examination panel is ‘external’ to the university, and the examiners are not known to the candidate. I would propose that we do something about both these points. At the outset of supervision we have been arguing for a panel of supervisors to be created for each candidate, with a chief supervisor who is accountable. Why could not this supervisory panel form the core of the examination team? After all, it is this panel which reviews the work of the applicant and endorses the annual report on progress and which should meet and discuss the viability of the candidature. An external member or members could be added at an appropriate time (which could be quite
early in the piece as the topic is refined and the proposal approved – or later, as now) and I can see no good reason why the candidate cannot be involved in the selection of the external examiner. The defence of the existing position works on the basis of ‘conflict of interest’ and the ‘impartiality’ of the examination process, reducing the possibility that the candidate could seek to nobble the examiners. Much of this concern is either misplaced or countered by other procedures which can be put in place. No single individual has power over the candidate as there is both a team of supervisors and a team of examiners. There is external scrutiny of both the supervision process (as evidence by the quality of the work in the submitted thesis) and the examination process. There are no surprises in the selection of the examiners—the candidate cannot be ‘ambushed’ by an unknown and inappropriate selection of examiner—and the writing of the thesis can be shaped accordingly.

The examination process itself provides the other guarantees. At the moment, very few universities in Australia examine on the basis of a face-to-face defence of the thesis—and the examination process drags on while written reports are being sought and interpreted. I would propose to put the defence of the thesis back at the centre of the examination process—as it is in the United States, Britain and in Europe. Modern communication technologies make obsolete the claim that the distances and costs are too much to have a face-to-face defence of a thesis in Australia. These technologies also mean that supervisory panels can include ‘external’ experts and meet in a virtual venue to assess progress and to provide feedback on research findings. Contemporary access grid technologies for the use of access grid rooms are such that good quality face-to-face meetings can take place over distance, with high quality visual images and good quality audio at a trivial price. There are no insurmountable problems in the way of such a face-to-face defence of the thesis and the gains are substantial. When the thesis is ready for examination, the examination time can be agreed between all parties on the basis of planned availability and the access grid room time booked. A written response outlining the issues and the preliminary view of the thesis can be requested and made available to all members of the examination panel and the candidate a couple of days before the examination. The examination itself can then focus on the serious issue of establishing the degree of new knowledge and innovation in the submitted thesis with an appropriate dialogue between examiners and candidate without the bureaucratic intermediaries of the present process. What this proposal does is to put the power back in the hands of the examining panel where it should lie and not in some exterior bureaucratic interpretation of comments and recommendations, which are never tested by the examiners themselves. The recommendation to award or not is then made and justified in a transparent way and any proposals for a further work and re-submission can be negotiated between the examiners and the candidate on the spot. This proposal would reduce the bureaucratic inertia of the present process and be far more open and transparent to the candidate than is the present process.

Information and Communication Technologies

Some of the changes required in the new PhD program come from, either the government, or the academic urge for regulation, but from the changing nature of research itself. For example, the new approaches to genomics, phenomics, and metabalomics in the biological sciences have promoted the need for larger teams of researchers working on related sets of problems with more expensive pieces of equipment and greater resources. The pressures for multi-disciplinary approaches to a common research problem have multiplied considerably in recent times. The rise of an e-Research agenda, where the power of large scale distributed computer networks, coupled through the use of internet resources, has transformed not only what is required for cutting edge research but also the
nature of the research problems themselves. These factors combine to have a significant impact on the research experience of PhD programs in all areas.

The application of high performance and distributed computing and robotics has changed the nature of research in so many disciplines and has the potential to change almost all those remaining. Informatics and computational sciences (e.g. computational biology, computational chemistry or rational drug design, radio astronomy, neuro-informatics and geosciences) have changed the resource demands and the skill base of these disciplines. Access to cutting edge (imaging) instruments and an array of expensive resources is the cornerstone of progress in these areas. These changes have an impact on the scope and character of PhD programs. For a start, computation skills are of increasing importance. There is little choice but to move to cross-disciplinary teams with varying degrees of complexity to make advances in these fields, at the very least combining discipline expertise with high-level computing skills. To what extent do PhD candidates in non-computer science fields need to have their computing skills enhanced by the contemporary PhD program? To what extent can PhD candidates who do not have appropriate IT skills be linked up in teams with those who do? How can either of these options be encouraged, funded, or supported within the present arrangements for delivering the PhD program?

The needed computing skills largely come from two related parts of the e-Research agenda. One set relates to the construction and manipulation of databases. Depending on the research area these can vary from very simple relational data bases to those of far greater complexity. With larger datasets, certain skills in informatics and statistics are needed. How are students to gain these skills? There are at least two different models. For those who lack ability to work with computers, this is a serious problem which can only be solved by funding access to ‘IT technicians’ with appropriate skills. This would increase the costs of the research and add team work to the research (and challenge traditional conceptions of the PhD in its own way). Would such participation need to be acknowledged? Would it have an impact on the quality of work found in the completed thesis? For those who are capable of working with computers (and one would hope that this would be the overwhelming majority of PhD candidates), basic relational database skills need to be incorporated into the research training component of the PhD, if they have not been included in undergraduate or Honours programs. Linked to that would need to be the statistical and mathematical skills to handle the manipulation of large, distributed, and diverse database sets. (As computation science improves, such data sets will need to integrate text, numerical information, visual images—still and moving—and audio and will be relevant across all disciplinary areas.) In advanced areas of informatics, access to IT professionals will still be part of the PhD program, and we need to find ways to fund and incorporate this into the work plan. A failure to do so will see the skill levels of Australian post graduates fall below the standard needed to be internationally competitive. As PhD candidates come to work in more complex and IT-rich environments, the interpersonal skills will need to be enhanced to include an ability to work in complex, inter-disciplinary, and cross-functional teams, both as a co-worker and as a team leader. This is undoubtedly an essential foundation for later research success.

The other needed skill lies in the area of informatics, modelling, and simulation. This is much more challenging, as the level of required IT and mathematical skills are much greater. It is unlikely (no matter how desirable) that all PhD candidates will aspire to the levels of skill required to become modelers and simulators in their own right. Nonetheless, it would be useful if we could design PhD programs which did give researchers the ability to build up these skills and be both confident and
competent to propose (and develop) models and simulations which can inform their research programs and the kinds of new knowledge being proposed.

These proposals to enhance the IT skills embedded in the PhD program are not, just relevant, to scientific (biology, physics, chemistry) and mathematically-based disciplines (such as economics). The social sciences and the humanities are going to require far more IT and computational grunt as the problems and the approaches to new knowledge evolve in these disciplines as well. Cultural studies, anthropology, studies of literatures will all gain from researchers who have these additional IT skills. For these disciplines and for many others, this means that for the research work to represent best practice and to be at the international cutting edge, it will be necessary for teamwork elements to become a standard part of the PhD program. This complements the general change in research, which sees a rise in the need for cooperation and collaboration between research workers from many different disciplinary backgrounds to advance knowledge at the cutting edge. The inclusion of appropriate IT skills is just one part of what contemporary research practice looks like across the broad spectrum of disciplines. The design of the contemporary PhD program needs to be able to incorporate these teamwork elements. Topics for a PhD cannot be restricted only to those which can be explored by a researcher working either in isolation or those doing the supervision and those in clearly subordinate relationship to the candidate. The obvious should be acknowledged: computer science is a research discipline in its own right and does not exist merely to supply passive technicians to the research imagination of others. Some research problems will require cutting edge research in both the discipline of the PhD study and in computer science. It is important that both contributions can be made, acknowledged, and assessed in appropriate ways. The legacy of some PhD topics will include new IT tools, databases or research techniques whose wide distribution will serve to advance knowledge and this too needs to be taken into account when designing the PhD program.

The greatest challenge this poses for the design of the PhD program is to find room within the time limits and the funding constraints to make sure candidates have the opportunity to develop as fully as possible the IT skills required. We failed to find a solution to the problem of incorporating the acquisition of foreign languages into the design of the PhD. We must not fail to find the appropriate response to the challenge of IT and, if we are very lucky, the IT solution might even make it possible to overcome the limitations inherited from our failure on the language policy front.

The coursework challenge

A few years ago, I gave up arguing for the reform of the PhD program in Australia through the introduction of coursework components based on the American model.

When I returned to Australia in 1978, having completed my PhD in the English system, I spent a good many years promoting the virtues of the American style PhD. I was not convinced by the assertions that holders of American PhDs were less well qualified than their European or Australian counterparts. In fact I could see ways in which the US style PhD provided far better training for the teaching and research academic career that seemed as likely a destination for the best research students as any other. Here were job applicants with graduate training in methods, and with graduate coursework in a number of specialist topics in the disciplines in which they were likely to teach. The claim that this was somehow equivalent to the scope of the Australian Honours program seemed to me to overstate the virtues of the Australian system. It also seemed to neglect the obvious point that the combination of graduate course work and a thesis, undertaken after an
Australian style honours degree, would provide a very powerful foundation for a subsequent academic career.

Some progress was made. Many different ways were found to include a 'course work' component in the Australian PhD in the late eighties and early nineties. Induction programs and structured programs became commonplace. When the UK began to reform the PhD I thought that there was a chance. The reduction in the period of funded candidacy for the PhD and the introduction of the RTS scheme demoralised research educators and me as well. I thought the standard opposition to the coursework components would be reinforced by these administrative and funding changes. But I'm not so sure that the cause is lost. Paradoxically there is some scope in the new arrangements that opens up the way for further reforms of the PhD program to provide students with a better educational and research experience and to better fit the PhD program to the contemporary needs for research. There is student demand for the American style PhD program, if not among Australian students then certainly among foreign students seeking to undertake a PhD program in Australia. Most international student offices receive requests for prospective candidates and from foreign governments seeking programs of this type. This is an opportunity. I would hope that one day an Australian University will have the courage to respond to these requests and build an appropriate coursework and thesis PhD program. Once such a program is in place, it will be difficult to deny Australian students who want a similar experience the same opportunity. It will still be necessary to be creative in finding appropriate funding structures, but I believe it can be done. I do not, however, expect to see this change in the near future.

**Conclusion: The quality postgraduate experience**

With the rise of the new e-Research paradigm and the evolving nature of cutting edge research methods and agendas, the PhD program and the postgraduate experience needs to be reworked. There needs to be scope for an emphasis on teamwork and team working skills which runs counter to at least some of the individualistic assumptions underpinning the initial design of the PhD. PhD candidates need to experience work in teams and develop the kinds of interpersonal skills needed to make good teamwork generate good research results. Equally, PhD candidates need opportunities to develop good research leadership skills which mean something other than just a willingness to command and dominate. In a related way, PhD candidates need to be exposed to the methods and thinking of different disciplines so that cross disciplinary cooperation can be built on confidence and mutual respect and not avoided in insecurity. Finally, all PhD candidates need to develop the appropriate repertoire of IT skills to enable their own research and to give them confidence to work with IT professionals to achieve the most from their research endeavours.

The changed nature of research, the changed funding regimes, the significant rise of high powered computers and communication technologies and the increased importance of research and innovation in the building of the knowledge economy, all these combine to require substantial rethinking of the PhD program. It is perfectly possible to continue with the present PhD paradigm and its contradictions, tensions, and insufficiencies. I doubt that too many PhD students or supervisors are going to complain much in the present circumstances, although there are bound to be some students who do not feel that the present PhD experience matches their expectations or their needs. Some of their complaints will take the traditional form of concern about the quality of supervision, shortage of resources, insufficient scholarships, work and time pressures, and the precarious prospects for employment at the end of the program. Others may well want the kind of PhD experience being described above, one designed to minimise bureaucratic regulation and
maximise transparency in the examination process, one with coursework relevant both to the research project and to future employment, including proper attention to relevant IT and computing skills, as well as the team work and cross disciplinary environment which will characterise future cutting edge research and the world of work in the knowledge economy.

Contact
Professor Doug McEachern
Doug.mceachern@uwa.edu.au