

PhD by Publication or PhD by Traditional Model: Which Way to Go?

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Abstract: South Africa is at the cross-roads with the knowledge production economy. The DST target is 6000 PhD graduates per million by 2018. The knowledge economy is important for South Africa as it is the engine for economic growth. There is a link between knowledge production and economic growth of a country by comparing the citation intensity and the economic wealth of the country. In addition to the knowledge production other factors such as political and macro-economic factors, infrastructure investments, providing clean water and sanitation, roads must be in place for sustainable economic development. This can only be sustained through the 'production of highly trained people' the PhD students. But the trick is which PhD model should I take? On the PhD model, the ASSAF study showed that South Africa produced most of the PhDs through the *traditional model*. However, for South Africa to produce more PhDs in a shorter time period there is a need to move away from the *traditional model* and embrace other forms of PhD production. The alternative model is the *PhD by publication*. This is able to produce PhD graduates in shorter pace of time with high quality impact publications.

Keywords: PhD graduate; knowledge economy; citation intensity

1. Introduction

Recently I read a document on the ranking of universities in Africa and the number one spot was the University of Cape Town and the main criteria for this ranking was the research agenda not teaching and learning but research. But the research is not undertaken by the professors but the postgraduate students (Hons, Masters and Doctoral students). And behind these students lies the postgraduate supervisor! Thus if I was at the University of Cape Town I would be patting my back for a job well-done as being number one research university in Africa. However, my own University of Venda (Univen) has greatly improved its internet rankings and its output in publications is high but the postgraduate (Masters and PhD) output is low. Thus, in this study I am discussing the reasons for the low rate of PhD output (*PhD by traditional model*) and how this may be upped by incorporating new ideas such as *PhD by publication*. I will discuss my own contribution, review of relevant academic discourse, challenges in postgraduate supervision and the way forward to attaining a single digit ranking. At the Univen, I have supervised and continue to supervise postgraduate students (Hons, Masters and Doctoral) who come from diverse backgrounds.

2. An Overview of Postgraduate Training in South Africa

The knowledge economy is important for South Africa as it is the engine for economic growth. The study of King (2004) clearly showed that there was a link between knowledge production and economic growth of a country by comparing the citation intensity and the economic wealth of the country. In addition to the knowledge production other factors such as political and macro-economic factors, infrastructure investments, providing clean water and sanitation, roads must be in place for sustainable economic development. This can only be sustained through the 'production of highly trained people' the PhD students. According to ASSAF, (2010:39) the purpose of PhD training is:

- Training for an academic career
- Training for industry
- Training for a profession

But central to this PhD training is the production of a thesis. According to CHE (2013:40) the Higher Education Qualification Sub-Framework the doctoral graduate must '*demonstrate high-level research capability and make a significant and*

original academic contribution at the frontiers of a discipline or field' and 'must be able to supervise and evaluate the research of others in the area of specialisation concerned'. It is this notion of significant and original academic contribution with which Park (2005:198) have questioned what constitutes significant and original when they are other advanced forms of PhD training such as the New Route PhD and professional doctorates. With regard to professional doctorates CHE (2013:41) have stated that during the doctoral study there is a research component that contributes to knowledge generation. The New Route PhD as proposed in the Britain is modelled along the North American PhD model has a combination of coursework, research training and a research component which also contributes to generating new knowledge and a shorter time to completion of four years (Park, 2005:201). From my side, I am following the traditional route in PhD training as I was trained but I will give more insights later.

South Africa was in the same cluster as countries such as Poland, Russia and Brazil in terms of economic wealth and citation intensity (ASSAF, 2010:21). The citation intensity is a measure of number of citations in science and engineering journals relative to the gross domestic product (GDP) of a country, citations per unit GDP (King, 2004:318). Thus to improve and maintain this citation intensity, there is a need to improve the doctoral output. Thus the Department of Science and Technology (DST) in its Ten-year Innovation Plan stated that there must be investments in the knowledge production, the training of more PhD students in order to join the wealthier nations (ASSAF, 2010) as South Africa is classified as middle income country (World Bank Group, 2015). This was also supported by the National Planning Commission (NPC) that stated that the training of PhDs is vital to the developmental success of South Africa (NPC, 2011; NDP, 2012). In its vision of 2030, the NDP (2012) has recommended the following:

- Improve the qualifications of Higher Education academic staff from 34% to 75% (this is the number one recommendation).
- Produce more than 100 doctoral graduates per million by 2030.
- SA needs more than 5000 doctoral graduates per annum.

- Most of these doctorates should be in Science Engineering & Technology.

I do agree that there is a need for more doctoral outputs especially from other universities such as the University of Venda. But innovative ways of PhD training are required in order to boost the numbers. The production of PhDs requires input in quality and quantity (supervision, facilities, environment and student) and quality output (graduate and publications). At present South Africa produces 23 to 27 PhDs per million of the population per annum and the DST projections are 6000 PhDs per million in 2018 of which half of the PhDs are the science, engineering and technology fields (ASSAF, 2010).

The production of PhDs in South Africa has been skewed with the traditional universities of producing the majority of graduates. According to the study of ASSAF (2010) the following findings:

- In 2007, 80% of all graduates were produced by Universities (as opposed to Universities of Technology and Comprehensive Universities).
- The top nine South African public higher education institutions in terms of PhD production were responsible for 83% of the doctoral graduates in 2007.
- Half of doctoral students select a particular PhD programme or institution based on the research focus of a department or programme.

The PhDs graduates have found employment in various sectors of the economy of South Africa with majority (48%) of science graduates entering industry and academia (ASSAF, 2010). From the employed graduates, the PhD training prepared them very well for employment and with some of the graduate establishing their own companies and or consulting companies. From my part, I have trained and supervised a number of Honours and Masters' students who have found work in government departments such as the Department of Water & Sanitation; academia as lecturers and local government in the water sector such as water service providers.

On the other hand the employers noted some critical elements in the PhD training in South Africa that requires improvements (ASSAF, 2010):

Employers note as the salient weaknesses in the skills and abilities of doctoral graduates from public higher education institutions in South Africa, a lack of:

(i) *Exposure to international expertise, theories and debates;*

(ii) *Methodological competence; and*

(iii) *'Real world' relevance.*

In response to this I have also improved my training and supervision of postgraduate students by exposing them to national conference participation and presentation. Secondly I am supervising Masters' students who are working and conducting relevant studies in their work place thus inculcating 'real world relevance'. For the doctoral student I am supervising I have recommended to the University of Venda, Department of Research & Innovation to be part of a delegation that will attend the 8th HOPE meeting with Nobel Laureates in Japan in 2016. The doctoral student will present a poster to showcase his research findings in defluoridation of ground-water using metal modified clay and diatomaceous earth. Though the meeting is for a week, there is ample time for networking and interaction between him and other invited guests and Nobel Laureates.

The ASSAF (2010) has pointed out that part of low PhD productivity is linked limited supervisor capacity, dysfunctional schooling systems, poor-supervisor relationships, insufficient funding for postgraduate research and scholarship/bursary awards and nature of PhD model. In order to boost PhD productivity, NRF has established centres of excellence and South Africa Research Chairs Initiative (SARChI) in a number of universities including the historical disadvantages universities such as the University of Venda (ASSAF, 2010).

In addition to the freestanding and grantholder-linked funding of doctoral students, three other programmes of the NRF allow for PhD support. These are Technology and Human Resources for Industry Programme (THRiP), the South African Research Chairs Initiative (SARChI) and Centres of Excellence (CoE).

At Univen, I am part of SARChI and the Masters' student is working on cyanobacteria in small holder fish farms. Instead of just letting stop at Masters'

level I am motivating her to continue the study area at doctoral level. But the trick is which PhD model should I take? On the PhD model, the ASSAF (2010) study showed that South Africa produced most of the PhDs through the *traditional model*. Thus the four main models of training doctoral students in South Africa are:

- Traditional model is the apprenticeship model of individual mentoring. This model is usually supplemented by informal and ad hoc support programmes.
- The course work approach, which comprises a more formalised curriculum in addition to apprenticeship.
- The cohort-based model provides a critical mass of students and supervisors and supposedly offers economies of scale
- The PhD by publication

However, for South Africa to produce more PhDs in a shorter time period there is a need to move away from the traditional model and embrace other forms of PhD production. The reasons for incorporating other forms of PhD models other than the traditional model are ASSAF (2010):

Traditional approach-being based on availability of suitably qualified supervisors-serves a relatively small number of students and may not be an efficient model for rapidly increasing PhD production; especially it involves an on-on-one student-supervisor relationship.... The shortage of qualified academic staff and the continuing ageing of the same cohort pose a serious constraint on any substantive growth in doctoral enrolments in the near future

Thus for South Africa to produce more PhDs there is a need to include a hybrid model that encompasses all and some of good attributes of different types of PhD models. The proposed route is the course work and cohort based PhD models since these are designed to reduce dropout rates; increased graduation throughput; use of interdisciplinary training and scaffold training the student may have lacked at undergraduate and Masters' level. For new doctoral students that I have supervised at Masters Level, the *PhD by publication* seems it is an attractive option that I want experiment in 2016 and beyond.

Instead of having one supervisor/promoter in the *traditional PhD model*, now there are innovative supervisory practices to cater for the students and improve limited supervisor capacity. Supervisory committees, joint supervision, virtual faculty and consortia, could potentially increase supervisory capacity and expose students to additional expert knowledge. Making use of the large numbers of staff members with doctoral qualifications within South Africa national science councils...cohort-based and course-based models could also maximise the available supervisory capacity, but they remain resource-intensive (in terms of time and money) and require institutional support and infrastructure.

In my experience, I co-supervised some of the Masters' and PhD students with supervisors and promoters from the science councils such as the CSIR, MinTek and within the University of Venda from similar context discipline. For example, the co-promoter for doctoral student is the Department of Ecology and Resource Management and I from the Department of Hydrology and Water Resources. The supervisory committee has greatly assisted with supervisory capacity and planning. From my experience there are challenges with coordination and even talking to the postgraduate student in two 'tongues' in which the other supervisors are saying something almost different from ones' line of thought. To improve the lines of communication I have suggested to the other supervisor that we the team must discuss first and have a common understanding. Then we can approach the student with one voice to avoid confusion and miscommunication.

3. The Positive Benefits of PhD by Publication

There are benefits on moving to *PhD by publication* such as an increase in the number of PhD graduates and also the corresponding increase in the number of peer reviewed publications in higher impact journals (Asongu & Nwachukwu, 2016). A study of Frick (2016:303-304) showed that the Stellenbosch University, South Africa had a steady upward production of *PhD by publication* than the *PhD by traditional* route between 2008 and 2014. An interesting aspect of the study was the *PhD by publication* was favoured by Science based faculties (Agrisciences, Medicine & Health Sciences and Science) with the exception of Engineering. During the process of publishing the papers, the doctoral

student and supervisor/promoter benefit from the rigorous reviewer comments and in some cases improving the overall direction of the doctoral study (Frick, 2016:301). The *PhD by publication* produced more publications and these are linked to government subsidy by Department of Higher Education & Training (DHET) as a research incentive (DHET, 2016). Also linked to the high impact publications is the citations intensity that contributes to University Rankings worldwide (Frick, 2016:300). The publication incentive also contributed to the doubling of the overall paper publications in South Africa between 2000 and 2010 (Pouris, 2012). In my case, the doctoral student (student enrolled in 2016 and target date of PhD completion is 2019) has produced one peer reviewed paper and has two papers under review. In South Africa and elsewhere the number of PhD graduates and the number of publications form the basis for academic promotion for the supervisor/promoter (Frick, 2016:300).

4. The Challenges of PhD by Publication

There are also challenges to the concept of *PhD by publication* such as the review in policy at institutional levels; doctoral pedagogy; retraining and orientation of the supervisor/promoter and availability of support staff and infrastructure. At most institutions, the policy on PhD by publication are not expressly stated but do encourage any activity that leads to the improvements in doctoral outputs (Univen, 2012a,b; Odendaal & Frick, 2017).

The *PhD by traditional* requires on average 1.4 supervisors/promoters per thesis and the *PhD by publication* requires 1.6 (~2) supervisors/promoters (Frick, 2016:308). Thus doctoral pedagogy needs to change in order to have more supervisors/promoters to supervise doctoral students. The promoters must on their own have doctoral degrees in order to supervise doctoral students and this put strain on the promoter who is also ready burdened with teaching of large classes. To ease the supervisory challenges, supervisors/promoters can be drawn from Science Councils such as the Council of Scientific & Industrial Research Council (CSIR), Agriculture Research Council (ARC) and Human Research Council (HSRC). In my case, I have supervisors/promoters from the CSIR for the doctoral students. As shown by the study of Frick (2016:308) there is a need for infrastructure and support staff to back science based doctoral studies.

5. Requirements on PhD by Publication

The requirements for a PhD by publication is a thesis composed of introductory chapter, five or six papers and a chapter on concluding remarks. The number of papers and number of pages per paper differ as seen by study of Frick (2016:307) and Robins & Kanowski, (2008: 6). According to Frick (2016:307), there a five papers per thesis and the issue of introductory and concluding chapters may depend on institutional regulation on thesis (this ties in with institutional policy). The other requirement is examination of the thesis by two or more external examiners and internal examiners and oral deference of the thesis. While in Social Sciences discipline, the number of papers is between three and five and also requires an introductory chapter, a second chapter that introduces and summarises the content of published papers and a concluding chapter (Robins & Kanowski, 2008: 6).

6. Conclusion

The knowledge economy is important for South Africa as it is the engine for economic growth, the developmental paradigm. This can only be sustained through the 'production of highly trained people' the PhD students. The production of PhDs in South Africa has been skewed with the traditional universities of producing the majority of graduates. On the PhD model, the ASSAF study showed that South Africa produced most of the PhDs through the *traditional model*. The traditional master/apprentice model of supervision has limitations in that there are built-in critical assumptions. Thus for South Africa to produce more PhDs there is a need to include a hybrid model that encompasses all and some of good attributes of different types of PhD models. The *PhD by publication* seems to offer an alternative route is designed to reduce dropout rates; increased graduation throughput; use of interdisciplinary training and scaffold training the student may have lacked at undergraduate and Masters' level.

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