1. DEVELOPMENT OF THE STRUCTURED PhD IN IRELAND AND ELSEWHERE

Traditionally, graduate education was designed to explore and advance the limits of knowledge and in this way it contributes greatly to the overall mission of the university[1]. However, according to the Salzburg Principles[2] (Appendix 1) agreed under the Bologna Accord[3] in 2005 for the European Higher Education Area (EHEA),   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.   This charter for what has effectively developed into the structured PhD approach is intended to provide doctoral graduates with a range of career options extending well beyond traditional academia.   At the political level, the structured approach supports the European Union's Lisbon and Europe 2020 Strategy of making the EU the most competitive and dynamic knowledge-based economy in the world[4]. Looking further afield, a recent US report by senior industrialists and academics that is setting the agenda for the future of graduate education in the US, has affirmed that 'the ultimate product of graduate education is a knowledgeable, productive, and innovative worker'.[5]   A comparison between the structured PhD and the traditional "apprentice" model is presented in Appendix 2.

In Ireland, graduate education is a rapidly expanding feature of higher education, particularly following the recommendation in the 2004 OECD review[6] that Ireland double its doctoral graduate output. In particular, 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 sector[7] which can serve the needs of society by promoting and fostering a sustainable knowledge economy[8].   Three key elements of the SSTI strategy relevant to the development of a new approach towards doctoral education were:

- To increase PhD 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 PhD programmes;
- To shift the emphasis in PhD education towards careers outside of academia.

The Advisory Council for Science, Technology & Innovation recommended that structured PhD programmes should both deepen the students' understanding of their discipline and develop in-depth knowledge of research approaches, techniques and methods that are critical to the value of the PhD for

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

2   *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

3   *Bologna Process*, see http://www.ond.vlaanderen.be/hogeronderwijs/bologna/

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

5   *The Path Forward (p. 35),* US Council of Graduate Schools

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

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

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

enterprise[9]. The Network of University Deans of Graduate Studies in Ireland has produced a PhD in Graduate Skills Statement[10] which sets out the attributes that modern PhD graduates should possess in line with the Salzburg Principles (Appendix 3). This statement has been influential in respect of broader European developments in the field of doctoral education, in particular by supporting Irish higher education participation in, and contribution to, European initiatives such as the Marie Curie Initial Training Network (MC-ITN) and the Erasmus-Mundus Joint Doctorate (EMJD) programmes.

The Hunt Report (2011) states that demand for doctoral graduates in the private sector is increasing and 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[11]. For example, doctoral graduates working in a research and development capacity in the private sector almost trebled between 2001 and 2007, from 420 to 1,191[12]. The Report endorses the establishment of the Higher Education Authority (HEA) framework for structured PhD education informed largely by the University Deans model that is being applied consistently across all higher education institutions. In meeting or exceeding the relevant international standards, this framework upholds the reputation of the Irish PhD brand, as advocated by Hunt. Adoption of a common framework also leads to greater consolidation and collaboration among HEI, leading to stronger taught options for students. In addition to the research element, the Hunt Report recommends inclusion of the following components for the structured PhD:

- Formal induction
- Progress monitoring through advisory and supervisory panels
- Placements where appropriate
- Discipline-based modules
- Transferrable skills modules.

According to the Salzburg Principles, the research project must remain the principal focus of the PhD, but all students should be given the opportunity to take a number of high-level academic courses in the discipline relevant to their PhD topic. In addition, appropriate professional skills courses should be offered to all students. A figure of 30 ECTS credits, equivalent to six, 5-credit taught modules was suggested as a non-prescriptive guideline at a recent conference on graduate education in physics and chemistry in Ireland[13]. The submission of a substantial written report, and a viva voce defence, after the first year ("transfer or progression report") provides an opportunity for assessing that some of the professional skills have being attained, as well as research competences.

While many modules can be delivered by staff in the home institution, there is much to be gained by sharing modules between the various schools/departments across Ireland. This is especially the case for specialist modules, where the number of interest students in a particular institution may be small. One approach to effective delivery of such modules which is being used in Scotland is video conferencing. Another is through the organisation of workshops or multi-day summer schools. These allow the participation of invited international experts, as well as local academics or industrialists.

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9 *The Role of PhDs in the Smart Economy*, Advisory Council for Science, Technology & Innovation, Forfas (2009)

10 *PhD Graduates Skills,* Irish Universities Association (2010), see Appendix 2 and
http://www.4thlevelireland.ie/publications/Graduate_Skills_Statement.pdf,

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

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

13 *The Future of Graduate Education in Chemistry and Physics*, Royal Irish Academy (2009)

National initiatives such as the Strategic Innovation Fund (SIF), IRCSET and in particular the HEA-funded Programme for Research in Third Level Institutions (PRTLI) are providing funding for this doctoral education strategy and the move to structured PhDs. To date, CIT has been awarded funding for two PRTLI5 structured PhD programmes, with the first candidates due for enrolment in September 2011:

- ED4LIFE – "Structured PhD Education and Training for Life Sciences", in which CIT is the lead partner, together with UCC and Teagasc – see Appendix 4;
- INSPIRE – "A National Graduate Education Programme in Nanoscience and Nanotechnology", together with a number of HEI and industry partners, including lead partner Tyndall National Institute/UCC[14].

All institutions awarded funding for structured PhDs under PRTLI 5 must agree to the Higher Education Authority (HEA) definition of a PhD, see Appendix 5. CIT's response to that template is included as Appendix 6.

In addition, CIT-CAPPA is one of the lead partners in the European PROPHET consortium of fifteen HEI, research institutions and industrial partners that was recently awarded funding for doctoral (and post-doctoral) fellowships under the European Union's Marie Curie Initial Training Network (ITN) programme[15].

2.   PROPOSAL for a STRUCTURED PhD in CIT

It is proposed that the following model for the structured PhD be formally adopted by CIT through the Academic Council. Many of the elements of the proposed structure are already in place due to commitments CIT was required to enter into under the ED4LIFE proposal, and therefore aligns with the HEA model. The proposed specific organisational elements supporting the structured PhD are as follows (more detail is given in Appendix 4):

- Postgraduate Research Studies Board (PRB)
    o This CIT-wide board approves the research proposal and supervisory arrangements
    o Approves the transfer/progression process;
    o Monitors the progression of each student;
    o Advises on format and layout of theses;
    o Reports to the Registrar and Academic Council through the R&D Committee.

- Doctoral Programme Panel (DPP)
    o Each structured PhD programme is managed through a DPP;
    o Comprises the principle investigators, representatives of the Registrar's Office, Dean of Graduate Studies, student representatives and representatives from external partners;
    o Responsible for execution of:
        ▪ Governance and quality assurance in accordance with CIT postgraduate regulations;
        ▪ Curriculum and module development;
        ▪ Oversight of supervisor training
        ▪ Admissions

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14   See http://www.inspirenana.com/teaching-learning.aspx
15   See http://www.prophet-itn.eu

- 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 PRB and relevant Heads of Department.

- Graduate Supervisory Panel (GSP)
    - GSP is appointed for each doctoral candidate;
    - Comprises the main supervisor, second supervisor, independent chairperson from the DPP and another senior academic;
    - 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.
    - Reports to the relevant DPP

- Prospectus: This document will lay out the main features of the programme structure and content, and the responsibilities of both students and CIT – see Appendix 7 for the draft Ed4Life Prospectus.

The main elements of the structured PhD are as follows (more detail is given in Appendices 4 and 5):

- Duration: 3-years (minimum); 4-years (standard)

- Pre-Admission: Preparation and agreement of DPP for
    - Personal development plan
    - Research Proposal ($\leq$270 credits)
        - "The core component of doctoral training is the advancement of knowledge through original research" (Salzburg Principles)
        - Requires the approval of the Postgraduate Research Studies Board prior to admission to the doctoral register

- Admission, Transfer and Progression:
    - PRB is responsible for approving entry to the doctoral register;
    - Based on submission of a suitable research proposal;
    - Students enrolling on a structured PhD will be registered as PhD students from the outset, with the possibility of a transfer to Masters or other relevant programme if they do not reach the appropriate PhD level or wish to transfer.
    - Progression: PhD students will be assessed by the DPP and PRB 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

- Induction: ½ day

- Taught Modules (<30 credits – 3-year programme; <90 credits – 4-year programme)
  - o A maximum of 30/90 ECTS mandatory credits;
  - o Modules to be approved by the Doctoral Programme Panel
  - o Transferrable skills modules
  - o Discipline modules
  - o 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
  - o The student will be required to pass the mandatory taught modules.

- Examination: The PhD is examined by means of a private *viva voce* examination, in line with CIT Regulations for Postgraduate Research Study[16]. The nature and format of the thesis will be in accordance with CIT regulations.

- Diploma Supplement: The award of PhD will include a Diploma Supplement setting out the total achievement of the doctoral graduate.

- The figure below shows the main elements of the CIT Structured PhD:
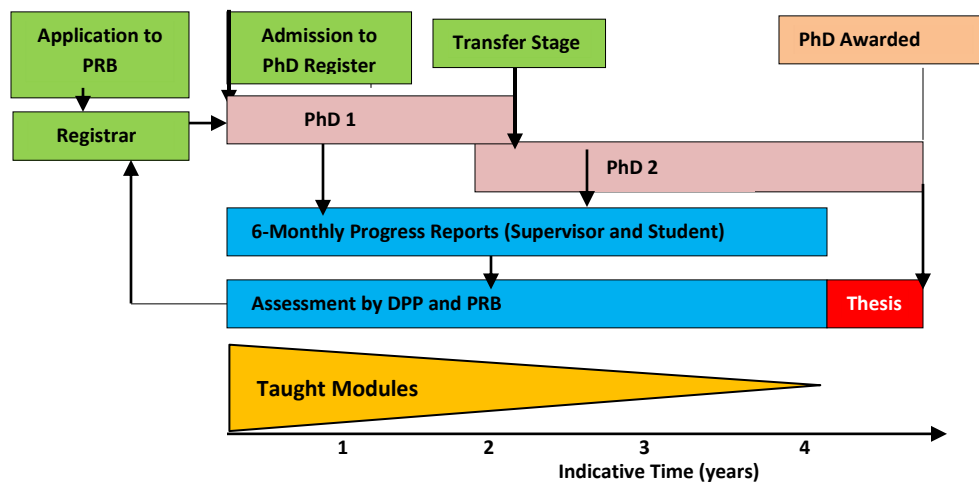
- Supervisor Training: Training of Supervisors was piloted by the CIT Research Office in 2010 using the framework developed by the SIF-funded NAIRTL initiative involving UCC, TCD, NUIG, WIT and CIT[17]. The first one-day workshop was run twice (with a total of 55 staff participants) and the second was run once (with a total of 20 staff participants).

- A register of supervisors will be maintained
  - o Supervisor training on structured PhD programmes will be mandatory
  - o Training will be practical, along the lines of the recently-approved module developed by the NAIRTL partnership, rather than pedagogical.

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[16] *Regulations for Postgraduate Research Study*, CIT (March, 2010)
[17] See http://www.nairtl.ie/index.php?pageID=164

3. FURTHER INFORMATION

The following additional information is included in the appendices:

1. Salzburg Principles
2. An International Comparison between the Traditional and Structured PhD
3. IUA PhD Graduate Skills
4. Ed4Life Structured PhD
5. CIT's Structured PhD Education Statement
6. CIT Compliance with National Definition of Structured PhD Programme
7. Ed4Life Prospectus (Draft)
8. CIT Generic and Transferrable Skills Modules
9. Resources and Funding the Structured PhD
10. A Reprise of Postgraduate Studies in CIT

R&D Committee   April 6th, 2011

APPENDIX I
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 intersectoral 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.

APPENDIX 2

An International Comparison between the Traditional and Structured PhD

An opinion piece by Professor Bernard Morley (Imperial College London) and Professor Chris Park (University of Lancaster)

Most doctoral activities will lie somewhere along a spectrum running from a very traditional PhD, in which the student-supervisor relationship is the most important element, to a fully developed Structured PhD Programme framed by formal procedures and processes. Table 1 summarises the main differences between these two ends of the spectrum.

	Traditional PhD	*Structured PhD Programme*
Mode of study	Individual	Cohort & individual
Named programme	No	Yes, approved, published and promoted
Culture/approach	Traditional, apprenticeship	Contemporary, emphasis on professional development
Taught modules	No	Integral
Programme handbook	No	Yes
Focus of marketing effort	Low	High
Bologna-compliant	Occasionally	Yes
Attractive to international applicants	Increasingly less so	Yes
Admission criteria	Good first degree	Good first degree
Initial registration	Usually a Masters (e.g. MPhil), then upgrade to PhD (e.g. 1 + 2 or more recently incorporating a first stage masters e.g. 1+3)	PhD, 4 year programme
Development of research skills	Supervisor responsible for advice and guidance to the student	Formalised, integrated programme of activities, embedded in experience, compulsory or expected
Development of generic and transferable skills	Usually none, or responsibility of the student	Formalised, integrated programme of activities, embedded in experience, compulsory or expected

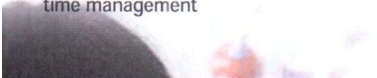|		
Professional development	No, passive, incidental	Integral
Maximum registration period	4 years full-time	4 years full-time
Duration of funding	3 years	4 years
Provision of studentships	Relatively few, high competition	Relatively more, high competition
Supervision	Single supervisor, may be co-supervisors; usually negotiated within the department	Supervisory team, usually confirmed/approved by the institution
Supervisor Training	No	New supervisors required to attend a training workshop – optional workshops available for experienced supervisors
Monitoring supervision	No	Supervision conforms to guidelines laid out by the institution and is monitored by Graduate Dean or Committee from student and Departmental feedback
Progress monitoring	Usually informal, often departmental	Formal, explicit, criteria-based, institutional
Progression decision	Based on advice from supervisor(s)	Formal, criteria-based, approved by Graduate Dean or committee
Transfer/confirmation of PhD registration	On recommendation of supervisor(s)	Formal, criteria-based, evidence-based, limited role of supervisor(s), may include exam and/or viva
Completion time	Relatively long	Relatively short
Completion rates	Relatively low	Relatively high
Complaints procedure	Informal, handled locally	Formal, institutional

APPENDIX 3

IUA PhD Graduate Skills (2010)

The skills identified by the Irish Universities Association's Fourth Level Network of Deans of Graduate Studies as relevant to PhD student education are outlined below. This is not an exhaustive list, and their relevance to students will vary upon experiential learning, disciplinary and professional development needs.

Research skills and awareness

- exhibit knowledge of advances and developments in their field
- demonstrate knowledge of research in related fields and disciplines
- comprehend and effectively employ appropriate research methodologies
- critically analyse and synthesise new and complex information from diverse sources
- formulate and apply solutions to research problems and effectively interpret research results
- exercise critical judgement and thinking to create new ways of understanding
- demonstrate, where appropriate, a knowledge of health and safety procedures and their application in the research environment
- have a broad awareness and knowledge of key relevant funding sources and grant application procedures
- appreciate basic principles of project and time management

Ethics and social understanding

- understand, and apply in their research, principles of ethical conduct of research, including avoidance of plagiarism, allocation of credit and authorship and definitions of research misconduct
- understand the relevance of research in society and the potential impact of research on individuals, groups and society
- where applicable, understand and apply the relevant guidelines for the ethical conduct of research involving people, human tissue and animals

Communication skills

- demonstrate effective writing and publishing skills
- effectively use and decide on appropriate forms and levels of communication
- communicate and explain research to diverse audiences, including both specialist and non-specialist
- teach and support the learning of undergraduate students when involved in teaching and demonstrating

Personal effectiveness/development

- operate in an independent and self-directed manner, showing initiative to accomplish clearly defined goals
- appreciate key rhetorical skills, including how to persuade others of a viewpoint's merits, demonstrating and communicating credible suggestions to achieve one's aims
- appreciate the importance of initiating new projects, proactively reacting to newly identified needs or aiming to resolve persistent problems
- ability to handle difficulties in research or other professional activities in an appropriate way
- critically reflect on experiences and act on such in a cycle of self-improvement

Career management

- demonstrate an awareness of transferable skills and their applicability to both academic and non-academic positions and how they are applied in different circumstances
- take ownership of their own career management, forming credible career plans
- initiate and sustain networks and relationships that may encourage opportunities for employment
- present themselves and their skills, attributes, experiences and qualifications, through effective job applications, CVs and interviews
- understand the broadest possible range of their employment opportunities

Team-working and leadership

- develop and maintain effective relationships with colleagues
- work in a collaborative environment
- awareness of their own working style, that of others, and how they interact
- understand how to acknowledge others' views, with a willingness to reflect on and critically appraise them
- understand leadership in team environments, recognising the strengths of team members and work effectively to achieve mutual goals

Entrepreneurship & innovation

- understand the role of innovation and creativity in research
- demonstrate an awareness and understanding of intellectual property issues, appreciate and, where appropriate, contribute to knowledge exchange
- appreciate the skills required for the development of entrepreneurial enterprises in the public and private sectors
- understand different cultural environments, including the business world, and the contribution that knowledge transfer can make to society

APPENDIX 4
Ed4Life Structured PhD – Revised Implementation Plan (March 18th 2011)

Commentary: This revised implementation plan provides the requested clarity on the roles of the two HEI's involved in Ed4Life, CIT and UCC and the additional significant partner (Teagasc, Moorepark). This is achieved through:

1. Expanded Milestone/Deliverable table (page 14/16).
2. List of preliminary project modules with Institutions responsible for their delivery included alongside each (page 16).
3. Revised Structured PhD template in line with feedback of 1st March 2011.

Principle: Ed4life leverages off the existing academic delivery in CIT, UCC and MFRC. It adheres to the compliance requirements of the HEA in regard to Structured PhD's.

1. **Key Steps Required to establish Ed4Life**
   - Establishment of the Ed4Life **Joint Management Board** (JMB) which will define the terms of reference and reporting structures to each institution's teaching and learning and research committees. The JMB will be drawn from the principal investigators (named in the Phase 2 – Volume 5 documentation and including all three partners), representatives from the Registrar's Office/Dean of Graduate Studies Office in CIT and UCC, existing PhD students and external stakeholders. Membership of the JMB can be augmented as appropriate. The JMB will work with the recently established inter-institutional Joint Academic Standard's Board between CIT and UCC (see next bullet point below). The JMB will:
     a. have overall responsibility for the execution of the three workpackages described in Phase 2 – Volume 5 documentation:
        i. Governance and Quality Assurance;
        ii. Curriculum and Module Development;
        iii. Monitoring and Reporting,
     b. re-examine the suite of modules currently available between the three partner institutions (listed in the Phase 2 – Volume 5 documentation) and determine whether new modules need to be developed and whether the existing modules need to be amended,
     c. agree the suite of modules to be delivered in September/October 2011 (and thereafter),
     d. agree an induction programme,
     e. agree on the credit system for modules,
     f. agree on a system for mentoring new supervisors,
     g. agree on a system for supervisor training,
     h. agree on formal feedback mechanisms to students,
     i. oversee all the quality assurance and marks and standards issues relating to the running of the modules,
     j. oversee admission and entry into the Ed4Life programme,
     k. regularly review the module content in association with all relevant stakeholders including industry,
     l. assess all cases for RPL where exemptions are being sought by learners,
     m. establish the rules for the Personal Development Plan between supervisors and students,
     n. consider and promote interactions with other graduate school programmes in the lifesciences.
   - Notification to the "**Joint Academic Standard's Board**" (JASB) of the establishment of the JMB. On November 1st, 2010, CIT and UCC signed a memorandum establishing a Joint Academic Standards Board. The aim of the high-level Board, as noted at the CIT Academic Council on October 6th 2010, is to "ensure that the academic standards and procedures applying to collaborative and joint programmes delivered in partnership between CIT and UCC satisfy the

requirements of both institutions". This will include *inter alia* managing joint programme validation, review and monitoring. Whilst Ed4Life is not technically a joint programme, it is critical that it operates effectively between the partners. The Ed4Life JMB will report regularly to the JASB.

- Agreement by the **Academic Councils** of both CIT and UCC of the Ed4Life Structured PhD framework.
- Recruitment of the **Curriculum Development Manager** (CDM). In our PRTLI submission we noted that "the expertise to develop and deliver the necessary modules already exists within CIT, UCC and MFRC. What is missing is the co-ordination of the activities." It was thus envisaged in our application that the CDM would play a crucial role and will:
    a. Co-ordinate the existing modules, materials and assessment methodologies to create a suite of generic skills modules and subject specific modules.
    b. Engage with stakeholders, through the JMB and focus group meetings, to develop new modules. These modules will be accredited within the institutions and carry ECTS credits.
    c. Co-ordinate the delivery of the modules in both 'chalk and talk' and e-learning mode. This will allow both full-time, part-time and students in the workplace to avail of the modules.
    d. Address all logistical issues.

2. **Publication of Ed4Life Student Prospectus**
    - A student prospectus which describes the programme structure and objectives will be published to inform the current cohort of PhD students of the advantages of participating in Ed4Life, and to encourage prospective PhD students to select one of the three institutions as their host institution on the basis of the overall quality, coherence and student-centric nature of the research, teaching and networking that are integral to an Ed4Life PhD. The student prospectus will help to brand the Ed4Life delivery.
    - A comprehensive website will be developed with details on modules, how to apply, PIs involved, etc. The website will be cross-linked to relevant CIT, UCC, APC, MFRC websites.

3. **Student Selection, enrolment timeframes in Ed4Life**
    - The JMB will consider matters pertaining to student selection and enrolment on an ongoing basis. Ed4Life students are not directly-funded through the PRTLI programme but the first cohort of Ed4Life students will begin in September/October 2011. Some will be new PhD entrants and many will be already registered on a lifescience PhD programme. The successful selection processes that currently exist in CIT, UCC and MFRC will continue in the startup phase and be augmented as Ed4Life continues.

4. **Initiation of Ed4Life**
    - Ed4Life will begin with a JMB meeting following the letter of issue from the HEA. The first JMB meeting is anticipated in April 2011, with regular meetings thereafter.
    - The process of recruiting the CDM will begin immediately following the letter of issue from the HEA, with an expected start date of no later than 1st March 2011.[18]
    - Agreement will be sought from the relevant Academic Councils on the Ed4Life framework before delivery at the beginning of the 2011/12 academic year.
    - The first delivery of the Ed4Life programme is planned for September 2011.

5. **Student Progression Milestones in Ed4Life**
    - Monitoring of student progression within the PhD process will follow the well-established methodologies in the three institutions, which have already been endorsed by the Academic Councils in CIT and UCC and which already allow for close interactions such as jointly-supervised

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[18] The CDM was recruited on March 10th, 2011.

PhD students and PhDs with a significant industry engagement. Progression milestones are already a required element of all PhD trainees in the lifesciences in CIT, UCC and MFRC.

- The JMB will have responsibility for integrating the taught modules of Ed4Life into the overall structured PhD, and for monitoring student progression. Issues to be considered will include, but are not limited to:
    - i. Ensuring the student completes a Personal Development Plan at the outset to assure clarity on what is required of them and what they can expect from their supervisor/institution/collaborator, etc.
    - ii. Deciding whether modules are assessed on a pass/fail basis and whether progression from one year to another are contingent on passing specified modules;
    - iii. Determining which modules are mandatory and which are elective;
    - iv. The scheduling of the modules.

6. **Conduct of quality review(s) in Ed4Life**
    - The JMB will undertake a quality review on an annual basis to:
        - i. Ensure implementation of procedures directed at improving the quality of PhD education
        - ii. Ensure the quality and relevance of the offered modules
        - iii. Ensure a consistent high quality of PhD graduates from Ed4Life

7. **Conduct of student feedback survey(s) in Ed4Life**
    - The JMB will conduct annual surveys to elicit student feedback in relation to the overall operation of the Ed4Life programme. This will be in addition to the on-going feedback provided by students in their six-monthly reports (CIT registered) or annual reports (UCC registered) which focus on issues relating to their own specific PhD.
    - Under the auspices of the JMB, the CDM may undertake additional student feedback surveys from time to time.
    - Under the auspices of the JMB, the CDM may undertake external stakeholder surveys from time to time.

8. **Enrolment and sustainability plan for beyond 2015 in Ed4Life**
    - The strong track record of the research teams involved in Ed4Life, where current PhD numbers are approximately 75, is a primary indicator of the relevance of, and demand for high-quality PhD education in the lifesciences. Each of the groups involved has demonstrated a capacity to draw funding from a diverse range of sources, ensuring that there is no overreliance on a single funding stream. This will be important given the present and foreseeable exchequer finance situation. Ed4Life will place an increased emphasis on applications for EU and other non-exchequer funding (including from industry), with specific training for supervisors who are inexperienced with these funding mechanisms.
    - A professional Student Prospectus and dedicated Website with links to/from each of the partner institutions will promote awareness and enrolment.
    - Since the modules used within, and developed for, Ed4Life will be agreed upon by the Academic Councils, the same modules can be re-used in other graduate programmes. By corollary, the CDM will make recommendations regarding modules that may be relevant to Ed4Life and which are already in use in other graduate programmes. This will provide maximum value-for-money and therefore assist with sustainability.
    - CIT will continue to fund the CDM after 2015.

9. **Other Ed4Life Specific**
    - Modules will also be available to MSc by Research students.

Ed4Life Deliverables

1. Numbers of directly-funded PhD students
   a. No students will be directly funded from PRTLI V resources
2. Target numbers of other fulltime/part time students
   a. The total number of students is expected to exceed 50 at all times, distributed between CIT, UCC and MFRC.
3. Target research and knowledge generation outputs from directly-funded students
   a. No students will be directly funded from PRTLI V resources.
4. Target teaching and learning outcomes for each student
   a. The teaching and learning outcomes are clearly specified for each module (e.g., see Phase II – Volume 5 documentation) and are consistent with the requirements of the NQF. A similar level of specification will be applied to all newly developed modules, or when a module is amended.
   b. More generally, all students can expect:
      i. A high quality research experience and training in the lifesciences;
      ii. Enhanced arrangements for supervision and mentorship, leading to better team working capabilities;
      iii. Structured arrangements for the development of generic and transferable skills;
      iv. Advanced taught courses in the lifesciences;
      v. Improved business, entrepreneurial and commercialization skills;
      vi. Regular monitoring of progress.

Ed4Life Milestones / Deliverables (with individual institutions listed separately)

Milestone / Deliverable	Date	CIT Responsible	UCC (APC) Responsible	MFRC Responsible
M1 Establishment of JMB	By end April, 2011	Yes	Yes	Yes
M2 Recruitment of CDM	March, 2011	Yes		
D1 Web Portal	May, 2011	Yes – coordinated by CDM in CIT	Yes	Yes
M3 Credit system for modules agreed upon	May, 2011	Yes (JMB)	Yes (JMB)	Yes (JMB)
M4 Suite of modules agreed upon	May, 2011	Yes (JMB)	Yes (JMB)	Yes (JMB)
M5 Student Progression Framework agreed upon	May, 2011	Yes	Yes	
D2 Final Student Prospectus	May, 2011	Yes – coordinated by CDM in CIT	Yes (JMB)	Yes (JMB)
D3 Student Induction Programme agreed upon	June, 2011	Yes (JMB)	Yes (JMB)	Yes (JMB)
M6 Supervisor Training Programme agreed upon	June, 2011	Yes JMB, Dean of Grad Studies/Head of Research	Yes JMB, Dean of Grad Studies	Yes (JMB)
M7 Ed4Life Delivery Framework	June, 2011	Yes JMB, CDM,	Yes JMB,	Yes (JMB)

		Academic Council	Academic Council	
D4 New Cohort of Students / induction programme	Sept 2011 and annually	Yes – coordinated by CDM in CIT	Yes	Yes
D5 Personal Development Plan	Sept 2011 and annually	Yes Supervisory panel	Yes Supervisory panel	Yes
D6 Supervisor Training	Sept 2011 and annually	Yes JMB, Dean of Grad Studies/Head of Research	Yes (JMB, CDM)	Yes (CDM)
M8 Annual reviews	May 2012 and annually	Yes JMB, CDM, Academic Council	Yes JMB, CDM, Academic Council	Yes (JMB)
D7 Analysis of student feedback / review of personal development plan	May 2012 and annually	Yes (CDM, JMB)	Yes (JMB)	Yes (JMB)
D8 Student placements/exchanges	Ongoing from Sept 2011	Yes (CDM,JMB)	Yes (JMB)	Yes (JMB)
M9 Mainstreaming of Ed4Life	Sept 2014	Yes	Yes	Yes

Note: Where brackets are used in the table above, the first entry has the primary responsibility for implementation (e.g., in the case of (CDM, JMB) this would be interpreted as meaning the primary implantation responsibility resides with the Curriculum Development Manager and the Joint Management Board would act in an oversight/governance capacity).

Preliminary Project Modules (5 ECTS credits each)

Generic & Transferable Skills Modules	Institution	Subject Specific Modules	Institution
Research Skills and Techniques	CIT	**Biotechniques**	UCC
The Research Environment	CIT	**National and Global Food Sector**	UCC
Research Management	CIT	**Food Regulatory Affairs**	CIT
Personal Effectiveness	CIT	**Innovation: From new Idea to Product**	CIT
Communication Skills	CIT	**Industrial Scale R&D in the Food Industry**	MFRC
Networking and Teamworking	MFRC		
Career Management	MFRC	**Cell and Molecular Biology**	UCC
Teaching and Learning for Graduate Students	CIT	**Human Molecular Genetics and Genetic Engineering Techniques**	UCC

Commercialisation Skills for Research	CIT	**Cancer: Biological and Clinical Perspectives**	UCC
Science in Society	UCC	**Current Topics in Life Sciences**	MFRC
Health and Safety	CIT	**Bioinformatics**	UCC
Effective Research Supervision	CIT	**Systems Biology**	UCC

Note: This list may be amended in line with the input of stakeholders external to CIT, UCC and MFRC and in line with the best practice in the development of structured PhD's.

APPENDIX 5

CIT's Structured PhD Education Statement (March 2009 in support of PRTLI 5 application, Phase I)

PhD education at CIT aligns with the Lisbon/Barcelona Agendas and specifically the Salzburg's principles[19] by (i) equipping students with a range of the highest-quality research and innovation skills relevant to their discipline area, (ii) training them with the skills needed for the wider employment market and (iii) providing them with multiple career options. These business-ready and innovative graduates will play a key role in achieving the vision put forward in the government's Smart Economy Framework (2008). An integral part of CIT's education lifecycle is formal supervisor training, which has the objectives of improving PhD student education, enhancing the research performance of the research team and developing the leadership capabilities of the supervisor. All developments in structured PhD education are subject to the Institute's Equality of Access policy.

Description of the Current Provision of PhD Education
The PhD lifecycle begins with the application by the student via the relevant Departmental Research Studies Board to the Institute's Postgraduate Research Studies Board (PRB). A viable research proposal and research plan must be provided at this stage. The PRB makes recommendations to the Registrar, and feeds back comments to the supervisory team, as necessary. Upon successful registration the student engages in original doctoral research activity and this is supported by the following key elements:

- **Induction** (1/2 day): When rolled out this will include a comprehensive look at the PhD experience including – responsibilities of stakeholders, institutional supports, rules, regulations and policies[20], a personal development plan, professional development advice and the examination process. A senior academic, independent of the supervisor, is allocated to the student as mentor with the role of providing guidance and support based on the student's unique developmental needs.

- **Generic Skills Training**: A series of taught courses, some with workshops, provide the student with generic skills that enhance their research capabilities and prepare them for the workplace. By academic year 2009-2010, PhD students across all disciplines in CIT will have the option of taking up to six generic skills courses accredited by HETAC including research skills, ethics, communication skills; entrepreneurship, career management, and team-work and leadership.

- **Quality Assurance**: Frequent formal monitoring of both the student and supervisor involves the completion of six-monthly progress reports as a condition of continued registration. These are assessed by the relevant Departmental Research Studies Board and independently by the Registrar's Office and advice offered, if appropriate. Significant issues must be dealt with within one month by the PRB. There is a formal complaints procedure, if needed. At the end of the first year of registration the student undergoes a major assessment to determine their suitability as a PhD student and to transfer to the PhD Register (see flowchart below). Feedback from progress reports is used by CIT to monitor and improve the research student experience.
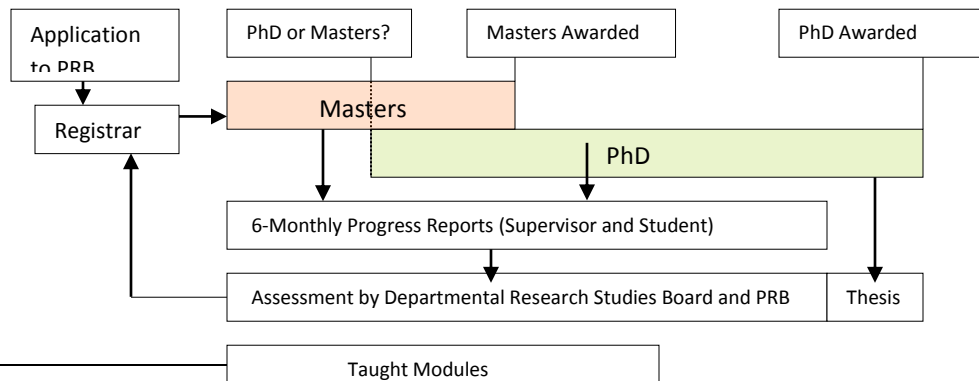
[19] "…doctoral education's core component, which is the advancement of knowledge through original research. At the same time, it is recognised that doctoral training must increasingly meet the needs of an employment market that is wider than academia". (EUA Report on the Bologna Seminar, Feb 2005.)
[20] PG Regulations; Code of Practice in Research; IP Policy; Ethics Policy.

- **Supervisor Training**: This includes a day-long Forum for existing supervisors and is supplemented by a number of seminars and mentoring where appropriate (e.g., for inexperienced supervisors). A more formalised Training Framework for Research Supervisors is being developed through a SIF-funded NAIRTL initiative involving UCC, TCD, NUIG, WIT and CIT, which will be available from late 2009.
- **Subject-Specific Training**: Students within the SRC's participate in a number of discipline-specific courses, developed both in-house and through strategic regional collaborations with UCC, UCC-Tyndall and also national/international partners.

Structured PhD initiatives already in place

The formalised training of students and supervisors, the regular and formalised monitoring of student progress by committee, and the supports in terms of induction, mentoring and professional development advice, all represent initiatives that already support a structured approach to PhD education. These will be enhanced in the future plans outlined below.

Future Plans for Structured PhD Education

Our model for structured PhD education most closely resembles the subject-based graduate school covering several institutions. The median time to completion will be targeted at 4 years (currently it is 4.8). We will prioritise the provision of comprehensive structured PhD education for the SRCs, thereby strengthening the Institute's strategic research focus, whilst taking account of the resources available to CIT.

Specifically, by 2014 those areas that are seeking funding under PRTLI Cycle V will:
- Be partners in inter-institutional structured PhD programmes[21] with wide availability of the largest number of subject-specific training modules for students and an environment where best practice between HEI's can be shared. Notwithstanding this, CIT remains committed to local engagement with UCC, UCC-Tyndall, Teagasc, hospitals and industry. Strong local engagement has the added value of enabling the organisation of seminars, workshops and lectures in a cost-effective manner with a critical mass of numbers present. Students can also meet regularly and exchange ideas. Educational delivery can be enhanced by various e-learning initiatives, possibly linked to national graduate programmes. Local engagement provides an efficient platform for merging HEI educational and research activities with industry.
- Continue the internationalisation of research teams by employing PhD graduates from the EU and beyond – currently about half of the PhD students in SRCs are non-national, with 10% non-EU.
- Enhance the student's access to diverse knowledge/culture through international mobility between collaborating research teams.
- Establish a joint UCC-CIT Structured PhD Committee to coordinate PhD education activities between the two institutions.
- Provide a suite of formal supervisor training modules, available through flexible delivery modes.
- Establish a Graduate Studies Office.
- Establish an appropriate ECTS Credit Framework which takes account of the balance between the demands of taught courses and the central importance of research activity.
- Increase the already strong involvement between industry and CIT researchers, with a view to enhancing the preparedness and understanding of graduates in developing and commercialising innovative leading-edge products and services.

Those areas that are not seeking funding under PRTLI Cycle V will, by 2014:
- Continue to be supported by the formal PhD education quality assurance structures referred to above.
- Continue to have access to the full suite of generic-skills training courses provided by CIT and any others of particular relevance to their broad discipline area through alliances with regional HEI's.
- Have access to all the supervisor training modules, including the planned modules referred to above.
- For the *New and Emerging Areas*, be partners in appropriate national Structured PhD programmes.

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[21] The national structured PhD initiatives include INSPIRE (Photonics) and Food Ireland (BioPharmaChem)
Note of 31/1/2011: Since this was written CIT is involved in Environment and Climate Change, INSPIRE, ICGEE and Ed4Life.

APPENDIX 6 - CIT compliance with the National Definition of a Structured PhD Programme (December 2010)

Characteristic	Compliance (Y/N) – *if No please indicate target date for compliance*	Brief description/summary of how comply
The core component of the structured PhD programme is the advancement of knowledge through original research….	Y	CIT agrees with the IUA and international recommendation that a PhD is awarded on the basis of the thesis presented to an external referee or panel and defended by a *viva*. The critical element of the thesis is that of original research work. Results from subject-specific and generic-skills modules cannot be used as an award criterion, though they are very important to the education of the student.
The structured PhD is designed to meet the needs of an employment market that is wider than academia….	Y	Structured PhD's recognise that employment of graduates is very likely to take place outside of academia. It is crucial to involve outside stakeholders (including enterprise) in curriculum design and delivery, placement, career advice, etc. Potential graduates need to understand this landscape as early as possible in their PhD.
It is a formalised integrated programme of education, training and research …..,	Y	Formal modules delivered to a schedule (calendar) that is clearly set out from the beginning, with defined ECTS credits and consistent with the personal development plan of the candidate are important elements of the structured PhD. Credits must be associated with defined learning outcomes. In some instances, such as placements, formal credits may not be accumulated, but the placement may be a mandatory part of the PhD. The structured PhD should provide *education* through subject-specific modules, *training* through generic skills modules and *original research*, ideally leading to peer-reviewed publications or original intellectual property. The integration of the education, training and research is key to the success of the formalised approach and also necessary to facilitate the necessary logistics (so that students can physically attend the required elements of

		the programme). Structured PhD's should last no more than 4 years, except under exceptional circumstances.
It is a formalised integrated programme of ……. personal and professional development activities,	Y	A Professional Development Plan must be agreed with the student at the outset. This helps to identify the appropriate programme elements that the student should take, accounting for his/her background prior to the PhD. A Personal Development Plan must also be agreed upon. Generic and transferable skills taught are a mandatory component of CIT Structured PhD's. A useful guide referred to in CIT is available through the IUA: http://www.iua.ie/publications/documents/publications/2008/Graduate_Skills_Statement.pdf
It enables the development of discipline-specific knowledge, …	Y	Disciplines tend to be broader than a thesis topic, and the availability of subject-specific or discipline-specific training can enhance the knowledge and experience of the candidate beyond the immediate focus of their research. This helps their research, especially if there are interdisciplinary linkages made, and the expanded knowledge helps with non-academic employability. Subject-specific modules are a mandatory element of CIT Structured PhD's.
It enables the development of … research skills	Y	Students may have a very varied background in research skills training, yet such training is highly beneficial. Research skills training, specific to the student discipline, is a key element of a CIT Structured PhD.
It enables the development of ….. generic / transferable skills	Y	As noted above, students will have varied backgrounds and must be taught generic skills (e.g., research management, writing, statistics, presentations, etc), taking due cognisance of their background. Generic skills modules may be taken in association with other providers or other Structured PhD programmes to provide better value-for-money.
It has declared outcomes (e.g. credits, formal training recognition) ….. in line	Y	All modules that carry credits must have designated learning outcomes appropriate for Level 10 programmes as per the National Framework of Qualifications.

with national and international best practice *(for all training and education components);*		
It has declared …. graduate attributes (e.g. competency profiles, other as defined by HEI) in line with national and international best practice *(for all training and education components);*	**Y**	Structured PhD's should take strong direction from international best-practice such as the IUA PhD Graduate Skills Statement and the IUQB Guidelines for Good Practice in the Organisation of PhD Programmes, for which both the universities and IoT's input comments and recommendations. Again, modules should be developed in line with NFQ Level 10 guidelines, which themselves line up with international best practice.
Supervision is by a principal supervisor(s), with a supporting panel approved by the institution	**Y** (Graduate supervisory panel to be established by June 2011.)	CIT requires all graduates to have a principal supervisor, a second supervisor in cases where the principal supervisor is relatively inexperienced and a mentor. In addition the graduate reports twice-yearly on the progress of their Structured PhD to the Postgraduate Studies Board. Training for supervisors is provided by CIT. In the future a graduate (supervisory) panel will be convened for each student, with the panels supported by appropriate training. Note that, in practice, in CIT the supervision is supported by several individuals within the research teams, as is the norm elsewhere.
Progress to completion is formally monitored against published criteria and supported by formal institutional arrangements in line with national and international best practice;	**Y**	Before any student can be enrolled there must be a full project description, complete with milestones and deliverables, that is independently assessed as being original and of PhD level. The student must themselves have shown the requisite undergraduate performance in an appropriate discipline before being accepted to enrolment. Students are usually selected through an open recruitment process. Once enrolled, PhD students are assessed via six-monthly written reports to the Postgraduate Research Board. In all PhDs, requirements for progression from one year to another must be clearly specified, and may include satisfactory completion of modules, etc., along with progress in the research. Copies of all progress documentation are provided to the relevant Departmental Research Studies Board. Published criteria are in the "CIT Postgraduate Regulations Handbook".

Appropriate placements, rotations and assignments across wide sectors of the economy are encouraged for inclusion as part of the structured PhD programme	Y	CIT has for many years been active in using placements as an element of the PhD experience. These placements can be in industry or in academia, or both. Placements or rotations enhance the skills and knowledge-base of the PhD student and provide important networking opportunities which can assist them with their professional development plan. CIT supports the use of off-site supervisors (e.g., within the industry) to supplement the primary supervisor, especially if placements are of a number of months duration.
Successful completion and examination of the research thesis is the basis for the award of the PhD degree.	Y	Successful completion and examination of the research thesis remains the basis for the PhD award. The structured PhD is supplemented considerably by the generic and subject-specific modules, but any issues affecting progression from one year to the next must be resolved well in advance of the thesis writing and submission. In CIT, a thesis should be publishable in part or whole in an independent peer-reviewed publication.

APPENDIX 7

Education for Lifesciences (ED4Life) Structured PhD Programme
Provisional Draft Prospectus[22]

The CIT Structured PhD aims to support PhD students to achieve the best possible experience of graduate research and training and to make a substantial and original contribution to knowledge through original research outputs. The Ed4Life Structured PhD provides world class training and supervision to PhD scholars in CIT, UCC and MFRC and includes a number of innovative approaches to ensuring you achieve your academic, professional and personal objectives, providing you with the optimum preparation for your future career.

Level 10 Award
Ed4Life is a full- or part-time programme that operates for 48 (full-time) or 96 (part-time) months leading to a level 10 award of *Philosophiae Doctor.*

Entry Requirements
- Candidates must possess a primary degree (minimum 2.1 honours or equivalent) in the lifesciences.
- Applicants must submit a CV, a Personal Statement, a Research Topic Outline, and contact details of two referees. Candidates may be called for an interview.
- The Personal Statement should make it clear why the candidate considers that participation in Ed4Life will benefit them in attaining their future professional goals; the statement should also highlight the candidate's past research experience and current research interests. The statement is an important element of the application process and should be given the appropriate attention by the candidate.
- The Research Topic Outline should provide brief information on the proposed area of research and how it fits in with ongoing research in the Ed4Life associated research teams.
- Templates for the Personal Statement and Research Topic Outline are available here (to be added).

Applicants will be enrolled on Ed4Life according to selection via the following criteria:
- Academic qualifications
- Personal statement
- Recommendations from referees
- Proposed Research Topic

Ed4Life consists of three mandatory elements:
- Transferrable Skills Training consisting of Taught Modules
- Subject-Specific Training consisting of Taught Modules and Advanced Laboratory Skills
- Research

Transferrable Skills
As a PhD graduate you will be expected to possess a range of transferable skills, which will help you to successfully complete your research project and to gain important training that will support your broader career development. Taught modules, online modules and workshops covering a wide range of transferable skills and research skills topics are available to assist you. See Table 1 for more information.

Subject-Specific Skills
To deepen your understanding of your area of research, and to provide you with high-level skills necessary for your research to be internationally competitive, you will be required to take subject-specific modules that have been

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[22] The Ed4Life Implementation Plan submitted in November 2011 included the development of the prospectus by June 2011, under the coordination of the Curriculum Development Manager. The development of the prospectus will be accelerated but this document, of 18th march 2011, is an outline of the prospectus only and should not be considered as in any way being complete.

tailored to students taking Ed4Life. Modules are delivered in taught (including online) and practical (laboratory) modes. See Table 1 for more information.

Research

The cornerstone of your PhD is original research and its dissemination, normally through peer-reviewed publication in international journals. As an Ed4life graduate you will work within a world-class research environment with access to some of the best research teams and research infrastructure.

Electives

In addition to the mandatory elements above, you will be provided with opportunities to take additional workshops to enhance your research skills and laboratory capabilities. See Table 3 for more information.

Table 1: Ed4Life Taught Modules

Generic & Transferable Skills Modules	Subject Specific Modules
Research Skills and Techniques	Biotechniques
The Research Environment	National and Global Food Sector
Research Management	Food Regulatory Affairs
Personal Effectiveness	Innovation: From new Idea to Product
Communication Skills	Industrial Scale R&D in the Food Industry
Networking and Teamworking	
Career Management	Cell and Molecular Biology
Teaching and Learning for Graduate Students	Human Molecular Genetics and Genetic Engineering Techniques
Commercialisation Skills for Research	Cancer: Biological and Clinical Perspectives
Science in Society	Current Topics in Life Sciences
Health and Safety	Bioinformatics
Effective Research Supervision	Systems Biology

Specific information on the all aspects of modules (content, learning outcomes, delivery schedules, locations, assessment methods, etc.) can be found here (link here to the **2011/12 module delivery handbook**)

Graduate Supervisory Panel

You will be appointed a Graduate Supervisory Panel once you have been accepted onto the Ed4Life programme. This panel will normally consist of your supervisor, second-supervisor, an independent chairperson and a senior academic. They will support and enhance the supervisor-student relationship, monitor your progress on a twice-yearly basis, and provide advice and support both to you and your supervisor(s).

Needs analysis / Professional Development Plan

To ensure you are taking the best modules from the suite available, your Graduate Supervisory Panel will perform an analysis of your strengths and weaknesses and make recommendations in relation to which modules will be most beneficial to completing your research and preparing you for your future career. This needs analysis will be assisted by you completing a Professional Development Plan.

Credits and Modules

Ed4life employs a credit-based framework, based on the European Credit Transfer System (ECTS) with one credit corresponding to 20 to 25 hours of total student effort. There is a limit of 30 ECTS credits which you may take for a 3-year PhD and 90 credits for a 4-year PhD. The actual number of credits you take will be agreed between you and your Graduate Supervisory panel at the outset of your PhD. Typically, you will be expected to take 40 ECTS credits for subject-specific modules and 30 ECTS credits for transferrable skills modules in the Ed4life programme which is itself a 4-year structured PhD.

Progression

The award of PhD is based solely on the basis of an oral examination and thesis meeting the recognized standard. Nevertheless, you will be required to gain sufficient ECTS credits through taught modules, as noted above, before you will be allowed to submit and defend your research thesis. To gain ECTS credits you will be required to pass the assessment procedure set for the corresponding module. Please pay careful attention to this and clarify any queries you might have with your supervisor. You can expect the following general progression pathway:

Year 1 – completion of approximately 55-60 ECTS credits through taught modules are required, alongside final preparations for the research programme in consultation with the Graduate Supervisory Panel. At the end of the first year, your continued enrolment on the Ed4Life structured PhD programme will be determined based upon your performance in the taught modules and your preparations with respect to the research programme that you will conduct in years 2-4. Candidates who are not recommended for progression may be offered the opportunity to enroll on a Master's by Research course. A **mandatory induction course** must be taken at the beginning of the programme.

Year 2 – completion of approximately 10-15 ECTS credits through taught modules are required. The majority of your time will be spent on research. You may be offered the possibility to attend additional workshops which will not be formally assessed.

Year 3 - completion of approximately 5-10 ECTS credits through taught modules are required. The majority of your time will be spent on research. You may be offered the possibility to attend additional workshops which will not be formally assessed.

Year 4 – you will spend all your time on research, preparation of your thesis and its defence at an oral examination
.

A typical progression pathway is shown in Table 2 below.

Table 2: Typical requirements' pathway for taught modules in the Ed4Life programme

PhD Year	Generic and transferable Skills Requirement	Subject Specific Requirement	Total ECTS credits
1st	25	30	55
2nd	5	5	10
3rd	0	5	5
4th	0	0	0
Total	**30**	**40**	**70**

Table 3: Typical short elective modules/workshops that are not assessed, and therefore carry no ECTS credits, but which you may wish to take to enhance your research skills.

Elective Modules (optional)	Year
Developing the research programme	1
Writing reports	2,3
Good laboratory practice	1,2
Intellectual Property Management	1-4
Communication and Presentation Skills	1,2
Research Ethics	2

Time management	2,3
Grant writing	3,4
Thesis planning	3
CV development and career planning	3,4
Interview skills development	4

For further information please refer to the following documents:
- Regulations for Postgraduate Study (link here)
- Regulations Governing Structured PhD programmes (link here)
- Code of Ethics (link here)
- Good Practice in Intellectual Property Management (link here)
- Module descriptions are contained in the "2011/2012 Book of Modules" (link here)

APPENDIX 8

GENERIC AND TRANSFERRABLE 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 technical skills modules such as:
    - Analytical Techniques
    - Engineering Design
    - Computer Applications
    - ICT
- NAIRTIL Research Supervision Modules:
    - Project Management
    - Intellectual Property
    - Commercialisation
    - Entrepreneurship
- ED4LIFE Modules (Proposed):
    - 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

APPENDIX 9

RESOURCES AND FUNDING THE STRUCTURED PhD

A recent conference on the Structured PhD[23] noted that Irish PhD graduates are well regarded internationally, and that by-and-large the quality of the traditional research apprenticeship offered is high. Maintaining and enhancing this high quality training for a four year structured PhD will require significant support. Graduate courses need to be properly resourced, bearing in mind that the smaller numbers of students for these course (even with the pooling of students via video conferencing) requires a larger staff to student ration than for undergraduate course. The issue of staff resources is regarded as the main barrier to the success of structured PhD programmes: a structured PhD programme based on volunteer effort from a few dedicated PhD supervisors is not sustainable in the longer term.

Clearly, subject-specific modules will be "expensive" and so can only be delivered through partnerships/collaboration, as suggested in the Hunt Report which states that the developing structured PhD framework "*will lead to greater consolidation and collaboration among providers, with stronger offerings for students*". This is in line with a research landscape that is "*characterised by critical mass within institutions and further enhanced by collaboration*".   CIT's involvement in two partnerships funded under PRTLI as mentioned previously offers an insight into how structured PhD provision can be accommodated by CIT.   An additional benefit of externally-funded structured PhD programmes is that the modules are then also available for other postgraduate students within CIT.

A further resource issue is the provision and more importantly the maintenance, of suitable facilities such as video conference facilities in each institution to support inter-institutional programmes. Experience from graduate schools elsewhere (e.g. Scotland) shows that it is essential to have dedicated technical support at each site, so that lecturers and participants can focus on the learning process rather than getting bogged down in technical / communication problems.

A third essential resource for structured PhD's is the need for high level, subject specific, administrative support, not only to maintain proper records and provide coordination services (e.g. VC scheduling) but also to provide a collegiate focus and accessible advice service for PhD students.

The above requirements are of course additional to the extra funding needed to provide a minimum of four years support (stipends and fees) for PhD students. At present in Ireland, only SFI has committed to the provision of four year support with IRCSET retrenching to three year support in 2009 / 2010.

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[23]   *The Future of Graduate Education in Chemistry and Physics*, Royal Irish Academy (2009)

APPENDIX 10

A REPRISE OF POSTGRADUATE STUDIES IN CIT

Postgraduate provision has played an increasingly substantial role in CIT's academic portfolio, especially since 2005 when the Institute secured delegated authority from the Higher Education and Training Awards Council (HETAC) to award its own degrees up to PhD level in certain named disciplines (science, electronic engineering, mechanical & manufacturing engineering)[24].   The Evaluation Group appointed by HETAC that gave CIT's "fourth-level" activity this clear endorsement as meeting the best international standards comprised national and international members with a wide range of expertise and experience in higher education. September 2010 registrations stand at 58 PhDs and 78 research Masters by research with a further 10 PhD and 29 Masters graduates awaiting conferring[25].
Systemic support for postgraduate studies comes in various forms, including through the Registrar's Office, the Development Office and the Research Office at institute level, as well as the faculties/colleges, schools, departments and individual researchers that have responsibility for programme delivery.   The recent formation of the School of Graduate Studies and appointment of a Dean of Graduate Studies will offer further enhancement of post-graduate activities in CIT.

By and large, current postgraduate policy for CIT is expressed principally through Research 2011[26], which includes the following key elements directly relevant to postgraduate studies:
- Improving the integration of research with teaching and learning;
- Providing all research postgraduate students with nationally-accredited modules in generic and transferable skills training;
- Training and support for research supervisors;
- Identifying and building multidisciplinary research clusters comprising a mix of experienced principal investigators and new researchers, to support and encourage high quality well-funded research across CIT as a whole.

In developing graduate studies policy through research, CIT is informed by best national and international practice, evident from the number of partnerships with a direct bearing on postgraduate studies in which CIT is involved:
- Research Alliance: CIT is a partner in the SIF-sponsored Institutes of Technology Research Alliance Graduate Education Programme[27].   One of the initiatives is development of a Generic and Transferable Graduate Skills Programme.   A number of modules are already available.
- Graduate Research Education Programmes (GREPS): CIT is involved with implementing subject-specific national graduate schools in nanotechnology (INSPIRE) and in marine studies.   In addition, CIT has recently developed the "ED4LIFE" structured PhD and training programme for life sciences, jointly with UCC and Teagasc. The curriculum contains a number of generic and technical modules.
- Training for Research Supervisors: The Graduate Studies Working Group of NAIRTL which includes CIT aims to "*develop strategies for the support of staff involved in student supervision including induction sessions for new staff and workshops for experienced staff and to develop training materials, guidelines and handbooks, and an on-line forum for discussion of issues*"[28].

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[24]   http://www.hetac.ie/docs/Cork%20IT-DA%20Evaluation%20Group%20Report.pdf
[25]   *CIT Self-Evaluation Report (p. 70)*, Cork Institute of Technology (2010)
[26]   *Research 2011*, Cork Institute of Technology (2007)
[27]   http://www.postgrad.ie/graduate-education-programme/index.html
[28]   http://www.nairtl.ie/index.php?pageID=164