The South African PhD: Insights from employer interviews

REINHOLD TREPTOW
Stellenbosch University

Current international trends reveal that doctoral education is increasingly expected to satisfy workplace demands. In South Africa, Work Integrated Learning (WIL), introduced as part of the HEQF, is the principal initiative to facilitate greater relevance of higher education in the workplace. There has, however, been significant confusion regarding its precise definition and implications. This article presents insights gained from interviews conducted in 2009 with employers of doctoral graduates (located outside the higher education sector) regarding their expectations of doctoral education. The implications thereof for WIL are discussed and, based thereon, recommendations are made to facilitate greater workplace relevance for doctoral education in South Africa.

Introduction

Academic literature is replete with discussions and theories that seek to explain current changes in knowledge production and the effect of knowledge production on higher education. Gibbons, Limoges, Nowotny, Schwartzman, Scott and Trow (1994) postulate that we have moved from Mode1 to Mode2 knowledge production and that this change has resulted in a more "interdisciplinary, pluralistic, 'networked' innovation system, in contrast to the previous system in which major corporate or academic research institutions were less closely linked with other institutions" (Mowery & Sampat, 2005:213-214). The 'Triple Helix' similarly describes how universities, the state and private enterprise interact and overlap in national and global knowledge production and innovation systems and that this interaction can create an environment conducive to technology-based enterprise and related innovative services (Etzkowitz & Leydesdorff, 2000; Etzkowitz, 2003). The relationship between universities, the state and business has, therefore, become increasingly complex and interdependent. This has also led to the proposition of the so-called 'third mission' of universities with a greater mandate of contributing to innovation and technology transfer. It is in this evolving climate that the nature and form of doctoral education are being reconsidered.

Concern regarding the appropriateness of doctoral education has mounted, as studies show that fewer graduates are entering the academic profession (Pearson, Cowan & Liston, 2009:101). In the UK, only approximately a third of doctoral students pursue academic careers (UK GRAD, 2004). A similar tendency is distinguishable in the USA, where less than half of the doctoral graduates surveyed ended in academia (Wulff & Austin, 2004). According to a tracer study conducted as part of the Academy of Science of South Africa (ASSAf) investigation into the status and place of the South African PhD (discussed below), the scenario in South Africa is similar: only slightly more than half of the respondents are employed in the academic sector.[1]

The prevalence of doctoral graduates employed outside academia has led various commentators to call for the development of a broader skills set. Boud and Lee (2009:11) suggested the development of graduates who are "work-ready and knowledgeable about research policy, including such matters as intellectual property and commercialization". Various universities and departments as well as national bodies have, therefore, sought appropriate changes to doctoral education. Within the South African higher education context, the most significant effort to align doctoral education with the world of work has been the introduction of Work Integrated Learning (WIL) within the Higher Education Qualifications Framework (HEQF).

Work Integrated Learning

Significant confusion followed the incorporation of WIL into the HEQF regarding its precise definition and implications. The South African Technology Network produced a position paper on WIL and concluded that neither the Higher Education Quality Committee nor the Department of Education present adequate guidelines specifying how workplace concerns can or should inform the development of appropriate tertiary-level education (Engel-Hills, Garraway, Jacobs, Volbrecht & Winberg, 2008). The paper emphasises that WIL is not synonymous with *workplace learning,*[2] as the HEQF document seems to imply. The paper also emphasises that the field of WIL is under-researched in the South African context.

Four distinct curricular modalities were subsequently presented. In addition, the Council on Higher Education published a good-practice guide, developed explicitly for teachers of career-focused and professional programmes, to accompany WIL (2011); this guide also utilises these four curricular modalities. The guide defined WIL as an "umbrella term to describe curricular, pedagogic and assessment practices, across a range of academic disciplines that integrate formal learning and workplace concerns" (Council on Higher Education, 2011:4).

Using the position paper and the good-practice guide, the four distinct curricular modalities applicable to WIL at the doctoral level are discussed below. These modalities are not considered mutually exclusive and the potential exists for the development of hybrid combinations.

The first modality concerns *work-directed theoretical learning*, which includes the theoretical components of a doctoral study that may be applied within the world of work. It stresses the importance of both group learning and autonomous learning. Professional doctorates are presented as examples of work-directed theoretical learning (Council on Higher Education, 2011:26). It is not clear, however, why the professional doctorate is considered distinctly applicable to this curricular modality.

The second modality concerns *problem-based learning*, which involves research that is oriented towards the solution of sequenced, real-world problems and that leads to the predetermined outcomes and objectives of a curriculum. In its purest form, problems rather than subjects become the organising structure of the entire curriculum and may include problem-based activities, assignments and projects. Research occurs within the context of small, self-directed groups; facilitators are appointed for each group to offer appropriate support and help with team dynamics – not to dictate what should be learned or which resources should be used (Council on Higher Education, 2011:34). This approach has been successfully applied in the field of health care, typically in the form of cases derived from authentic medical settings.

The third modality concerns *project-based learning,* which refers to learning that occurs through engagement with projects and that generally involves research guided by both workplace and university supervisors and mentors. Solutions to workplace problems with no clear answers, as yet, are pursued, with focus on the understanding of essential concepts and the development of relevant skills that draw on multiple disciplines. Students take the lead and make critical decisions. This approach, therefore, facilitates planning, management and communication skills. An example of this type of learning is service learning, as students engage with communities, service partners and academic experts. "R&D-type research" in respect of master's and doctoral studies is another example of this type of learning and is centred on the design, implementation, study and evaluation of a product or intervention (Council on Higher Education, 2011:23).

Workplace learning incorporates significant institution-based assistance, as students are placed in work environments.

The modalities serve as a rough framework around which appropriate support may be directed; their definitions, however, require refinement. Despite this limitation, findings from employer interviews in respect of the ASSAf investigation into the status and place of the South African PhD are presented below to uncover the extent to which the employers of doctoral graduates consider the implementation of the various aspects of WIL necessary. Unfortunately, the interviews were conducted before the publication of the good-practice guide to WIL and the curricular modalities were, therefore, not explicitly discussed with the employers.

ASSAf investigation into the status and place of the South African PhD

The Centre for Research on Evaluation, Science and Technology (CREST) was contracted by ASSAf in 2009 to contribute to an investigation into the status of the South African PhD. Several studies were commissioned, including a tracer study, employer interviews and an attrition study. The study on which this article is based is the employer interviews. This study investigated why employers specifically sought PhD graduates, what skills and attributes they expected of PhD graduates, what employer satisfaction with the actual performance of PhD graduates was, what employer perceptions of the available pool of PhD graduates were, what employer relations with higher-education and other professional research institutes were like and what intellectual-property issues existed.

Methodology

Locating the employers of PhD graduates was not unproblematic. For the purposes of this study, newspaper advertisements placed in the *Sunday Times* and *Mail & Guardian* (from 10 March 2006 to 11 March 2007) and seeking specifically PhD graduates for employment were inspected. A list of the non-academic employers was compiled and relevant e-mail addresses and telephone numbers were recorded. Thirty-two institutions were identified in this way and were then contacted by e-mail and telephone. Twenty employers (representing sixteen of these institutions) agreed to be interviewed. All the interviews were conducted by telephone and, with the consent of the interviewees, they were audio-taped and subsequently transcribed.

Eight of the interviewees represented four of the major national research councils: the Human Sciences Research Council (three interviewees), the Agricultural Research Council (two interviewees), the Council for Scientific and Industrial Research (two interviewees), and MINTEK (one interviewee). Three of the interviews were conducted with non-profit, non-governmental organisation (NGO) employers. Interviews were also conducted with employers located in the government sector. Two were with employers in national government focusing on marine and coastal management, and on science and technology. Two worked for government organisations: one was the executive portfolio manager of an organisation creating innovative biotechnology products and services, and the other worked at a public health-service provider of cost-effective and professional laboratory medicine. Unfortunately, only two employers of PhD graduates in the private sector were located, one a director and the other a manager of technology, both in the mining sector. Finally, the trustee of a postdoctoral funding trust and former vice chancellor of a prominent university was also interviewed.

Atlas.ti was used to analyse the transcriptions and to produce the codes on which the subsequent reports were based.

Results

The results section is divided into three parts. The first part examines what the employers expected from doctoral graduates, exploring the general characteristics, skills and knowledge that the employers expected. The second part identifies specific weaknesses based on doctoral graduates who were previously employed. The third part comprises suggestions offered by the employers on how to improve doctoral education.

Employer expectations

The employers expected newly appointed PhD graduates to embody the future leadership of their organisations. In various instances, the new employees were required to assume positions of responsibility immediately:

> ... *if you are hiring and looking for candidates because there is an ageing leadership, an ageing academy and there are issues of continuation, succession, etc. then it becomes fairly critical that the people you hire already have finished almost all of the background work of a PhD and can enter*

into this world to take on some of the roles and responsibilities associated with academic leadership. Within the space of five years they might find themselves in a fairly responsible position. (Science council)

[W]e also look for somebody in those senior positions who will be able to act as a mentor to our junior side ... where a person will be in a supervisory capacity, over a more junior scientist, and where the nature of the job requires and carries high level of responsibility. (Government sector)

The employers also expected PhD graduates to have well-developed project-management and people-management skills. This requires that the traditional skills related to the PhD (conceptualisation, proposal writing, various technical skills, and the synthesis and editing of research reports) be augmented with people-management, project-management, time-management, financial management and some business skills:

[P]eople who have some project management skills. And project management is a range of things that would include budgeting, financial management, managing the basic operations of a project. Secondly people management skills. You know we get PhDs in here even with work experience who are just clueless about interpersonal skills and how to work with people ... You know people come to us with relatively good writing skills, but interpersonal skills and presentation skills often don't come in the package. (NGO)

They need project managing, business skills, business administration ... [T]here are also other attributes like professional integrity, good interpersonal skills, good communication skills. (Private sector)

In the field of agriculture, one employer emphasised practical experience:

The more experienced the guy is the better ... [I]f a person has had a postgraduate career, in other words has gone from undergraduate into honours into masters into PhD, we often find that they don't have the practical hands on experience that we are looking for ... [W]hat we are looking for are those guys with experience. (Science council)

Employers, therefore, sought individuals that could lead research projects. For this, basic report writing and researching skills are essential, but these need to be supplemented with general project-management and interpersonal skills. Business and management skills were also prized, as was practical experience.

Specific weaknesses identified

The private-sector employers reported that the PhD did not currently have much relevance to the world of work, but that it would offer significant value if it were closely associated with a relevant area of enterprise:

If it is done as part of the field it does bring in some elements to the research that is already in place and this adds to the world of science, but these are generally peripheral to the progress of the technology – and in commercial R&D we deal with technology mainly. If the PhD is too academic it could in a sense actually hold you back from progressing your technology as fast as possible. In such a case the option is to either have the mop-up work done by people in the academia or by your academic PhDs or by your own people. At this point in time it is generally then not such a distraction for staff to engage in PhD studies because it is already taking place in the course of their normal work, but it will add to their workload which would otherwise not be so heavy. Then again, those people that do engage in PhD studies, in general it does not increase the value to the company but it does increase their self-image, peer-standing. (Private sector)

I don't want to sound too harsh, but actually a PhD generally may mean very little in the mining exploration consulting business. You can do your PhD on a glorified crystal or the alteration corona of a garnet crystal in the three to four impact structures which have very limited to no benefit for the work environment. It just shows that you can apply scientific principles and that you can add

something new to science. So all it actually testifies to is the ability that you've got. For us the ideal thing would be a PhD combined with the relevant practical experience, that for us would be the ideal combination. (Private sector)

Some of the employers also underlined the absence of various management-related skills, including project, people and financial-management skills:

Look the main issue for us is that a lot of them [doctoral graduates] come with very good substantive background and good training in their substantive areas. We would have political scientists and lawyers and people with good substantive knowledge and capacity to do that work. However within the context of our work those people at the senior researcher level and above also need to have other skills such as project management skills, people management skills. Often technical people are going into programme head positions where they need to know how to manage and that is the area where we are having the biggest problem. Like every other field, take engineering for example, you get really good engineers that get promoted into management positions then struggle with knowing how to manage the finances. (NGO)

... for instance project management is going to be a big deal, and if you don't have a clue, on what it is going to be about, obviously that is going to have to be developed ... So they know nothing about project management, they know nothing about clients and working with difficult staff members, and working with tight budgets. It is all the stuff that goes along with the real world. (Science council)

PhD graduates were described as overspecialised and academically isolated. Some employers stated that doctoral graduates did not get sufficient exposure to the broader intellectual environment within which their specialised studies were situated, and emphasised the importance of interdisciplinary training:

This is a sort of a personal feeling, sometimes people that are going on to do a PhD level are inclined to become a little too specialised and they lose the broad background of their degree and they try to live in their little corners and not go out and be able to think out of the boxes. They become too specialised in many instances, so you would like to make sure that they keep a broader touch in their field and if they are going to do – let's say molecular genetics – that they don't lose touch with the practical, the ordinary old genetics of physically making the crosses and all that sort of stuff. (Science council)

Well I think that the one area, which I am personally getting involved in, is exposure of doctoral candidates to a broader range of disciplines. Traditionally the doctorate can be a super specialised degree. So people know one issue in extraordinary depths and might even be the leading authority on that topic when they finish their PhD programme ... I think there is a need for exposure – not necessarily coming out with a certificate but exposure to other disciplines rather than the super specialist. The super specialist tends to run the risk of leading to the ivory tower type academic, which there is a place for, but you need plenty of PhDs that can go out there and work with society and make a difference as well. (Science council)

Other employers emphasised problems with the 'typical' or 'basic skills' associated with the PhD, such as writing or researching skills. Significantly poor were quantitative research skills, particularly in statistics:

Then the training in methodology is often quite weak. I mean there are very few South Africans that can write a proper bibliography, unbelievable I mean, and that's the kind of thing in America that you learn at school and they discipline you there to make sure that you do it. For some reason we don't do that here. Most people that come through at any level don't know how to do a proper bibliography and then you have to go through all of that and they don't take time to go to a website and see how to do it there ... So we set pretty low standards. (Science council)

[T]here is a gap, in terms of stats and I need to say this, we are weak mathematically. I got an F or E or something like that but then I am churning out the stats here so now how did that happen? ... People come in who have had training in stats and they don't know what I am doing. Now that's disappointing. That means the next generation have not been properly trained. So our stats in the

> *bigger sense, I don't mean just crunching numbers, I mean in terms of understanding the nature of that number. How did you get to it, how did you cross tabulate, what really does this all mean and was it really significant? Quite important how you deal with all the statistical tests I mean just thinking vigorously. (Science council)*

Several weaknesses were, therefore, identified. Employers complained that the PhD did not currently have much relevance to the world of work; that there was a general absence of managerial skills and a lack of experience; that there were problems with the 'typical' or 'basic skills' associated with the PhD, such as writing and researching skills, and that PhD graduates were overspecialised and academically isolated.

Employer suggestions

Several suggestions were given by the employers on how to prepare PhD graduates better for the work environment. The need for greater exposure to the broader intellectual climate was emphasised, as was the importance of attending international conferences. The prevalence of international collaborations should also be increased:

> *I know that American and European universities are very good at that. A student is expected to go to so many conferences during the time that they are doing their PhD and not only regional conferences but international conferences as well. In this way they will be exposed to experts in their field and to obtain those networks. We sometimes suffer from the syndrome where the supervisor being the person who always wants to be exposed to conferences and talking about the work that the students are doing without giving the students those opportunities. So if the supervisor gives the student those opportunities then definitely you will find the person coming with those networks. I think that is slightly lacking in the South African set-up. (Science council)*

> *More emphasis on international exposure. It is extremely important that young PhDs go to international conferences – it is part of their essential experience. To hear what is going on, to hear about how other people tackle problems, to develop collaborations and links ... That is one of the things that South African PhD students don't get as much of as for example people in the United States and Europe do where it is relatively cheap for somebody based in Paris to go to a conference in London or in Munich or around the United States whereas we have very few meetings within South Africa, in Africa in fact. (National Research Facility)*

> *I would say the networking – so if you rapidly want to go up the ladder it is international networking that is important. International networking, international exposure, forcing some form of collaboration/ cooperation across boundaries would be good. This is so that they already have their networks by the time they hit the job market. Being part of the global network. (Private sector)*

The suggestion was made to improve the PhD by introducing set training courses, thereby generating greater emphasis on methodology training:

> *There should be a programme of training that ensures that there are basic core skills that the master's/PhD student actually has. By comparison with a lot of international programmes – the US PhD etc. – every one of them have to undertake a significant methodology course, statistics course and including a whole bunch of qualitative data analysis courses. Part of the problem has been that if you look across the number of people that are numerate in terms of being able to apply statistical skills to data etc. is just like – you can't even see it. (Science council)*

> *If they come from a discipline specific background and then in our context if that discipline specific background includes a lot of methodology training, they do excellent. So people who come with weak research training experiences, they actually also struggle with their PhDs as well. So I think that the extent to which people can be trained into – I don't really care in what they do their PhDs or where they do it. I think one of our biggest problems in terms of productive PhDs has to do with the fact that a lot of them don't get the core training across the board around methodology. (Science council)*

Employers also suggested that university leaders pursue and maintain ties with business leaders and the world of work:

> I don't want to put stumbling blocks in universities, but what would improve the preparedness is if high-level university leaders, head of department and deans – they could have closer interaction with the business world which would then enable the universities to propose potential topics to PhD candidates that not only would get funded but would also be more applied ... (Private sector)

> Then the last thing is whatever PhD you do it should be relevant, there is no use doing a PhD for a job that there is no demand for, and that you get, am telling you I am seeing it. The only people that can make that happen are the supervisors in the departments. They shouldn't allow people to do PhDs on topics that are irrelevant and have no demand and I know you guys will not agree with me because it's my academic freedom. I don't believe in that. I don't think South Africa can afford that kind of approach with all the shortages that we have. (Science council)

Employers, therefore, suggested that PhD students should have greater exposure both to the practical demands of the work environment and to intellectual discussions taking place within relevant fields globally. For the latter, the attendance of international conferences was considered necessary, as was collaboration with researchers from other faculties and regions. Furthermore, various employers indicated that training courses in methodology should also be presented at the PhD level. Finally, employers insisted that university heads of departments, deans and supervisors need to maintain closer relations with the world of work.

Discussion

The introduction of WIL within the HEQF has been the principal initiative to facilitate greater relevance of higher education in the workplace in South Africa. The four curricular modalities summarised earlier, however, offer the only conceptual framework to direct the implementation of WIL. These modalities require further definition and would benefit from clearer examples of implementation, particularly at the doctoral level. Unfortunately, the study was conducted before the Council on Higher Education published its good-practice guide to WIL, with its elaboration on the definitions of each curricular modality (2011). The modalities were, therefore, not discussed during the interviews. Despite these shortcomings, however, the four curricular modalities are discussed below, with reference to the key concerns of the employers of PhD graduates.

The incorporation of *problem-based learning* and *project-based learning* could be useful in the facilitation of management and related communication skills. Employers emphasised that PhD graduates are expected to embody future leadership and, therefore, consistently underlined various desirable management skills, including financial, people and project-management skills. Prospective PhD graduates could best acquire these skills by participating in studies or projects in which they are given the responsibility of managing specific components of the research process. In this regard, the formation of groups of PhD students to tackle projects and problems would be useful, although it is not clear how this would work in practice and within which fields this would best be applied. Documented evidence from the Council on Higher Education good-practice guide to WIL (2011) does not include examples of *problem-based learning* or *project-based learning* at the doctoral level.

Workplace learning could also present doctoral students with the opportunity of fostering relevant management-related skills if they are presented with opportunities to direct the research process within the working environment. This, however, seems less likely to occur when PhD students are new to a particular working environment or have only recently been introduced as team members. The increased prevalence of *workplace learning* could, however, meet the stated desire for practical experience and could also help foster business-related skills in instances where the nature of employment includes business-related tasks. In this regard, it is imperative that relations between the employers of PhD graduates and the academic supervisors of PhD graduates be encouraged in order to facilitate relevant and effective work placements that enable learning pertinent to doctoral education. Furthermore, instances where prospective

PhD students are already employed should be effectively utilised and the role of workplace employers in the doctoral education process made clear. The general format of the South African PhD emphasises the development of a traditional thesis. Within this model, it is, therefore, essential that co-supervision between academic and workplace supervisors does not lead to contradictory instructions to prospective PhD graduates, and a clear division of labour should be constructed, agreed upon and adhered to from the outset. It could also be worthwhile introducing alternative doctoral outputs that contribute towards the doctoral degree. These could include the completion of specific projects applicable to specific work environments.

The application of *work-directed theoretical learning* could help expose students to the broader intellectual climate and could facilitate connections with various practitioners within specific fields. Exposure to the broader intellectual climate could include wider exposure to related disciplines and exposure to developments at international level. Employers particularly stressed the need for greater exposure to international conferences. Other important components of *work-directed theoretical learning* could include guest lectures and supplementary course work directed towards the world of work. Although not exclusively work-oriented, employers' dissatisfaction with the basic research skills of doctoral students is cause for concern. Without proper attention to the acquisition of basic research skills, changes to doctoral education will be superfluous. The recommendation for the implementation of relevant courses is deemed prudent and could be considered to form another (fundamental) component of *work-directed theoretical learning*.

Recommendations

First, the curricular modalities presented need proper definition. It is not clear, for instance, how professional doctorates could be considered examples of *work-directed theoretical learning*. Excessive overlap also seems to exist among some of the modalities; an anthology of examples at the doctoral level would, therefore, be extremely useful. It is also imperative that the recurrent employers of PhD graduates for various fields of study be made known and that innovative ways of facilitating greater interaction between leaders in these fields of employment and study be facilitated. Once these ties are made known, forums could be established to discuss the expectations from both these parties with regard to appropriate doctoral as well as general higher education.

Secondly, universities and policymakers should investigate *the feasibility of introducing alternative doctoral models* and consider, in particular, introducing professional doctorates. International developments in the changing structure of PhD education should be closely monitored as reports on the strengths and weaknesses of various alternative doctoral-programme structures are generated. Investigation into the application of these structures globally could facilitate the implementation of valuable programmes within the local context.

Thirdly, PhD *students should be exposed to international conferences and guest lecturers to ensure exposure to various methodological and theoretical paradigms*. In this regard, universities and policymakers should consider the feasibility of introducing *graduate or doctoral schools or academies*. This could help ensure that methodological foundations are sound, international perspectives are presented and developments within emerging multidisciplinary fields are discussed by experts from a variety fields.

Finally, it is imperative that *universities ensure that the South African PhD is up to international standards*. Deterioration in the standards of South African PhDs could hamper the proliferation of networking capabilities and destroy funding opportunities, as the international community could lose confidence in our ability to generate local expertise and run research projects. Greater emphasis on quantitative data-analysis training would be particularly useful.

Endnotes

1   Notable areas of employment outside academia included industry (18.8%), government (9.4%) and science councils and the non-profit sector (10%).
2   Learning that occurs as a result of work placement during a course of study.

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