

1. DEVELOPMENT OF PROFESSIONAL DOCTORATES IN IRELAND AND ELSEWHERE

Graduate education is a rapidly expanding feature of higher education in Ireland, particularly following the recommendation in the 2004 OECD review¹ that Ireland double its doctoral graduate output. Traditionally, graduate education in Ireland and internationally was designed to explore and advance the limits of knowledge and in this way it contributes greatly to the overall mission of the university². At its highest level, doctoral education relates to the discovery and development of new knowledge and skills through original research, or original application of existing knowledge, and the delivery of findings at the frontiers of knowledge and application that are of publishable standard in peer-reviewed literature, or by equivalent peer review through performance, exhibition or patent. The National Qualifications Authority of Ireland (NQAI) has determined the standard for doctoral degrees in Ireland, which are set at Level 10 on the National Framework for Qualifications (NFQ) (APPENDIX 1).

According to the Salzburg Principles³ (APPENDIX 2) established under the Bologna Accord⁴ in 2005, graduate education should not only equip doctoral students with a range of world-class research and innovation skills relevant to their discipline area but should also train them in the advanced skills required for employment and in their professional lives. This has led to the development of graduate schools in universities across the European Higher Education Area (EHEA)⁵, including the School of Graduate Studies in CIT in January 2011. Increasingly, many of these graduate schools now offer structured PhD programmes that involve taught modules covering both discipline-based and professional skills (APPENDIX 3), a personal development plan and the support structure of a Graduate Supervisory Panel, whilst retaining the individual research project as the principal focus of PhD education. A Framework for the Structured PhD embracing all these elements was adopted by the CIT Academic Council in 2011.

The development of a structured approach towards doctoral education aligns with the Irish government's Strategy for Science, Technology and Innovation 2006-2013 (SSTI) for the growth of a strong fourth-level sector⁶ which can serve the needs of society by promoting and fostering a sustainable knowledge economy⁷. Key elements of the SSTI strategy relevant to the development of a new approach towards doctoral education are:

- To increase doctoral graduations from 730 in 2005 to 1,312 in 2013 encompassing Science and Engineering and the Arts, Humanities and Social Sciences, in line with the EU's Lisbon Agenda for making Europe more competitive and innovative;
- To revamp doctoral education through development of structured doctoral programmes;
- To achieve scientific excellence, improved competitiveness and innovation through cooperation between researchers and industry;
- To shift the emphasis in doctoral education towards careers outside of academia.

¹ *Review of Higher Education in Ireland*, OECD (2004)

² *Organisation and Administration of Graduate Education*, Council of Graduate Schools, Washington DC (2004)

³ *Doctoral Programmes for the European Knowledge Society*, Salzburg (2005), see Appendix 1 and http://www.eua.be/eua/jsp/en/upload/Salzburg_Report_final.1129817011146.pdf

⁴ *Bologna Process*, see <http://www.ond.vlaanderen.be/hogeronderwijs/bologna/>

⁵ *Salzburg II Recommendations, Executive Summary*, European University Association, (2010)

⁶ *Strategy for Science, Technology and Innovation 2006-2013*, Government of Ireland, (2006)

⁷ *STI – Delivering the Smart Economy*, Government of Ireland, (2009)

The “National Strategy for Higher Education to 2030” Hunt Report (2011)⁸ states that demand for doctoral graduates in the private sector is increasing and that meeting this demand has had the desired catalytic effect on the ability and willingness of diverse sectors of the economy to conduct research and development. A Forfas report on “Business and Expenditure on Research & Development 2007-2008”⁹ confirms that the number of doctoral graduates working in a research and development capacity in the private sector almost trebled between 2001 and 2007, from 420 to 1,191. Building on the Hunt Report, the Higher Education Authority (HEA) document “Towards a Future Higher Education Landscape” (February, 2012)¹⁰ states that “*Considerable progress has been made in expanding the provision of research degrees at Levels 9 (Masters) and 10 (PhD)*. The document then goes on to state that “*PhD provision is but one element of Level 10 education and training and a growth in alternate means of Level 10 provision such as industrial/ professional doctorates is expected to be reflected in the missions of some (HE) institutions*”.

The HEA viewpoint aligns with the EHEA’s definition of research in its Framework for Qualifications where, “*the word “research” is used to cover a wide variety of activities, with the context often related to a field of study. The term is used to represent a careful study or investigation based on a systematic understanding and critical awareness of knowledge. The word is used in an inclusive way to accommodate the range of activities that support original and innovative work in the whole range of academic, professional and technological fields....*”¹¹. The term research therefore includes basic and applied research, scholarship, creative work, performance, composition and related activities.

Accordingly, another route to achieving the aims of the Salzburg charter that is in line with the HEA statement above, and one that is especially suitable for those currently employed in enterprise is to provide graduates with the opportunity to achieve postgraduate research-focussed qualifications up to doctoral level based on the practice of research in the work domain, leading to the award of professional doctorate (DProf). In the DProf programme of advanced study, the research will usually be practice-led, which pushes research well beyond traditional academia and so should have a direct effect on organisational policy and change, as well as improving personal practice¹². The DProf is a highly-structured research-based award that supports the acquisition and embedding of generic and practice-based skills, relevant to the perceived needs of the professional conducting research in their work-domain¹³. According to a recent UKCGE survey of HEI, professional doctorates “*are typically taken in the part-time mode by middle-ranking professionals sponsored by their employer and devised to assist in up-skilling and transferring research capability direct into industry and professional practice*”¹⁴, i.e. there are clear advantages both for the individual through attaining the qualification and for the employer through enhancing research capability.

⁸ *National Strategy for Higher Education to 2030*, Government of Ireland (2011)

⁹ *Business and Expenditure on Research & Development 2007-2008*, CSO-Forfas (2008)

¹⁰ *Towards a Future Higher Education Landscape*, HEA (2012)

¹¹ *Framework for Qualifications of the European Higher Education Area*, page 68, (2005), http://www.bologna-bergen2005.no/Docs/00-Main_doc/050218_QF_EHEA.pdf

¹² *Doctoral Degree Characteristics*, QAA (UK) (September, 2011)

¹³ *Professional Doctorates in the UK*, T. Fell, K. Flint and I. Haines , UKCGE (2011)

¹⁴ *UKCGE Newsletter*, Issue 64, (May, 2012)

According to HETAC's Research Degree Programme Policy and Criteria¹⁵, the professional doctorate must meet the same core standard as the PhD, by requiring the student to generate significant peer-reviewed outputs from their research, such as publications, patents, standards of practice etc., or alternatively outcomes that will have a comparable peer-recognised impact on their profession. In terms of the balance of time allocated to taught elements relative to the research project, compared to the traditional PhD the professional doctorate is similar to the structured PhD in its higher level of taught content.

At a political level, this professional doctorate approach supports the European Union's Lisbon and Horizon 2020 Strategy of making the EU the most competitive and dynamic knowledge-based economy in the world¹⁶: according to Salzburg II, *"The knowledge society requires the creativity and flexibility of the research mind-set for a number of different functions and careers, also beyond those directly related to research. The doctorate has increasingly achieved recognition as a key part of this process"*¹⁷.

In an Irish context, the Hunt Report floated the concept of the technological university for amalgamations of existing institutes of technology that meet internationally-benchmarked university-level criteria. In relation to doctoral provision, the subsequent draft criteria for designation of technological university (TU) status in the HEA's Marginson Report (May, 2011)¹⁸ specifically advocates *"the development of a distinctive model of TU PhD, within the framework of the national approach to structured PhD programmes. This model would emphasise research applications, knowledge transfer and relations with enterprises, including as appropriate, jointly supervised TU/industry PhDs and nested doctoral training in enterprise settings. These would not preclude orthodox forms of PhD in the TUs but in the main orientations would be to enterprises and to innovation-related networks in Ireland and abroad"*. The consolidated criteria for TU designation published by the HEA (February 2012)¹⁹ reiterates the *"methodical approach to the formation of Level 10 knowledge, skills and competences that are appropriate to the institution's research mission and meet national PhD level standards. This will be through the integration of practice-led, professional and industrial doctorate structures, alongside more traditional PI (principal investigator) –led approaches, all within the context of national policy for structured PhD provision"*.

There is a clear case that the professional doctorate supports the type of Level 10 provision advocated by the HEA for institutions seeking technological university status. This is specifically relevant to Cork Institute of Technology's declared objective in January 2012²⁰ to seek re-designation as the Munster Technological University, jointly with Limerick Institute of Technology and the Institute of Technology, Tralee and the recently signed Memorandum of Understanding between the three institutions to *"pursue a process of consolidation which will put in place the necessary conditions, in accordance with HEA's published process and criteria, for the establishment of a single institution which will be designated as the Munster Technological University (MTU)"*²¹.

¹⁵ *Research Degree Programme Policy and Criteria*, HETAC (October, 2010)

¹⁶ *Europe 2020*, see http://ec.europa.eu/europe2020/index_en.htm

¹⁷ *Salzburg II Recommendations, page 1*, European University Association, (2010)

¹⁸ *Criteria for Technological University Designation*, S. Marginson, HEA (2011)

¹⁹ *Process and Criteria for Designation as a Technological University*, HEA (2012)

²⁰ *Proposal to Establish the Munster Technological University*, Statement by the Presidents and Chairs of Governing Bodies of Cork Institute of Technology, Institute of Technology, Tralee and Limerick Institute of Technology (January, 2012)

²¹ *Update on Munster Technological University*, Communication by the President of CIT (May, 2012)

2. DEVELOPMENT OF PROFESSIONAL DOCTORATES IN CIT

The Roadmap for Employer-Academic Partnership (REAP), a Strategic Innovation Funded (SIF) project of which CIT is the lead partner, has identified as part of its Professional Postgraduate Pathways strand 24 existing professional postgraduate programmes available in Ireland²². Such programmes are well established in the UK and the US, with awards in the Social Sciences, Engineering, Education and Medicine being especially well regarded by employers²³.

The proposed Professional Doctorate framework for CIT is essentially a research programme individually tailored to each work-based student's requirements, although there may also be instances where a cohort approach is appropriate. The purpose of these DProfs is to prepare graduates for leadership roles in an area of specialised practice in either the professions or other applied fields. There are certain core principles to the proposed CIT Professional Doctorate programme, as follows:

1. The Professional Doctorate award signifies a doctoral level of achievement, judged by the same Level 10 descriptors as the PhD and constitutes an original contribution to knowledge in a professional setting;
2. The Professional Doctorate is distinguished from a PhD by a title that refers to a particular profession or a professional area of work. As per HETAC criteria, CIT will designate these awards Doctor of (Professional Discipline), e.g. Doctor of Education, Doctor of Business Administration;
3. The Professional Doctorate comprises an individual journey of directed study designed to achieve specific educational outcomes and a substantial programme of original research. The path of progress of each individual is unique, in terms of the research project as well as in terms of the individual professional development. The taught modules support the individual professional development of the doctoral candidate rather than being central to the meaning of the structure;
4. The Professional Doctorate is organised systematically in terms of length and structure of programme, supervision, support, and assessment; such structures should facilitate the institution in providing support for individual development, but must not produce uniformity or predictability;
5. The Professional Doctorate is a research degree. The research element is based on work domain based problems and takes place in whole or in part in the workplace. It may comprise one or more linked projects which may include a component concerned with professional competencies. Because of its professional nature the various components are intrinsically linked and are likely to be of a trans-disciplinary nature;
6. The outputs of the Professional Doctorate include training in research methods, the generation of new knowledge or original applications of existing knowledge, a contribution to practice and the presentation of primary research in the form of a thesis or portfolio submitted for oral examination. The results of the research must be shown to be implementable in the work place and/or have an impact on practice in the profession;
7. The Professional Doctorate is subject to the same quality systems and processes as other research degrees and CIT's *Regulations for Postgraduate Research Study* apply. Due to the work domain based nature of the research, specific programme regulations and programme specifications may be required for Professional Doctorate programmes. The CIT framework for the Structured PhD is most closely aligned to the Professional Doctorate.

²² *Professional Doctoral Education in Ireland: Launching the Debate*, J. Buckley and L. El Amoud, REAP (2010)

²³ *Professional Doctorates in the UK*, T. Fell, K. Flint and I. Haines, UKCGE (2011)

3. PROPOSAL for a PROFESSIONAL DOCTORATE PROGRAMME in CIT

It is proposed that the following model for the Professional Doctorate (DProf) be formally adopted by CIT through the Academic Council. Many of the elements of the proposed structure are already approved through CIT's "Regulations for Postgraduate Research Study" (2012)²⁴. The structure also aligns with the HEA model developed by the Network of University Deans of Graduate Studies and endorsed in the Hunt Report²⁵. The specific organisational elements proposed for the DProf are as follows:

- Postgraduate Research Studies Board (PRB)
The PRB advises the Dean of Graduate Studies and, through the Dean, the Registrar and Vice-President for Academic Affairs:
 - On policies and procedures for the admission and registration of postgraduate students by the Institute;
 - On guidelines for the supervision and monitoring of the progress of postgraduate students, including transfer to the professional doctorate register;
 - On examinations, including the overall format and layout of final theses to be submitted by postgraduate students of the Institute;
 - And supports the Dean, as required, in reviewing applications, progression, transfers and examination arrangements for postgraduate students.

- Departmental Research Studies Committee (DRSC):
Each Department carrying out research is required to operate a Departmental Research Studies Committee (DRSC) or, where more appropriate, participate in such a committee at School or Faculty/College level.
 - Such committees should be made up of all relevant staff who are research supervisors or are research-active, and student representatives. Committee meetings should be held at least twice per year. The Head of Department is an ex-officio member.
 - The DRSC has a pivotal role in monitoring the Department's performance with regard to its research-related responsibilities and in assisting the Head of Department on:
 - monitoring the research environment within the Department, and advising the Head of Department on noteworthy developments;
 - monitoring governance and quality assurance in accordance with CIT postgraduate regulations, including compliance with the CIT Code of Good Practice in Research;
 - advising on curriculum and module development;
 - organising departmental research seminars at least twice a year, coinciding with the 6-monthly progress review process, at which all research students within the Department present their research for discussion and peer review;
 - advising on the requirements for supervisor training;
 - publicity and documentation such as the programme prospectus;
 - specifically in relation to each student, the DRSC has responsibility for advising the Head of Department on:
 - admissions, transfers and progression;
 - appointment of Graduate Supervisory Panel (GSP);

²⁴ *Regulations for Postgraduate Research Study*, CIT (April, 2012)

²⁵ *PhD Graduates Skills*, Irish Universities Association (2010), see http://www.4thlevelireland.ie/publications/Graduate_Skills_Statement.pdf,

- induction programme;
 - personal development plans (PDP), including agreement on mandatory modules, maintenance of student log and progression milestones;
 - approving the research proposal either by delegation to appropriate external experts or directly; in such cases, the proposed supervisor must not be a party to the decision reached by the Committee;
- Doctoral Programme Panel (DPP):
- The Head of Department, acting on the advice of the DRSC, may establish a Doctoral Programme Panel (DPP) to manage the operation and delivery of a specific DProf programme, for example one delivered on a cohort basis or aimed at a particular profession.
- Membership comprises relevant staff who are, for example, research supervisors or are research-active, student representatives, and external members who may be associated with the programme e.g. representatives from another institution involved in module delivery or with students on the programme.
 - Responsible for advising the Head of Department on the execution of:
 - Governance and quality assurance in accordance with CIT postgraduate regulations;
 - Curriculum and module development;
 - Oversight of supervisor training
 - Admissions
 - Student Induction programme
 - Personal development plans, including agreement on mandatory modules, progression milestones and research proposal
 - Appointment of Graduate Supervisory Panel;
 - Monitoring and reporting of student progression to PRB (and other relevant bodies), especially at the transfer stage (12-15 months)
 - Publicity and documentation such as the programme prospectus.
 - The DPP reports *inter-alia* to the relevant Heads of Department and DRSC.
- Graduate Supervisory Panel (GSP)
- A GSP is appointed for each professional doctorate candidate;
 - It comprises the main supervisor, second supervisor, workplace-based mentor, independent chairperson from the DPP and another senior academic who will assume an advisor role.
 - The supervisors shall collectively have Level 10 competence and expertise in the field(s) of research, but may propose calling upon practice-based consultants in areas of particular technical expertise, where required. The reports of any such consultants will be presented to the GSP by the main supervisor.
 - The mentor is the senior member of the company employing the student (or their relevant professional body) who offers support and guidance to the student with regard to their doctoral studies within the organisation. The DPP proposes the choice of mentor;
 - The GSP supports and enhances the supervisor-student relationship, monitors student progress on a twice-yearly basis, provides advice and support both to the student and their supervisor(s), and assists at the thesis preparation and writing stages.
 - It reports to the relevant DRSC/DPP.

4. PROFESSIONAL DOCTORATE PROGRAMME STRUCTURE

The Role of Credits in Doctoral Programmes: In applying the European Credit Transfer System (ECTS) at the doctoral cycle, the proposed structure aligns with the Salzburg II recommendations which state that *credits do not make sense when measuring the research component or its associated dissemination outputs*²⁶. However, the Recommendations do see merit in applying credits to the taught modules, to support the recognition of learning and transfer of credit within joint doctoral programmes or other instances where individual candidates may be in a position to accumulate such credits through a variety of different routes, particularly through the application of recognition of prior experiential learning. Accordingly, under the structure proposed for the CIT Professional Doctorate, ECTS credits apply to the taught modules only.

The main features of the CIT professional doctorate are as follows:

- Duration: The normal duration is four years following registration

- Application Stage: Preparation and agreement of the DPP for
 - Personal development plan: Acting on the advice of the Dean of Graduate Studies, the relevant Head of Department is to appoint an academic advisor to work with the applicant in the preparation of the personal development plan;
 - Research Proposal:
 - “The core component of doctoral training is the advancement of knowledge through original research” (Salzburg Principles – APPENDIX 2);
 - The research proposal for the DProf may comprise a portfolio of Level 10 tasks, rather than the monolithic research proposal of the standard PhD. Accordingly, the proposal will be subject to annual review and amendment.
 - Requires the approval of the Dean of Graduate Studies prior to admission to the doctoral register;
 - Recognition of Prior Learning (RPL): The Institute’s policy and procedures for RPL may be applied (a) in establishing eligibility for admission and (b) in awarding credit²⁷.

- Admission, Transfer and Progression:
 - Dean of Graduate Studies is responsible for approving entry to the doctoral register, based on submission of a suitable research proposal;

²⁶ *Salzburg II Recommendations, paragraph 2.6*, European University Association, (2010)

²⁷ As the Institute’s RPL policy extends to the granting of credits only, it is not readily applicable to elements of programmes that are not assigned credits, such as the research component of level 10 degrees. Pending review of the Institute’s RPL policy for level 10 programmes, it is proposed that an applicant’s recent work may be considered for RPL as a contribution to the research element of the DProf, as follows: The Graduate Supervisory Panel, working with the applicant, will determine if this work is at a level appropriate to the DProf, how much extra work is needed for it to meet the research requirements of the DProf, and how much of a contribution it can make to the final thesis, for decision by the Dean of Graduate Studies on advice, as necessary, from the PRB. In all cases, such work cannot make a contribution greater than 50% towards the final thesis and a minimum supervised research engagement of two years is required before a thesis can be submitted.

- Students enrolling on a DProf will be registered as DProf students from the outset, with the possibility of a transfer to Masters or other cognate programme if they do not reach the appropriate doctoral level or wish to transfer.
 - Progression: DProf students will be assessed by the DPP after 12-15 months (about 4 semesters) for progression on the doctoral track;
 - Student Log: Students required to maintain a log of work undertaken and completed, signed off by supervisor;
 - The GSP may propose variations to the student's personal development plan as deemed necessary; in particular, the research proposal is subject to annual review and amendment.
- Induction: ½ day
 - CIT facilities;
 - Postgraduate regulations;
 - Use of electronic portfolio etc.
 - Taught Modules (APPENDIX 3)
 - A minimum of 30 and maximum of 90 ECTS credits contribute to the DProf;
 - Modules are to be proposed by the DRSC/DPP for approval, including any modules or elements that are proposed for recognition of prior learning (RPL);
 - Relevant transferrable skills and discipline-specific modules are eligible;
 - It is anticipated that taught modules will be front-loaded to an extent, but with sufficient research project "credits" to facilitate transfer to a Masters register where necessary
 - The student will be required to pass the mandatory taught modules.
 - Examination: The DProf is examined by means of an oral examination, in line with CIT Regulations. The nature and format of the thesis is in accordance with CIT postgraduate regulations.
 - Diploma Supplement: The award of DProf will include a Diploma Supplement setting out the total achievement of the doctoral graduate.
 - Supervisor/Mentor Registration and Training:
 - A register of supervisors and mentors will be maintained by the School of Graduate Studies;
 - Supervisory training on DProf programmes will be mandatory;
 - Training will be practical rather than pedagogical.

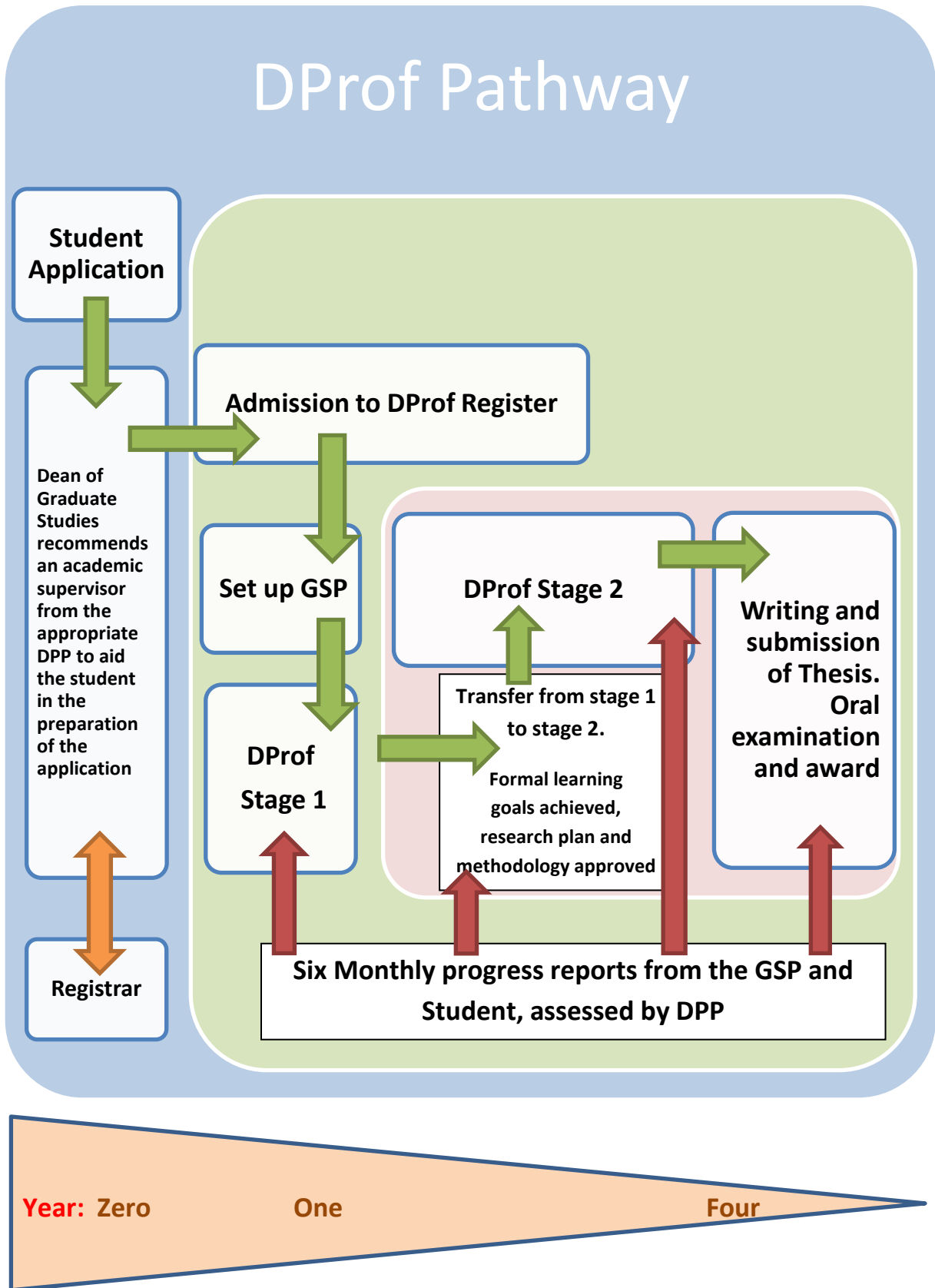
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Dr Eamonn Cashell
Dean of Graduate Studies

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APPENDIX I
NQAI Standard of Doctoral Degree

Title	Doctor of Philosophy (PhD) or Doctor of [Professional Discipline] (DProf) Degree
Purpose	This is a multi-purpose award-type. The knowledge, skill and competence acquired are relevant to personal development, participation in society and community, employment, and access to additional education and training.
Level	10
Volume	Large
Knowledge - breadth	A systematic acquisition and understanding of a substantial body of knowledge which is at the forefront of a field of learning
Knowledge - kind	The creation and interpretation of new knowledge, through original research, or other advanced scholarship, of a quality to satisfy review by peers
Know-how and skill - range	Demonstrate a significant range of the principal skills, techniques, tools, practices and/or materials which are associated with a field of learning; develop new skills, techniques, tools, practices and/or materials
Know-how and skill - selectivity	Respond to abstract problems that expand and redefine existing procedural knowledge
Competence - context	Exercise personal responsibility and largely autonomous initiative in complex and unpredictable situations, in professional or equivalent contexts
Competence - role	Communicate results of research and innovation to peers; engage in critical dialogue; lead and originate complex social processes
Competence – learning to learn	Learn to critique the broader implications of applying knowledge to particular contexts
Competence - insight	Scrutinise and reflect on social norms and relationships and lead action to change them

APPENDIX 2

The Salzburg Principles for Doctoral Education (2005)

1. The Core Component of doctoral training is the advancement of knowledge through original research. At the same time it is recognised that doctoral training must increasingly meet the needs of an employment market that is wider than academia.
2. Embedding in institutional strategies and policies: universities as institutions need to assume responsibility for ensuring that the doctoral programmes and research training they offer are designed to meet new challenges and include appropriate professional career development opportunities.
3. The importance of diversity: the rich diversity of doctoral programmes in Europe – including joint doctorates – is a strength which has to be underpinned by quality and sound practice.
4. Doctoral candidates as early stage researchers: should be recognised as professionals – with commensurate rights - who make a key contribution to the creation of new knowledge.
5. The crucial role of supervision and assessment: in respect of individual doctoral candidates, arrangements for supervision and assessment should be based on a transparent contractual framework of shared responsibilities between doctoral candidates, supervisors and the institution (and where appropriate including other partners).
6. Achieving critical mass: Doctoral programmes should seek to achieve critical mass and should draw on different types of innovative practice being introduced in universities across Europe, bearing in mind that different solutions may be appropriate to different contexts and in particular across larger and smaller European countries. These range from graduate schools in major universities to international, national and regional collaboration between universities.
7. Duration: doctoral programmes should operate within appropriate time duration (three to four years full-time as a rule).
8. The promotion of innovative structures: to meet the challenge of interdisciplinary training and the development of transferable skills.
9. Increasing mobility: Doctoral programmes should seek to offer geographical as well as interdisciplinary and inter-sectoral mobility and international collaboration within an integrated framework of cooperation between universities and other partners.
10. Ensuring appropriate funding: the development of quality doctoral programmes and the successful completion by doctoral candidates requires appropriate and sustainable funding.

The Salzburg II Recommendations (2010)

1. Doctoral education has a particular place in the European Research Area and the European Higher Education Area. It rests on the practice of research, which makes it fundamentally different from the Bologna first and second cycles;
2. Doctoral candidates must be allowed independence and flexibility to grow and develop. Doctoral education is highly individual and by definition original. The path of progress of the individual is unique, in terms of the research project as well as in terms of the individual's professional development;
3. Doctoral education must be developed by autonomous and accountable institutions taking responsibility to cultivate the research mind-set. Institutions need flexible regulation to create special structures and instruments and continue advancing European doctoral education.

APPENDIX 3

PROFESSIONAL/MANAGEMENT AND DISCIPLINE SKILLS MODULES

- Current CIT Modules: These modules are currently available to all postgraduate students. However, they are not yet accredited and are not mandatory.
 - Time and Project Management
 - Research Methodology
 - Research Ethics
 - Presentation Skills
 - Statistical Data Analysis
- Research Alliance: The modules above plus discipline skills modules such as:
 - Analytical Techniques
 - Engineering Design
 - Computer Applications
 - ICT
- NAIRTIL Research Supervision Modules:
 - Project Management
 - Intellectual Property
 - Commercialisation
 - Entrepreneurship
- ED4LIFE Modules:
 - Research Skills and Techniques
 - Research Environment
 - Research Management
 - Personal Effectiveness
 - Communication Skills
 - Career Management
 - Teaching and Learning for Graduate Students
 - Commercialisation Skills for Research
 - Science in Society
 - Health and Safety
 - Teamwork and Leadership
 - Effective Research Supervision
- Other Suggested Modules:
 - Creativity
 - Stress management.
 - Entrepreneurship
 - Outreach and Communication

