Doctoral Education in Context

Perspectives from Africa

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CHAPTER 6

The MPhil/PhD degree at the University of Mauritius: Time to diversify and adopt other models of doctoral degrees?

Meera Manraj

The **Republic of Mauritius**, a group of islands in the Indian Ocean on the eastern side of Africa, has a 1 278 000 (in 2023). There are 10 publicly funded higher education institutions (HEI) and 30 private higher education institutions (HEIs) in Mauritius (Higher Education Commission in Mauritius). Four public institutions have the power to award doctoral degrees. In 2019, out of 18 372 new entrants into tertiary education, 15.6% and 8.3% enrolled at postgraduate level in public and private HEIs respectively, including 202 doctoral candidates.

The **University of Mauritius**, established in 1965, comprises 7 faculties, employs 276 academic and 623 support staff. In 2020/2021 the university had 9 321 students (20.6% on a part-time basis) of whom 193 were MPhil or PhD students, and one MPhil and 27 doctoral degrees were awarded (2020-2021 Annual Report).

1. Introduction

The average annual growth of doctorates awarded has increased worldwide (Cyranoski et al., 2011) mainly in countries that see educated workers as a key to economic growth. South Africa is considered a regional hub in graduate education on the African continent (Teferra, 2015) as it provides training both to local and PhD graduates from other African countries. The situation is quite different in Mauritius as the production of PhD graduates seems to stagnate

even though the country aspires, according to its policymakers in 2006, to develop into a knowledge hub (Cloete et al., 2011).

The University of Mauritius (UoM) (established in 1965) is the main and oldest public tertiary public institution in the country. It offers the traditional supervised MPhil/PhD by thesis programme in all its seven faculties, namely, the Faculty of Science, the Faculty of Agriculture, the Faculty of Engineering, the Faculty of Social Sciences and Humanities, the Faculty of Law and Management, the Faculty of Information, Communication & Digital Technologies, and the Faculty of Medicine and Health Sciences (established in September 2020). The UoM has continued the tradition of Commonwealth universities where students usually register on a full-time or part-time basis for an MPhil, MPhil/PhD programme after the bachelor's degree, or, more rarely, directly for a PhD programme. Organisation of the doctoral programme follows an apprenticeship model and is thesis based. The average annual growth in doctoral output from 2001 to 2015 at UoM was estimated at 2%, the lowest among the eight African universities included in the HERANA project (Bunting et al., 2017, p. 40). The average annual growth in research publications over the same period at the UoM was also amongst the lowest. Whereas doctoral graduate numbers stagnated between 2001 and 2015 at the UoM (17 in 2001, 15 in 2011 and 21 in 2015), the number of taught master's graduates increased over the same period (69 in 2001, 396 in 2011 and 351 in 2015) (Bunting et al., 2017, p. 32).

In this chapter, I shall first make a few comments about the history of doctoral education in the world and the current situation regarding the prevalent types of doctoral studies. I shall describe the situation at the UoM based on data from its published annual reports of activities available from 2019/2020 to 2002/2003.[1] I shall propose a few suggestions regarding alternative formats of doctorates that may be realistically feasible and helpful in remedying the current situation of low doctoral production at the UoM in light of trends in doctoral education occurring in most parts of the world. The chapter will conclude with a summary of activities that are advised for good doctoral supervision practice.

1 https://www.uom.ac.mu/index.php/about-us/publications/report-on-uom-activities-factsheets.

2. History of the doctorate and models of PhD

2.1 The German and American models, and PhD by publication in 19th and 20th centuries

'Doctor' and 'master' were synonyms up to the 12th century in Europe and were not linked to research. These titles allowed individuals to teach (Hargreaves-Mawdsley, 1963 cited in Academic Apparel, n.d.). The doctoral degree that was developed in 1806 at Humboldt University, Germany, combined teaching and research. It was obtained upon completion of several years of research apprenticeship and submission of a dissertation. That was the traditional doctoral degree by thesis (German model) which was considered the highest academic degree.

The PhD qualification that was first offered by Yale University in the USA in the mid-19th century differed from the German model as it consisted of blended course work and a PhD thesis (Matas, 2012). Thus, it came to be known as the American model. The PhD qualification was offered in the early 20th century by Oxford University in the UK, then in Canada and Australia. Both German and American models co-existed in universities across the world. For much of the 20th century there were marked differences between science-based graduate programmes in the USA and elsewhere. Course work and research were an integral part of both master's and doctoral programmes in the USA and Canada, whereas European institutions privileged hands-on research and research training, usually to the exclusion of course work in doctoral programmes (Kehm, 2007). Doctoral programmes, which were of three-year duration in European universities, were longer in the USA, typically between four to six years. More institutions around the world have evolved curricula closer to the US and Canadian models, with blended course work and research in the past couple of decades.

A new trend occurred in the UK in the 1960s when the PhD by publication was introduced. This format, which is popular in some European countries and in Australasia, is examined on the basis of publishing one or more peer-reviewed academic paper(s), accompanied by an overarching introduction, discussion and conclusions (Matas, 2012).

2.2 Reforms as from the 21st century

In the late 20th century, several countries followed the example of the USA, where a national survey on doctoral learning experiences of students in

1999 had been carried out. The survey found that the research training was not comprehensive and not effective at preparing students for careers they could pursue in academia and outside of academia, and, alarmingly, it was not effective in preparing students to become researchers (Matas, 2012). A wave of doctoral education reforms ensued in various countries after surveys were conducted on the careers of doctoral graduates.

Germany redesigned its doctoral education with the creation of graduate schools teaching transferable skills through structured programmes to increase the quality and the relevance of doctoral education and research training in what was coined the 'third cycle' of studies in the framework of the Bologna process (Kehm, 2007). A trend of introducing learning outcomes frameworks and assessment into doctoral education, which previously only focused on undergraduate learning, began in the USA. This was in response to calls for aligning doctoral training with the career needs of students irrespective of their future, whether in academia (only 15% of PhD graduates secured academic appointments in 2006 in the USA) or elsewhere, and to make the learning outcomes of doctoral degree programmes more explicit and more student-centred (Ortega & Kent, 2018).

National qualification frameworks in Europe, Australia and Canada provided guidelines for the definition of doctoral degrees, placing emphasis on the creation of new knowledge through research. Parallel to the USA, the Lumina Foundation, which emphasises the importance of learning frameworks (Travers et al., 2019), provided a definition of the doctoral degree: Level 8 (the highest level) describes a PhD degree holder as someone "who demonstrates competencies for obtaining research findings in a scientific subject or for the development of innovative solutions and procedures in highly complex and novel problem situation within a field of occupational activity" (Ortega & Kent, 2018).

The UK innovated with the introduction of three new doctoral education models which included the 'professional doctorate', the 'practice-based doctorate', and the 'new route PhD' to reach more national and international students (Matas, 2012).

- The professional doctorate targeted working professionals and was based on a combination of course work and a supervised research project that was more applied and work-focused and smaller than the traditional PhD. An example of such endeavour in UK was the recruitment in 2011 of the first cohort of so-called 'Industrial PhD students' by the University of Strathclyde. These students were hosted at Glaxo-Smith-Kline (GSK) for

the majority of their PhD project which was in an area directly aligned with GSK's business and discovery projects (Allen, 2016).

- The practice-based doctorate aimed to reach artists and was based on a supervised research project in the performing arts. This type of doctorate assessed a creative work and a thesis which was shorter than the traditional thesis and included context and reflections of the doctoral student.
- The new route PhD aimed at an international doctoral student population, it provided research training, personal and professional development opportunities, and formative assessment based on course work (Matas, 2012).

Doctoral education reform in the UK was also based on inclusion of at least two weeks of training per year in transferable and generic skills for all doctoral and postdoctoral researchers, to improve their employability prospects (Matas, 2012). In a survey performed in the UK, employers ranked researchers' relative competences in the following order: *data analysis, problem solving, drive and motivation, project management, interpersonal skills, leadership, and commercial awareness* (Matas, 2012, p. 171). It is to be noted that reforms that occurred in the UK were not necessarily adopted by universities in its former colonies (including Mauritius) which mostly retained traditional models of PhD training.

In trying to speed up and expand knowledge production to keep ahead in the international knowledge innovation race; to participate successfully in the global knowledge economy; as well as for universities to improve their place in the international university rankings doctoral students' publications are increasingly being financially rewarded by most governments (Matas, 2012). Thus, the model of the PhD by publication has become more appealing than ever in countries like Australia (Powell, 2004).

2.3 Situation in Africa and in Mauritius

The first doctorates were awarded by South African universities from 1899 (Herman, 2017). Other sub-Saharan African universities set up doctoral programmes later after achieving independence around the mid-20th century, Universities that were modelled on the institutions of their former colonizers.

The Higher Education Qualifications Sub Framework (HEQSF) of South Africa (2013) described the submission requirements for the doctoral degree, whose duration was to be for two years minimum full time after a master's degree: "submission of a thesis, with possibility of submitting publications or creative work". Thereafter the Council on Higher Education in South Africa

(CHE, 2018, p. 13–14; Botha et al., 2021, p. 164) described the minimum threshold for graduate attributes to be achieved at doctoral level. Attributes at doctoral level considered in the Doctoral Qualification Standard were "specialised knowledge of a discipline, specialised knowledge of a specific area of research, insight into the interconnectedness of the topic of research with other cognate fields, ethical awareness in research and professional conduct and an original contribution to the field of study".

Other definitions of the doctoral degree were provided in 2015 by the Inter-University Council for East Africa (IUCEA), such as in the East African Qualifications Framework for Higher Education (EAQFHE), and more recently, in the Standards and Guidelines for Postgraduate Studies in East Africa in 2018. The IUCEA is responsible for the coordination and harmonization of postgraduate degrees in East African countries but does not have accreditation or regulatory powers (Botha et al., 2021, p. 161).

The University of Mauritius offers the MPhil or PhD degree as in some other Commonwealth universities. Three other public universities in Mauritius also offer doctoral studies. Information on doctoral studies offered at the four institutions is summarised in Table 1.

Table 1: Brief description of research degrees currently offered by 4 public universities in Mauritius2

Public Tertiary Institutions	University of Mauritius (UoM)	University of Technology, Mauritius (UTM)	Université des Mascareignes (UDM)	Open University of Mauritius (OUM)
Set up through Parliamentary Acts	7 December 1965	21 June 2000	28 May 2012	12 July 2012
Type of doctoral degrees offered	MPhil, MPhil/PhD, or PhD (rare cases)	MPhil, MPhil/PhD, or PhD (directly)	MPhil or MPhil/ PhD or PhD	PhD (MPhil/PhD very rarely) DBA: professional doctorate
Areas of research	Many disciplines (across the 7 faculties and centres)	Management, tourism, applied mathematics, modelling and sustainable development	Engineering, IT and management	Business administration, Finance and investment, law and management

2 Sources: https://udm.ac.mu/research/doctoral-school-ecole-doctorale/ http://www.utm.ac.mu/files/sthug/Regulation/Research%20Degrees/booklet.pdf https://www.uom.ac.mu/Images/Files/Regulations/MPhilPhD/2021_2022/chap1.pdf https://www.open.ac.mu/dbaphd-programme-document-for-jan-2022-intake/

Public Tertiary Institutions	University of Mauritius (UoM)	University of Technology, Mauritius (UTM)	Université des Mascareignes (UDM)	Open University of Mauritius (OUM)
Entry requirements	For MPhil or MPhil/ PhD: 1st or upper 2nd class BSc Honours or taught master's degree. For PhD: MPhil degree (or MA by Research/MSc by Applied Research)	For MPhil or MPhil/ PhD: at least upper 2nd class Honours or master's degree For PhD: MPhil Degree or a master's degree by Research in the field	For MPhil or MPhil/ PhD: at least upper 2nd class Honours degree For PhD: MPhil or a master's degree in a related subject area	For DBA: A masters- level degree, MBA or specialist MA or M.Sc. in a related area. For PhD: A master's- level degree in the related area
Admission process	Applications are first processed by the doctoral school; research proposal is assessed by its Higher Degrees Committee. Final approval for registration is by the Teaching and Research Committee of UoM, then implementation is at the faculty level (6 monthly progress reports, external assessors for transfer reports and theses etc.).	Application and preliminary proposals are first processed by the head of school who provides a letter of offer after which the student attends courses on research methods, ethics and quantitative and qualitativeresearch. Final proposal is submitted within 6 months for consid-eration by the Research Degrees Committee prior to confirmation for MPhil and PhD Registration.	Applications and research proposals (format available online) are sent to the head of the doctoral school of UDM.	Applicants do not submit their research proposal up front in either the DBA or PhD. They benefit from course work in the first semester (PhD) or first year (DBA) of registration, this is followed by a supervised stage where the doctoral student develops a research proposal that is submitted to the OUM Research Committee for review and approval.
Duration of studies	MPhil: 2 to 3 years (FT), 3 to 4 years (PT) MPhil/PhD: 3 to 5 years (FT), 3½ to 7 years (PT) PhD (direct): 2 to 4 years (FT), 3 to 5 years (PT)	MPhil: 2 to 3 years (FT), 3 to 5 years (PT) MPhil/PhD: 3 to 5 years (FT), 4 to 7 years (PT) PhD: 1½ to 5 years (FT), 3 to 7 years (PT)	MPhil: 2 years (FT) MPhil/PhD: 3 years (FT), 5 years (PT)	DBA: 3 to 6 years PhD: 3 to 8 years

Public Tertiary Institutions	University of Mauritius (UoM)	University of Technology, Mauritius (UTM)	Université des Mascareignes (UDM)	Open University of Mauritius (OUM)
Degree course organisation	Apprenticeship model and thesis- based The doctoral school organises transferable skills seminars for PhD students. Student notifies dean of faculty, with the approval of their supervisor(s), of their intention to submit a transfer report. Faculty Research Committee approves selection of external assessors.	Apprenticeship model and thesis- based Student is supervised by a supervisor (2 max.). Supervisor interacts with student and submits undertaking that transfer report, or thesis is acceptable to the Higher Degrees Committee (HDC).	Apprenticeship model and thesis-based Student supervised by a director of studies. The doctoral school organises specialist courses and transferable skills seminars for PhD students.	DBA: Structured courses in the 1st year to develop learners' expertise in use of research in to explore professional practice and submission of supervised research work as a written DBA thesis. PhD: structured course work in the 1st semester on research, systematic literature review. Supervised research after final proposal is approved by OUM and submission of a thesis.
Assessment process Conditions for awarding degree	Two (overseas) external assessors are appointed for MPhil transfer report or PhD thesis. No viva voce. A board of examiners (BoE) makes recommendations based on both EEs' reports: For MPhil transfer report: BoE may recommend upgrade to PhD or award of MPhil degree (the first positive recommendation received from one EE is sufficient for upgrade to PhD). For PhD thesis: Need for one publication in Web of Science journal before PhD thesis is sent to the external assessors. BoE recommends award of a PhD (or corrections or resubmission).	MPhil transfer report examined through viva by a MPhil transfer assessment panel. MPhil/PhD thesis is assessed by a MPhil/PhD examination panel (including 2 external assessors) + face-to-face or online oral examination.	PhD thesis is examined by 2 external assessors + viva voce	DBA: Assessment is through review of the DBA thesis + viva voce. PhD: Assessment takes the form of a review and/or by an oral 'defence' of the thesis, conducted in person or by live video link. PhD degree is awarded to successful students. All PhD students are required to have published at least two papers in peer-reviewed journals before being allowed to submit their final thesis.

Public Tertiary Institutions	University of Mauritius (UoM)	University of Technology, Mauritius (UTM)	Université des Mascareignes (UDM)	Open University of Mauritius (OUM)
Number of registered students (most recent)	171 per annum on average in the last 18 years	30 MPhil/PhD students were registered in 2008	26 (9 enrolled in 2014, 6 in 2017, 11 in 2020)	Started offering PhD and DBA in 2013. Has offered 56 PhD and 18 DBA to date. No student is enrolled in MPhil/PhD
Output	297 since 2002 (235 PhD); 16 per year in the last 18 years	Not available	Total of 8 (5 PhD in 2020, 3 in 2021)	

FT: Full-Time; PT: Part-time; DBA: Doctorate in Business Administration; EE: External Assessors

3. Trends in doctoral production at the University of Mauritius

In the last three decades, the University of Mauritius has offered programmes providing the following possibilities for enrolment in postgraduate programmes by research: MPhil or MPhil/PhD or PhD, on a part-time or full-time basis. It also offered master by research programmes in the last decade such as the MA by Research (social sciences) or MSc by Applied Research (technology and sciences), which are "tailor- made programmes of demand work-based research type, they emphasise independent study over taught components". The MPhil or MPhil/PhD or PhD programmes of UoM do not involve any course work, they are based on the apprenticeship model and assessed upon submission of a transfer report and/or of a thesis. Entry requirements for the MPhil and MPhil/PhD programmes are common: having a first or upper 2nd class BSc Honours or a taught master's degree. Entry requirements for the PhD programme are having an MPhil degree or another postgraduate degree by research (MA by Research or MSc by Applied Research).

Few students choose to register for an MPhil programme without any future intention of registering for a PhD. In that case they submit an MPhil dissertation at the end of the research study period for assessment by two external assessors for the award of an MPhil degree. Up to now, even fewer students were able to register directly for a PhD degree. Most students choose to register in the MPhil/PhD programme, where their registration can be upgraded to PhD after successful submission of an MPhil transfer report. If the MPhil transfer report is unsatisfactory, the student may be requested to submit an MPhil thesis for the award of an MPhil degree (exit degree).

A taught postgraduate masters' degree is not deemed acceptable for entry into the PhD programme at the University of Mauritius and at the University of Technology, Mauritius (Table 1). The situation is different at Université des Mascareignes and the Open University of Mauritius which accept the registration of students with a "master's degree in a related subject area" in their PhD programmes. The four public universities have their own individual guidelines regarding the offer of doctoral degrees, the duration of doctoral studies and assessment formats. There has been to date no development of doctoral standards and guidelines for doctoral education at the national level as in other countries or regions.

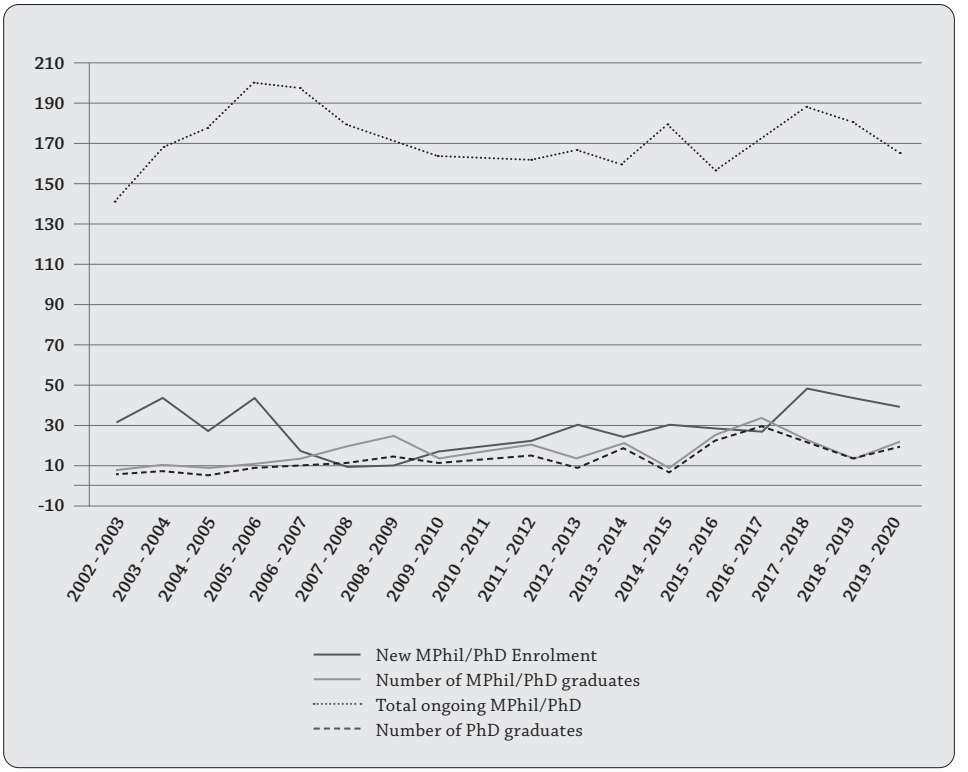
To study the trend in doctoral production from 2002 to 2020, I extracted data on ongoing MPhil/PhD registrations, new MPhil/PhD enrolment and the number of MPhil or PhD graduates from the annual reports of activities that are publicly available for the period extending from 2002/2003 to 2019/2020.

Figure 1 shows the number of ongoing MPhil/PhD registrations (students registered either in the MPhil or PhD phases of their studies), new doctoral enrolments (either in MPhil or MPhil/PhD or PhD only), MPhil and PhD graduates (numbers of MPhil graduates and PhD graduates are combined), and PhD graduate output at the University of Mauritius from 2002 to 2020. MPhil graduates comprise those who enrolled in the MPhil programme only and those who had enrolled in the MPhil/PhD programme but were not upgraded to PhD and had to submit an MPhil thesis.

The number of ongoing MPhil/PhD students registered per faculty or centre in the period 2002 to 2020 is shown in Figure 2. The annual output of MPhil and PhD graduates (numbers combined) per faculty from 2002 to 2020 is shown in Figure 3. The cumulated MPhil and PhD graduate output over 18 years in the different faculties of the University of Mauritius (between 2002 and 2020) is illustrated in Figure 4.

- The total number of ongoing MPhil/PhD students registered at the University of Mauritius peaked at a maximum of 199 in 2005-2006, it decreased between 2007 and 2016 then increased again from 2016 to around 170 per year.
- Those fluctuations mostly reflect annual enrolment of new doctoral students over the same periods. New doctoral enrolment (MPhil or MPhil/PhD), which was above 30 per year between 2002 and 2006, decreased in 2006, stagnated for 10 years and then rose in 2017 to above 30 per year (peaking at 50 in 2017).
- The number of MPhil or PhD graduates (combined numbers) grew slowly from an annual average of 9.8 per year between 2002 to 2006, to an

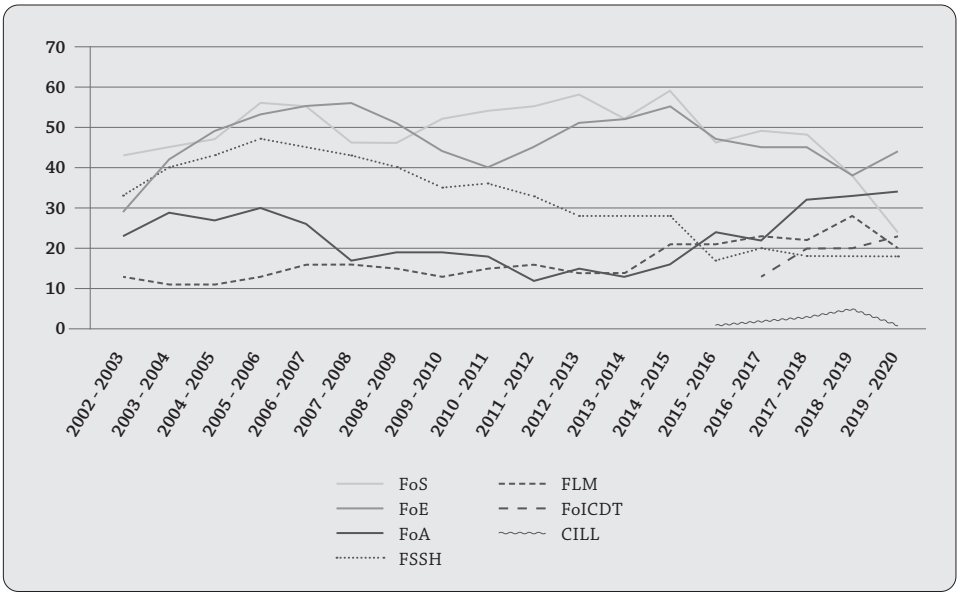
Figure 1: Number of ongoing MPhil/PhD registrations, new MPhil/PhD enrolment, MPhil or PhD graduate output (combined), or PhD graduate output at the University of Mauritius from 2002 to 2020



annual average of 16.8 between 2007 and 2014, and an annual average of 22.8 graduates between 2015 and 2020. The maximum number of MPhil or PhD graduates was 33 in 2016-2017.

- The number of PhD graduates grew slowly from an average of 6 per year between 2002 to 2006, to an average of 12 PhD graduates between 2007 and 2014, and an annual average of 21 PhD graduates between 2015 and 2020 (17% increase over the 18-year period). The maximum number of PhD graduates at UoM was 29 in 2016-2017.
- Since 2015, an important decline has been noted in the number of ongoing MPhil/PhD students registered at the Faculty of Science. The decline has been even steeper since 2017, with the number of registrations in 2019-2020 being at its lowest since 2002 (only 24 students when that faculty had 50 students registered on average in the period 2002-2019).

Figure 2: Number of ongoing MPhil/PhD students registered per faculty or centre in the period 2002 to 2020

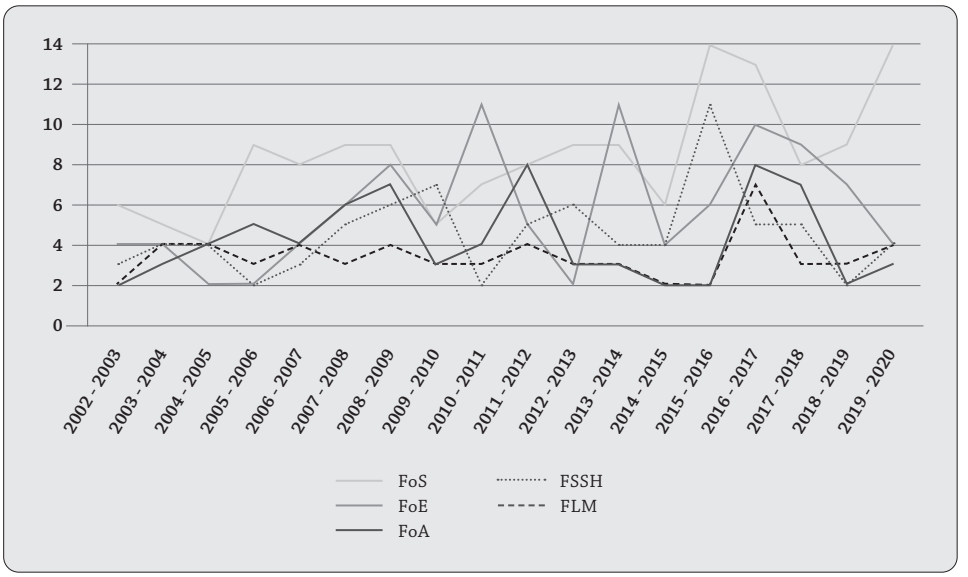


FoS: Faculty of Science; FoE: Faculty of Engineering; FoA: Faculty of Agriculture; FSSH: Social Sciences & Humanities; FLM: Faculty of Law and Management; FoICDT: Faculty of Information, Communication & Digital Technologies (newly set up Faculty); CILL: Centre for Innovative and Lifelong Learning

- A gradual and steady decline has been observed since 2006 in the number of ongoing registered students at the Faculty of Social Sciences and Humanities (32 registered on average for the period of 20 years, while the average number of registered MPhil/PhD students at the faculty in the last five years was 18, representing a 56% decrease in numbers).
- The number of MPhil/PhD students registered fluctuated around 47 on average at the Faculty of Engineering over the period 2002-2020, the number of students registered in that faculty in 2020 was higher than in 2002.
- The number of MPhil/PhD students registered at the Faculty of Agriculture was 27 on average between 2002 and 2006. It declined to an average of 17 doctoral students from 2007 to 2016, and that number has increased to 33 on average between 2017 and 2020 (94% increase).

- The number of MPhil/PhD students registered at the Faculty of Law and Management, which was 14 on average between 2002 and 2014, increased to 22 between 2015 and 2020 (57% increase).
- The number of MPhil/PhD students registered at the Faculty of Information, Communication & Digital Technologies (which was set up in 2015) averaged 19 per year between 2016 and 2020.
- There were very few doctoral students registered at the Centre for Innovative and Lifelong Learning (average of 2 between 2015 and 2020).

Figure 3: Annual output of MPhil and PhD graduates (combined) per faculty from 2002 to 2020

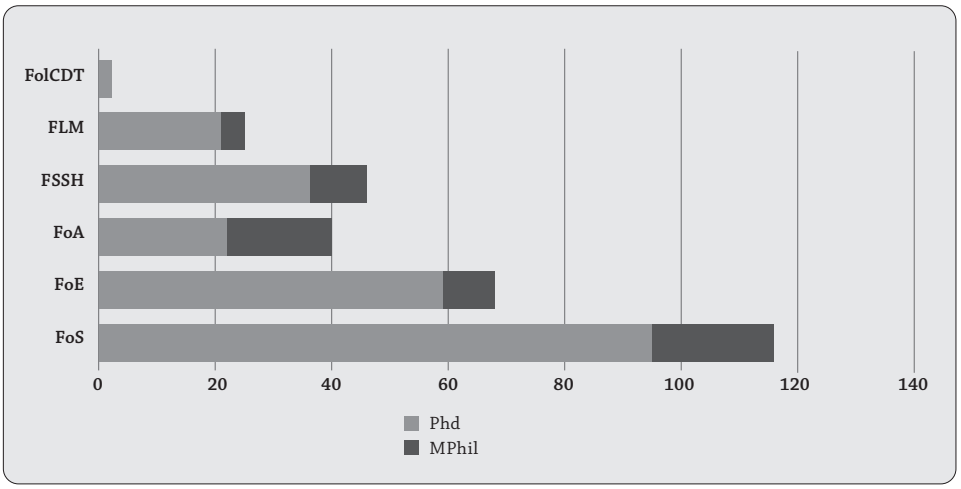


FoS: Faculty of Science; FoE: Faculty of Engineering; FoA: Faculty of Agriculture; FSSH: Social Sciences & Humanities; FLM: Faculty of Law and Management

- The average MPhil and PhD graduate output in the period 2002 to 2020 was 16.5 for the whole University of Mauritius (UoM).
- The Faculty of Science had the highest number of graduates from 2002 to 2020, it produced 39% of UoM graduates, with an annual average of 5.2 graduates from 2002 to 2014, and an annual average of 9.6 graduates between 2015 to 2020 (85% increase).
- The Faculty of Engineering produced 23% of UoM graduates, with an annual average of 3.8 graduates between 2002 to 2020.

- The Faculty of Social Sciences & Humanities produced 15% of UoM graduates, with an annual average of 2.6 graduates between 2002 to 2020.
- The Faculty of Agriculture produced 13% of UoM graduates, with an annual average of 2.2 graduates between 2002 to 2020.
- The Faculty of Law and Management produced 8% of UoM graduates, with an annual average of 1.4 graduates between 2002 to 2020.

Figure 4: Cumulated MPhil and PhD graduate output over 18 years in the different faculties of the University of Mauritius between 2002 and 2020



FoS: Faculty of Science; FoE: Faculty of Engineering; FoA: Faculty of Agriculture; FSSH: Social Sciences & Humanities; FLM: Faculty of Law and Management; FoICDT: Faculty of Information, Communication & Digital Technologies

- 2 PhDs were awarded for the first time in 2019-2020 at the recently set up Faculty of Information, Communication & Digital Technologies (March 2017).
- A total of 297 UoM students graduated with research degrees (MPhil or PhD) between 2002 and 2020, 62 MPhil (21%) and 235 PhD (79%).
- The ratio of MPhil to PhD at UoM in the period extending from 2002 to 2020 (all faculties combined) was thus around 1:4.
- The MPhil to PhD ratio was around 1:4 in the Faculty of Science and in the Faculty of Social Sciences & Humanities, it was lower both in the Faculty of Law and Management and in the Faculty of Engineering. The ratio of MPhil to PhD was much higher in Faculty of Agriculture (1:1).

- When only PhD graduate output was considered: the Faculty of Science had the highest proportion of graduates (40% of all graduates) followed by the Faculty of Engineering (25%), Faculty of Social Sciences & Humanities (15%), and Faculty of Agriculture and Faculty of Law and Management (9% each).

3.1 Estimation of dropout rates for students registered in the MPhil/PhD programme in the period 2002 to 2020

The best method to measure the doctoral graduate output efficiency at the UoM in the period between 2002 to 2020 would have been to apply a cohort-analysis methodology to individual student records with information on enrolment and graduation (Cloete et al., 2015, p. 77). Data that would have enabled cohort-tracking at the UoM are, however, not available to date. Therefore, I tried to provide a rough estimate of the proportion of students who dropped out of doctoral studies across the university each year by calculating a ratio of observed/expected number of MPhil/PhD registrations every year. We found that the proportion of students who had not yet graduated and still registered in the MPhil/PhD programme, decreased by 4% every year on average in the period 2002 to 2020. We did not have access to information that would have enabled us to estimate that proportion in the different faculties.

To look for the proportion of students who dropped out of the MPhil/PhD programme each year, I calculated a ratio where the observed numbers of ongoing MPhil/PhD registrations in an academic year [ObsNb(Y)] is divided by the expected numbers of ongoing MPhil/PhD registrations in the same academic year [ExpNb(Y)]. I calculated the expected number of ongoing MPhil/PhD registrations in an academic year using a simple operation involving numbers observed in the previous academic year (ongoing MPhil/PhD registrations, new enrolments and number of graduates):

ExpNb(Y)= ObsNb(Y-1) + ObsEnr(Y-1) – ObsGrd(Y-1)

Where:
ExpNb(Y): Expected number of students (Nb) registered in the current academic year (Y)
ObsNb(Y-1): Observed number of students (Nb) in the previous academic year (Y-1)
ObsEnr(Y-1): Number of new students enrolled (Enr) in the previous academic year (Y-1)

ObsGrd(Y-1): Number of students who graduated (Grd) in the previous academic year (Y-1)
ObsNb(Y): Observed number of students (Nb) registered in MPhil/PhD in the current academic year (Y)

I calculated the ratio between observed and expected of ongoing MPhil/PhD students for every academic year: [ObsNb(Y)]/ [ExpNb(Y)].

The results from calculating the ratio between observed and expected of ongoing MPhil/PhD students for every academic year are shown in Table 2. The ratio averaged over the 18-year period was 0.96. This means there was an annual average decrease of 4% in number of ongoing MPhil/PhD students registered at the University of Mauritius in the period between 2003 and 2020.

Summarily, from the data collected on numbers of doctoral students, doctoral enrolment and graduate output at the University of Mauritius between 2002 and 2020, I observed the following:

1. The number of ongoing MPhil/PhD students registered at the University of Mauritius:
   - has not increased, and seemed to have remained stable with an annual average of 171 over the 18-year period. The dropout rate was around 4% every year.
   - seemed to follow the trend in new annual doctoral enrolment during the same period, which was 28 on average, this number dropped between 2006 and 2012, and rose as of 2016.
2. The number of ongoing MPhil/PhD students registered in the different faculties:
   - had decreased sharply in the Faculty of Science over the last 5 years.
   - has decreased more gradually in the Faculty of Social Sciences & Humanities over the last 10 years.
   - had increased steadily in the Faculty of Agriculture over the last 3 years.
   - has also increased in the Faculty of Law and Management over the last 3 to 5 years.
   - has remained stable in the Faculty of Engineering.
3. MPhil and PhD graduate output increased quite slowly at the University of Mauritius from 8 per year at the beginning to 23 per year at the end of the 18-year period:
   - the annual graduate output averaged over 18 years was 16.5 per year, with 40% of doctoral output from the Faculty of Science, 25% from the Faculty of Engineering, 15% from the Faculty of Social Sciences &

Humanities and 9% from the Faculty of Agriculture and the Faculty of Law and Management.

- the ratio of MPhil to PhD was around 1:4 in most faculties, except in the Faculty of Agriculture where the MPhil graduate number was similar to that of PhD output.

Table 2: Observed and expected numbers of students registered every year in MPhil/PhD

Academic Year	New MPhil/ PhD Enrolment	Number of MPhil/PhD graduates	Observed number of ongoing MPhil/PhD	Expected number of ongoing MPhil/PhD	Ratio Observed/ Expected
2002-2003	31	7	141	-	-
2003-2004	43	10	167	**165**	**1.01**
2004-2005	27	8	177	**200**	**0.89**
2005-2006	43	11	199	**196**	**1.02**
2006-2007	17	13	197	**231**	**0.85**
2007-2008	10	19	178	**201**	**0.89**
2008-2009	10	24	171	**169**	**1.01**
2009-2010	17	13	163	**157**	**1.04**
2010-2011	19	17	163	**167**	**0.98**
2011-2012	22	20	161	**165**	**0.98**
2012-2013	30	13	166	**163**	**1.02**
2013-2014	24	20	159	**183**	**0.87**
2014-2015	30	8	179	**163**	**1.10**
2015-2016	28	25	156	**201**	**0.78**
2016-2017	27	33	172	**159**	**1.08**
2017-2018	48	22	188	**166**	**1.13**
2018-2019	43	13	180	**214**	**0.84**
2019-2020	39	21	164	**210**	**0.78**

4. Explanatory factors for the low PhD output at the University of Mauritius

The low output of PhD graduates is not due to high dropout rates (4%) but rather to the low enrolment rates which could be explained by several factors: lack of research funds, lack of equipment, scarcity of potential supervisors, delays when applications were managed by individual faculties, perception that MPhil/PhD is a lengthy and difficult journey.

4.1 Lack of research funding

We observed a drop in the number of new MPhil/PhD enrolments between 2006 and 2012, and a rise in numbers as of 2016. Funding for doctoral research by academic staff which was available before 2002 from the World Bank Higher and Technical Education Project (World Bank, 1999) had allowed an important number of academic staff to engage in doctoral degrees. Scarcity of research funding between 2006 and 2012 probably explains the drop in new enrolments of MPhil/PhD students during this period. Research funding available to academic staff at UoM was reported as being low compared to South African universities in the study by Cloete et al. (2011). The authors hypothesized that the chronic lack of research funds and high teaching workloads probably impacted on the weak outputs in doctoral graduates and research publications (Cloete et al., 2011, p. 105) and concluded: "The university will have to do a serious rethink of incentives if it wants to become a knowledge producer that can contribute significantly to an engine of development approach."

Funding prospects have improved considerably since 2015 with various research schemes made available to academic staff and researchers in public tertiary institutions by the Higher Education Commission of Mauritius and scholarships for full-time and part-time MPhil/PhD students.

Monetary rewards for research publications in Web of Science journals were made available in public tertiary institutions but doctoral supervisors at UoM were not remunerated and did not benefit from lower teaching workloads compared to those who did not supervise doctoral students. Academic development schemes at UoM were less well developed than at the University of Technology of Mauritius (UTM, 2018) where academic staff were encouraged to pursue their MPhil/PhD studies and were sponsored through a financial policy that allowed them to meet with their supervisors and to attend conferences.

Apart from better funding prospects, the rise in enrolment of new doctoral students was probably due to the change in the processing of applications that began in 2016. Instead of being managed by faculties where excessive bureaucracy often led to delays in enrolment of new MPhil/PhD students, applications were managed by the UoM doctoral school and the UoM Higher Degree Committee which made the application process more efficient.

The numbers of new registrants did not decline drastically, even with the offer of MPhil/PhD degrees by other public universities in Mauritius such as the University of Technology of Mauritius, the Université des Mascareignes and PhD degrees by the Open University of Mauritius which started recruiting students mid-2012. The time-to-degree is usually quite long for those registered

in the MPhil/PhD degree at UoM for several reasons that will be discussed later, much longer than the 4.7 years in South Africa.

4.2 Availability of potential supervisors

The ratio of doctoral graduates to permanent academic staff at UoM was very low (as low as 2.8%) in 2001. The upgrading of the university's staff and facilities was an objective of the World Bank Higher and Technical Education Project (1999), which was scheduled to take effect as of September 1995. The overall outcome was judged unsatisfactory as only 67 out of a total of 158 staff targeted took advantage of this opportunity according to the World Bank Higher and Technical Education report (1999, p. 15). The situation improved in 2007 compared to 2001, with 45% of UoM's permanent academic staff having doctorates as their highest formal qualifications in 2007 (Cloete et al., 2011).

As per the *Report on the Activities of UoM* for the academic year 2018-2019, 56% of permanent academic staff were PhD holders, while an additional 40% were enrolled in doctoral studies in July 2019. The situation regarding the availability of potential supervisors seems therefore to have improved over the last two decades. In terms of research publications, UoM's output was low with a ratio of publication units per permanent academic staff at 0.13 in 2007. This was well below the ratio of 0.50 which had been set as a target for South Africa's research universities. The latter performed rather well in terms of bibliometric analysis in the fields of tropical medicine, infectious diseases and agriculture (Mouton & Blanckenberg, 2018).

The possibility of academics increasing their income through consultancies, and important teaching workloads of academic staff also explain the modest improvements in doctoral output in the past two decades. PhDs produced were mostly academics trying to improve their career prospects, even if it usually took a long time to complete as part-time students.

The traditional PhD which is the only model of doctoral study currently available at the UoM relies heavily on individual research supervisors. A doctoral education model that relies heavily on supervisors may have the major disadvantage of high levels of doctoral attrition (Matas, 2012). As described in a Carnegie-sponsored study, there is a need for new doctoral education options such as apprenticeship with several faculty members, as such intellectual communities would foster the development of new ideas and encourage intellectual risk taking (Walker et al., 2008, p. 11).

4.3 Other hurdles for postgraduate studies at the University of Mauritius

Lack of networking with other overseas institutions to overcome isolation resulting from being an island state, and sharing of best practices, also contributed to low research output. Tight fluctuating budgets resulting in lack of investment in new equipment and poor maintenance of existing equipment were also deterrents for new doctoral student enrolments.

4.4 The two-step process in MPhil/PhD programme

The MPhil/PhD which is offered at the UoM is also offered by two other public universities in Mauritius. It is a research programme which involves the traditional apprenticeship model and does not include any structured course work. It involves submission of an MPhil transfer report which is assessed by external assessors before the student can be registered for the PhD studies. Award of the PhD degree is conditional upon submission of a thesis that is assessed by two independent external assessors, the thesis can be submitted only if the student has at least one paper accepted in a Web of Science journal.

I did not observe a high attrition rate based on our calculations on ratios between observed and expected numbers of registered MPhil/PhD students from one year to the other. However, in a case study of doctoral studies at UoM published in 2010 (Cloete et al., 2011, p. 104), concerns were raised that very few of the MPhil/PhD students registered at the University of Mauritius appeared to move into full doctoral studies. I also observed that students registered in the Faculty of Agriculture seemed to struggle and progressed to the doctoral phase much less often than in the other faculties. It is to be noted that the same degree is offered in all disciplines in the different faculties of the University. It has been argued elsewhere that some types of PhD such as the 'practice-based doctorate' seemed to be preferred in arts and humanities, while the 'professional doctorate' was preferred in Engineering and other scientific fields, all helping in the creation of new knowledge which is the main purpose of doctoral research (Matas, 2012).

4.5 Arguments against the current MPhil/PhD format performed as a two-step research degree using the master-apprenticeship model without any prior structured course work

The MPhil/PhD degree at the UoM and in two other public universities (UTM, UdM) is a doctoral programme of studies that is currently performed in two

steps or phases. A student registered full-time in such studies needs to produce a successful upgrading report after having performed two to three years of research to be registered in the PhD phase of their doctoral programme for at least another 2 years. MPhil/PhD students do not benefit from any structured course work that would provide them with tools such as research methodology, research design, research ethics, research management as well as scientific writing skills. The responsibility for transforming them into early researchers and scholars lies wholly on their supervisors.

The goal of doctoral education is to cultivate the research mindset, to nurture flexibility of thought, creativity and intellectual autonomy through an original research project (not through two smaller projects). The PhD student becomes a scholar through a process and not merely for having produced an upgrading report followed by a written thesis that is judged to be up to standard. In line with the first Salzburg Principle (European Ministers Responsible for Higher Education, 2007), it is the practice of research that creates this mindset.

The learning objectives of the MPhil and PhD programmes at UoM are more or less the same, the assessment criteria are very similar, except that the PhD student is expected to make an original contribution. Most students have an obligation to register for the MPhil/PhD degree and undertake their research apprenticeship in two phases. No two supervisors at UoM would have the same perception of what is expected from the students, yet the responsibility currently lies with the supervisor to decide when a student is ready for an upgrade. There are technical difficulties when there is a need for a second research question to be worked on after the upgrade report and when research funding has already been spent on the first project. There is a risk of dropping out of the programme after having produced the first upgrade report.

In an era where there are many holders of taught master's degrees, a structured PhD programme would be ideal. In that type of PhD programme, students would acquire, through course work, the generic skills and tools needed for postgraduate research, which would also help them develop and defend a research proposal in the first year. When the research proposal is accepted, students would benefit from guidance from supervisors who are experts in specific areas and disciplines for a period of 3 years if they are full-time students. This is the doctoral model that is currently adopted by the Open University of Mauritius.

5. Our recommendations for the introduction of a structured PhD programme at UoM

There are postgraduate studies scholars who maintain that the master–apprenticeship model is outdated, and that the models with course work provide a more structured doctoral learning environment, in which the doctoral student may not feel so isolated (Matas, 2012, p. 179).

If we believe that doctoral education is important for increasing the research capacity of the university and its reputation and ranking based on the number of scholarly publications, and contributing to the knowledge economy (Cloete et al., 2015), it is time to consider other models of doctoral study apart from the supervisor-centred traditional PhD by thesis currently required at the University of Mauritius. UoM regulations would need to be adapted regarding doctoral education programmes and their specific modes of assessment. Other processes such as doctoral applications, admissions, submission of research proposals, supervision, thesis submission, viva, etc. would be common.

1. I recommend that a 1 + 3 type of model for a full-time PhD programme at UoM be adopted, with a first year of PhD pre-registration comprising structured course work through which the students will benefit from training in generic skills that would increase their employability such as training in research methodology, research design, research ethics and integrity, research management as well as in scientific writing skills. Before the end of that year, they should have written a research proposal that they would have to defend to be granted permission to proceed with their full registration. Once the research proposal is accepted full-time students can spend 3 additional years for their PhD research and learn to master skills specific to the field they engage in with their supervisor/supervisors. Students with the required academic ability, dedication and passion for scholarship are less likely to drop out if they have acquired the self-confidence through the initial coursework and after they have successfully defended their research proposal. A more structured phase of qualification for a doctoral degree is meant to reduce dropout rates and provide more efficiency (Kehm, 2007).

   The UoM doctoral school would be ideally suited for providing coordination of the structured course work and facilities for preparation and submission of research proposals by the doctoral candidates.
2. Instead of the traditional thesis-only model, the PhD by publication (Badley, 2009) could be an interesting alternative model of doctoral

assessment to adopt as it would encourage students to learn to write for publications in reputable scholarly journals in their areas of expertise. It can consist, for example, of refereed publications that bear on the literature review, on the methods that are appropriate for the doctoral research, and on results of qualitative or quantitative research. Students then write an overarching manuscript with an introduction, and an interpretation of the findings from the three publications and conclusions from the PhD research (Smaldone et al., 2019). There would be a need for an online viva as our small island is thousands of kilometres away from the universities of our external assessors. Since the advent of Covid-19 and the attendant difficulties experienced by higher education institutions throughout the first two years of the pandemic (Salmi, 2020), flexibility in assessment with use of digital communication has become widespread.

The PhD by publication could prove to be beneficial for the UoM in the medium to long term as an increase in the production of peer-reviewed papers, which was described as low (Bunting et al., 2017, p. 41), may contribute to enhanced ranking of the academic institution.

Prior to publications, a memorandum of understanding (MoU) should be set up between supervisee and supervisor(s) to establish a basis for a productive working relationship. The document should specify details on management of the project (meetings and communication, timelines and progress reports, submission of work to supervisor, feedback and revision, expected outputs (articles), expectations around intellectual property (expectations regarding authorship, ownership of data), expectations regarding skills and knowledge, expectations regarding funding, work, ground rules and regulations, mechanisms for dealing with disputes, managing co-supervision. Since an MoU is not legally binding, there would be no consequences if it is not respected by any one party. However, such a document that makes objectives and expectations of all parties very clear could help in preventing potential future disputes from occurring.

3. The team co-supervision model in the traditional apprenticeship model of PhD by thesis or in new PhD models. Since there are sometimes only a few PhD holders capable of supervision in some departments, in the proposed structured (1+3) PhD programme, having supervising committees (including PhD graduates with a variable mix of experience regarding doctoral supervision) in the 'Poles of Excellence' recently created at UoM could be possible. The latter group of academic researchers who apply for research grants to carry out multidisciplinary research and who are ready to provide research projects to doctoral students. This can promote the

inclusion of the doctoral students as early researchers in a community of scholars, provided that constructive feedback is provided by co-supervisors to students, it would also promote enculturation of doctoral students in their discipline. Apprenticeship with several faculty members (thesis committee) would stimulate the development of new ideas and intellectual risk taking would be encouraged through such intellectual communities (Walker et al., 2008, p. 11).

4. The professional doctorate in the Faculty of Engineering, with possibilities of submitting a portfolio instead of the traditional single, lengthy but narrowly focused doctoral dissertation. The portfolio could consist of a collection of shorter research reports, held together by a linking paper that helps to articulate the thesis. Some authors argue that the portfolio is appropriate for the professional doctorate which focuses on improvement in the professional workplace, and that the key issues to be considered are coherence and significance (Maxwell & Kupczyk-Romanczuk, 2009).
5. The practice-based doctorate based on a supervised research project in the performing arts, would be appropriate in the Faculty of Social Sciences and Humanities where students may be called upon to produce a work in creative arts or multimedia works. They could submit a portfolio of their creative works together with a thesis showing their ability "to contextualise that knowledge or performance so as to demonstrate to peers how it contributes to the development of the subject in its content, its methods and/or its means of communication" (UKCGE, 1997, p. 27).

6. Training in doctoral supervision could be provided by the UoM Doctoral School

As doctoral supervision is viewed as a specific and specialized type of professional work, it is very important to provide professional development for doctoral supervisors, as this would lead to improvements in the quality of doctoral education in an international and competitive higher education sector (Halse & Malfroy, 2009) and it could lead to lower attrition rates (Lee, 2008). Powell and Green (2007, p. 253) view doctoral supervision as an "act of pedagogy, not of research", as doctoral students are learning "about how to do research".

7. What is considered good supervision practice?

Supervisors should learn to accompany students on their doctoral journeys and adapt their supervisory style with the phase of the doctoral journey (Gatfield,

2005). Supervision style usually starts with a 'laissez-faire' approach, when the student is extensively reading literature to identify a research topic, then a 'directorial' style is used when the student needs to consider research design and methods, followed by a 'contractual' supervisory style. 'Pastoral' style is needed whenever the student needs compassionate support.

Research supervision pedagogy is different from that of teaching undergraduates because the doctoral student is expected to reach a level of knowledge mastery superior to that of their supervisor (Wisker, 2005). At the beginning of the research, at the time of reading the literature before and while writing the research proposal, good supervisors should encourage students to construct a reading map to create links between themes derived from interpretation of scientific information read on the research subject. This way they should be better able to identify concordant and discordant information as well as identify current gaps in information they could work on as research topics. Good supervisors should insist that students write throughout their doctoral journey as the learning only happens when they write (Thomas, 2016).

Students should be provided with enough support and compassionate rigour in a research environment to liberate them from the supervisory relationship, ultimately, and facilitate their development as early researchers in their own right. Mutual trust and a non-threatening relationship lead to better student satisfaction than hierarchical relationships (Van Rooij et al., 2019).

More workshops in basic bibliometrics for all students and emerging scholars are needed (Mouton & Valentine, 2017). Students should also be appraised of the principles and responsibilities summarised in the Singapore Statement on Research Integrity (SSRI) that are intended to promote integrity in research and responsible research practice. The SSRI was developed at the 2nd World Conference on Research Integrity held in Singapore and was released for global use on 22 September 2010 to guide the responsible conduct of research.

Supervisors should have research knowledge and related skills, as well as management and interpersonal skills. They need to have multiple qualities as managers: innovative, problem solver, resource-oriented, work-focused, technical expert, decisive and dependable and a reflective learner who integrates all the other qualities (Vilkinas, 2002). They should give feedback in a timely manner, as effective feedback was identified by students and supervisors as the most important strategy by which students learned to write (Aitchison et al., 2012).

There is a need for well-informed and systematic pedagogies for writing development in all doctoral programmes. Written feedback helps in the development of doctoral students' academic competencies (Carter & Kumar, 2017).

Supervisors should take care to include diversity in their comments when providing feedback on students' writing (Hyatt, 2005): they should include positive comments in their feedback so as to foster a good academic and social relationship with the students, developmental comments to help students with subsequent work, structural comments, stylistic comments, content related comments (with positive, negative evaluations or non-evaluative summaries of aspects of the written material), methodological comments (on the approach, procedures, and process in conduct of the research).

7.1 UoM should endeavour to be involved in the Consortium for Advanced Research Training in Africa

The Consortium for Advanced Research Training in Africa (CARTA)'s goal is to increase the use of inter-institutional collaboration in order to build research capacity of doctoral students and to strengthen university systems to lead and conduct research on critical areas around public and population health in the African region.

Northern collaborating partner institutions provide expertise to CARTA fellows and supervisors, organise workshops for practical training on grant writing, grant management, etc. Southern collaborators provide an online teaching platform to improve on the writing skills of the African academy. We believe that UoM would greatly benefit if it became a member of this consortium.

8. Conclusion

The University of Mauritius currently offers the MPhil/PhD by research which is assessed through submission of a doctoral thesis a few years after a successful upgrading report submitted at the end of the MPhil study. The low doctoral output observed over the last 2 decades seems to be due to low doctoral enrolment, and not so much on a high attrition rate (4%). To increase doctoral output, other types of PhD models developed elsewhere in the world should be considered to attract potential students. Assessment should be diversified by allowing the traditional PhD by thesis, the PhD by publication and the submission of a portfolio for professional doctorates or practice-based doctorate in creative arts.

Instead of requesting all doctoral applicants to register for MPhil/PhD by research through submission of a research proposal without having benefitted from any prior training in generic skills, they should be provided structured training in their first year as PhD pre-registration trainees by the doctoral school to enhance their research skills. They would afterwards embark on

their individual doctoral journeys in their specific disciplines to make an original contribution to their field of study through their research projects. The doctoral school should also coordinate supervisory training for prospective PhD supervisors.

Moreover, there is a need for the development of doctoral standards and guidelines for the harmonization of doctoral education at a national level, given that PhD graduates enjoy the same privileges irrespective of the length and difficulty of their doctoral journeys at the different public higher education institutions.

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