Technological University Dublin – Tallaght

Programme Board Response to

EXTERNAL EXPERT PANEL VALIDATION REPORT FOR

MSC IN COMPUTING IN HUMAN CENTERED ARTIFICIAL INTELLIGENCE

90 ECTS

CP1 Ref: 2021_COM_CP1_HC_AI_MSc

LEVEL 9

School of: Science & Computing
Department of: Computing

Panel Meeting date:	07th January 2022	
Decision: *tick one only*	**Approved** - an excellent submission not requiring modification other than minor typographical corrections before resubmission to the Registrar for approval at Academic Council priorto release for external evaluation	
	Approved subject to modification – a very good submission requiring minor modifications to be carried out by the Programme Development Committee	**X**
	Retained - a good proposal but requiring some significant modifications and additions. Modifications/additions must be approved by the Chair of the IPRB in consultation with the othermembers before resubmission to the Registrar	
	Returned - a deficient proposal that needs to be reconsidered indetail by the Programme Development Committee, rewritten and resubmitted.	

Please note that the programme board responses to recommendations are given in italics the appropriate sections of the report. The original report is left in this document in 'grey'.

EXTERNAL REVIEW PANEL REPORT

PART 1 GENERAL INFORMATION

School	Science & Computing
Department	Computing
Date of panel meeting	07th January 2022
Programme evaluated	Master of Science in Computing in Human Centred Artificial Intelligence
NFQ level	9 (90 ECTS)
Mode of Delivery	Full-time & Part-time, Blended
Duration	12 months - 1 academic year FT; 24 months PT.
Programme approved title	Master of Science in Computing in Human Centred Artificial Intelligence
Panel	• Chair: Dr Sean Mc Sweeney Head of Computer Science, MTU • Dr Davide Buscaldi, LIPN, Natural Language Processing Laboratory, Uni Paris 13 • Dr Thomas Dowling, Head of Computing, Letterkenny Institute of Technology • Panel Secretary: Ken Carroll, Academic Registrar, TU Dublin Tallaght

University Staff

Name	**Grade / Responsibility**
Dr Barry Feeney	Head of Department of Computing, Tallaght
Dympna O'Sullivan	Assistant Head of School, Computer Science, Grangegorman
John Behan	Head of School of Science and Computing, Tallaght
Prof Pramod Pathak	Dean of Faculty of Digital and Data, TU Dublin
Dr Robert Ross	SL1 (Grangegorman)
Dr Stephen Sheridan	Lecturer (Blanchardstown Campus)
Dr John Cardiff	Lecturer (Tallaght)
Sean McHugh	Lecturer (Tallaght)
Gary Clynch	Senior Lecturer 1 (Tallaght)
Dr Fernando Perez Tellez	Lecturer (Tallaght)
Dr Keith Quille	Lecturer (Tallaght)
Emma Murphy	Assistant Lecturer (Grangegorman)
Damian Gordon	Lecturer (Grangegorman)
Jelena Vasic	Lecturer (Tallaght)
Rageish Jaiswal	Lecturer (City Campus)

Panel Meeting Agenda

14:00 – 14:30	Private meeting of Panel
14.30 – 14:45	Panel meeting with Head of School of Science & Computing, Head of Department of Computing, Tallaght and Assistant Head of School, Computer Science, Grangegorman
14:45 - 15.45	Panel meeting with the Programme Board
15:45 – 16:15	Private meeting of Panel and oral presentation of findings to the Head of Department and Programme Board
16:15	Close

PART II RECOMMENDATION/COMMENT

2.1 Comment

This programme was initially developed as a 60 ECTS Professional Master Degree programme. Although recommended by this panel, the decision of the TU Dublin University Programmes Board (UPB) was not to approve it in this form considering it to be inconsistent with a university norm of 90 ECTS for taught Master programmes.

A revised and expanded programme structure was devised to create a 90-ECTS taught Master programme taking cognizance of the suggestions provided by UPB. This report should be read in conjunction with the earlier report as the original endorsement, commendations and recommendations pertaining the original programme remain valid. The summary commendations and recommendations from the first report are included here for completeness.

2.2 Recommendations

The External Review panel recommends that the programmes(s):

Master of Science in Computing in Human Centred Artificial Intelligence

Level 9 (90 ECTS)

be approved subject to a satisfactory response being provided to the panel recommendations including associated documentation revisions.

2.3 Proposed Start Date September 2022

2.4 Mode of delivery: Full-time: Yes Part-time: Yes Online**:** Yes

2.5 Conditions:

None

2.6 Commendations (*as per the 1st validation process*)

a) The team are commended for their success in obtaining EU funding for the CEF project and the first delivery of this proposed taught Master degree. The development of international collaborations at this level has potential to position TU Dublin to become still more competitive in its bids to access European funding for research and other activity.

b) The collegial approach taken in securing the European funding and the planned cross-campus approach to the delivery is commendable.

c) The panel commend the team on a strong and comprehensive response to the evident market demand for a programme at this level, in this field.

d) The Panel commend the team on their engagement with the panel and their comprehensive defence of the proposed programme.

2.7 Recommendations

Further to the original Panel recommendations on the 60 ECTS version which the Programme Team had already responded to, the Panel further recommends that:

a) Modules should be reviewed in general to ensure:

- The consistent application of contact hours across all modules.
- That the number and timing of assessments are indicated accurately.
- That the indicative syllabi are focused and practicable.
- That there is a co-ordinated approach to technologies/tools used to ensure that there is no overlap or unnecessary workload for the student.

Programme Board Response:

Contact Hours: The Programme board accepts this feedback which arises partially from academic teams across the three former colleges which comprise TU Dublin having slightly different approaches to recording student contact and effort. The Programme board has provided an Approved Course schedule which is the guiding master for each subject and will ensure that the hours presented in the ACS are reflected into the Akari document in a consistent manner.

Number & Timing of assessments: The programme board accepts this feedback and this matrix will be provided. The programme board is currently developing a 'Learning Event Schedule' as part of the European project underpinning this programme and the assessment matrix element will be included as part of this work.

Focused & Practicable Syllabi: Accepted. The programme board has been fortunate to draw on strengths across TU Dublin's Computer Science/ Computing/ Informatics Schools and has a depth of experience in providing practical material to illuminate abstract concepts. Members of the programme board are also members of EU projects and committees on Ethic, AI and IT and have experience in these matters.

Technologies/ Tools: a significant element of the development of the Learning Event Schedule for the associated EU project is to ensure that industry standard tools and datasets are used in the programme. There is a strong focus on ensuring use of a consistent set of tools so that students gain real depth of understanding rather than a 'smattering' of a wide set of technologies.

b) As part of or in addition to the Student Handbook:

- provide guidelines for staff and students in relation to the Research Project to includesupervisory arrangements, opportunities for Industry mentorship and programme specific requirements e.g. ethical guidelines, supervision arrangements of International students;

PB response: Agreed

- ERASMUS opportunities and arrangements, where applicable

PB Response: Agreed.

c) The Panel finds that the entry requirement criteria specified are appropriate and recommend that the criteria are made explicit wherever published for perspective students.

Recommendations relating to the additional 30 ECTS in the revised program proposal:

d) The integration of the 2 new modules, Statistics and Data Analysis & Programming, needs a little more thought in terms of how the topics integrate with and support the other modules.

This work is ongoing in the development of the LES.

e) A general recommendation to consider the overall number of assignments to avoid a risk of student over-assessment. A matrix of assessment for students to ensure an even distribution of effort and the avoidance of bottlenecking is recommended. Some modules have 2 assignments and others 3 or 4. For example p20 – Data

module MLO #4 is being assessed 3 times!

As noted above the LES will include an assessment matrix to obviate the risk of over assessment. Equally the programme development team is developing a number of assessment events which will be used across more than one module.

f) The Panel recommends further consideration of the workload requirement for students in the research project commensurate with the ECTS volume and time availability. The idea of producing a paper as part of the project is laudable but may be unrealistic given the other demands of the module.

The programme development team sees the 'paper' as a valuable tool in ensuring the students can demonstrate, in a succinct fashion, the value of their Research Project work. Not all papers are required to be publishable. Not all papers are suitable for publication but the exercise in creating a succinct communication is a very valuable one. The programme development team will keep this under review. Providing standard templates, giving multiple examples for previous years and underlining the value of the artefacts to students in their career development will be used as tactics to ensure students are not overloaded.

g) Minor amendments:

- Consider if the ISCED codes on each module are appropriate; some are shown as 611 but may be more appropriately classed under 613.

  Agreed

- P11: mentions 15 credit project – amend to 30 credit.

  Agreed

- Data Analysis & Programming modules: The module version provided was incorrect (mainly related to assessment). The corrected version should be included in the final book of modules.

  Agreed.

- The recommended references/reading materials should be updated to include more recent book editions.

  Will be done.

PART III FINDINGS OF THE VALIDATION PANEL

INTRODUCTION

The external expert panel was convened on 07th January 2022 to review the proposed programme. The revised programme documentation was made available to the panel members in advance of the meeting.

The aim of this programme is to produce graduates in the field of Computing (Human Centred Artificial Intelligence) with (i) a systematic applied knowledge of the key issues around Human Centred Computing (including Ethics, Transparency, Trust) and (ii) the ability to design, develop and deploy artificial intelligence (AI) solutions using current technologies in the field Artificial Intelligence.

This programme concept originates from a European funded project, **CEF Connecting Europe Facility; Action 2020-EU-IA-0068** which has TU Dublin as the coordinating university. The proposal of this programme was approved by the President, TU Dublin in May 2020.

The CEF project proposal received the highest ranking among submitted proposals with a particular mention made of the sustainability of the programme and its support by 27 industry associates in addition to the direct industry partners. Included amongst the supporters are AWS (Europe), Microsoft (Ireland), Technology Ireland Skillnet, Eir, Idiro, ICS, Evros, SAP (Ireland) among others.

The proposed Master programme is being developed by TU Dublin as a key work package with the CEF project and it will be a TU Dublin programme. Programme development involved the Department of Computing (TA), the School of Computer Science (CC), and the School of Informatics & Engineering (BN). The process leading to the programme development involved cooperation across TU Dublin, with European HEIs, and industry partners in the CEF Action. Through these discussions, an agreed approach to the programme development was arrived at as evidenced in the submission documents.

The Universities in the consortium are technological universities with a focus on industry engaged programmes as opposed to traditional research focused universities. The partners include:

Academic institutions	Centres of Excellence	SME's
TU Dublin (lead partner),	National Research Council of Italy	Citel Group Srl
Stichting Hogeschool Utrecht	University College Dublin	Nathean Technologies Ltd
Università degli Studi di Napoli Federico II	Fondatsiya Evropreyski Softueren Institut - Tsentar Iztochna Evropa	Real AI B.V.
Budapest University of Technology and Economics		

MEETING WITH MANAGEMENT AND STAFF

In advance of the meeting, the Head of Department liaised with the Panel to explain why the revised programme was being presented. The rationale for the proposed amendment to the programme structure was explained and subsequently explored by the panel as part of its own deliberations and in discussion with the programme team during this meeting.

The collaborative approach taken in the development of this programme as part of a wider European effort to address a skills need in this domain was noted. Exploiting the synergies available across the EU consortium and drawing upon the A.I. strengths and capabilities of each partner is a commendable feature of the proposal. It was noted that linked and collaborative provision is not envisioned; each partner HEI is developing its own Master programme appropriate to its own context but with a sharing of expertise in the development of program content and open learning objects to maximise the learning opportunities for participating students.

The Panel met with the Programme Team where each module was discussed in detail. Particular attention was afforded to the disbursement of the additional 30 ECTS to bring the revised proposal to a 90 ECTS Level 9 Masters. Key questions explored by the Panel in those discussions focused on

- Is there enough HC-AI to justify the proposed title?
- Is there sufficient focus on data analysis and the data lifecycle to support what they want to achieve?
- Data preparation and cleaning was an important concern. The Panel wanted to explore how this is addressed within the overall programme structure.

Programme Title and Award Title.

The panel was satisfied that the title of the programme is clear, accurate and fit for the purpose of informing prospective learners and other stakeholders and that the intended modules are set to the appropriate NFQ level.

Justification for the Programme

The Panel was satisfied that a demand exists for graduates with the knowledge and skills to be developed through the proposed programme. Evidence for such a demand was provided and substantiated.

The EU project consortium led by TU Dublin has a strong history of industry engagement and the provision of quality programmes of education and training aligned to the business sectoral

needs. AI is a rapidly evolving space requiring graduates versed in the regulatory, legal and ethical application of AI systems. The programme specifically examines the development of AI form an ethical, human-centred position.

EU funding has enabled the development of this proposed Master and other similar programmes across Europe via the consortium as a key deliverable of the CEF programme. Furthermore, the funding will defray the costs of participation for the first enrolled student cohorts expected from September 2022, subject to the programme being approved by TU Dublin.

The purpose is to produce Masters graduates with the capability to develop and implement AI based systems for organizations, particularly Small and Medium Enterprises (SMEs). Europe is placing ethics and transparency at the heart of AI development and deployment (*Human Centered, Trustworthy, Explainable*) to protect the rights of the individual. The programme aim is to develop graduates who can apply cutting edge AI technology having built-in human centered principles and business cost knowledge from the outset. It is expected that graduates of this programme will provide an advantage to early adopters of ethical AI approaches.

Graduate employment

The Panel reaffirmed the view from the original review of the proposed programme, that a strong sustainable market demand for such graduates exists in Ireland and beyond. The rapid growth of AI applications in all facets of business, healthcare, and our personal lives ensures that this is an area of high potential for graduate employment at the highest levels. The curriculum design is cognizant of key proficiencies that support graduate employment including the development of skills for research and critical inquiry, ethical and professional standards, effective communication, and team and interpersonal skills.

Conformance with the University Mission and Strategy

The panel was satisfied that the proposed programme conformed to the university's mission to provide flexible learning opportunities of the highest quality. The proposed Masters fits comfortably within the TU Dublin strategic intent to '*create a better world together*'.

The development of artificial intelligence is a global challenge and one that raises serious ethical concerns regarding how data is collected, managed and exploited. A key objective of this programme is to explore the ethical development and use of AI technology to protect the rights of the individual. The programme will also develop business cost knowledge from the outset. This multidisciplinary combination of ethics and business cost knowledge can deliver a global impact.

The programme places a strong emphasis on ethical and business cost knowledge consistent with an objective to develop graduates who understand and can contribute to the responsible development of AI.

The program objectives resonate with several aspects of the TU Dublin strategic intent including the development of globally responsible citizens, tackling global challenges, creating pathways for all and providing targeted lifelong learning opportunities, and developing a connected network that can provide synergies for TU Dublin education and research in a European context.

The programme is also a steppingstone towards building a strong and productive partnership with European partners in education and research and supports the engagement of TU Dublin with global networks of knowledge creators and researchers.

Access, Transfer and Progression Arrangements

The Panel was satisfied with the stated requirements for access and progression. The minimum entry requirement will be for cognate NFQ Level 8 graduates at a H2:2 or higher standard. The Panel noted that the minimum entry requirements for the revised programme were more relaxed which should attract more students. Previously, a more demanding entry criterion applied with regard to demonstrated knowledge and skills within a narrowly defined area.

Provision is also made for recognition of prior learning. Where appropriate, applicants may be directed to bridging modules before gaining access to the master's programme.

The first cohort of up to 20 students is fully funded for FT participation only. Students may come from anywhere across Europe.

The requirement for international students who do not have English as their first language to hold an IELTS score of 6.0 or equivalent was noted.

On completion of the programme, transfer and progression routes exist for the graduates to go on to other taught Master, research Master and or PhD studies, both in TU Dublin and in other HEI's nationally and internationally.

Programme Structure and Design

The Panel had reviewed and recommended for approval, an original version of the proposed programme as a 60 ECTS Masters with a structure is aligned to the Professional or Technological Masters Programme model used in other European countries. This, however, was not considered to be consistent with norms within TU Dublin and the programme team were asked to revise the structure as a 90 ECTS programme. In its second review, the Panel

looked in particular at the additional 30 ECTS, having already evaluated in detail the original 60 ECTS proposal.

The revised curriculum has been designed and tailored to meet the needs of real-world situations and companies. The delivery of the programme draws on the expertise and insight of external experts to bring real-world issues into the learning experience of the students and provide opportunity to tackle problems drawn from the world of work, from new contexts, and to refine their own ambitions and professional pathways.

The additional 30 ECTS comprise of:

- Expansion of the Research Thesis (Human Centred AI) from 15 to 30 ECTS
- Statistics* (10 ECTS)
- Data Analysis & Programming* (5 ECTS)

  (**pre-existing approved modules in TU Dublin; These additions are in direct response to suggested improvements arising from discussions at University Programme Board on the original proposal*).

The expanded capstone research project will be research-informed and practice-led with many projects being specified by industry partners of the consortium.

The curriculum design is cognizant of key proficiencies that support graduate employment including the development of skills for research and critical inquiry, ethical and professional standards, effective communication, and team and interpersonal skills

The panel was satisfied with the information supplied and welcomed the additional modules. The proposed course structure is logical and in terms of programme schedule, syllabi, teaching and learning strategy.

Programme Learning Outcomes and Award Standards.

The panel was satisfied that the learning outcomes of the programme were consistent with the Award Standard for the Master in Computing.

Teaching and Learning Strategy

The proposed approaches to teaching and learning were indicated and justified. They afford students the opportunity for independent learning and the development of a personalized critical understanding of the module topics. The approaches suggested to support learning and teaching were clearly articulated. They address critical examination of issues and the encouragement of independent learning, and the development transferable skills that are

highly valued by employers.

The Department of Computing has been to the fore in the adoption of innovative learning solutions and will continue its efforts in this area. The Department will continue to improve its competencies in blended and online teaching.

The panel was satisfied with the mix of theory and practical elements. Ethics will be delivered using a case model approach to challenge student thinking through real-world scenarios. The lecturers will promote integrated learning through use of shared terminology, shared data sets, and shared learning across modules and target higher order thinking and technical skill.

Learner Assessment

The learner assessment methods were clearly documented. The Panel welcomed the variety and of assessment modes and the approach to shared assessments across modules. The approach ensures that all learners have an opportunity to display their learning and skill.

For project assessment, students will have freedom to select their own projects with guidance from an academic lead.

There was a general discussion about the proposed volume of assessments. The Panel were concerned there might be some over-assessment and made recommendations on the production of a matrix of student assessment to ensure an even distribution of effort over each semester and the avoidance of bottlenecks, and to consider if some MLO's were being assessed too often.

Quality Assurance

The procedures in developing the programme were outlined for the panel as per the university's quality assurance procedures. The panel was satisfied that the procedures were applied to the development of the proposed programme and that the quality assurance mechanisms are in place to ensure its provision, monitoring and review. In addition to the Programme Board, an Industrial engagement and a research project supervisory groups will be formed to manage the Programme.

Information Provision

The panel was satisfied with the programme specific information provided. An example of a student handbook and indicative time-table was included in the documentation provided. A handbook for this programme has already been produced.

Library and Physical Facilities / Resources

The panel was satisfied that the staffing and physical resources were available to deliver the proposed programme.

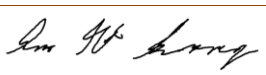
Academic Staff and Qualifications

A short bio for each member of the programme team was provided. The panel was satisfied that the lecturing and support staff is available within the university to deliver the content of this programme.

This is augmented by the expertise of the partner HEIs who will contribute to the development of objects to support the programme and guest lectures from industry experts.

Part V: Approval

Programme Internal Evaluation Report Approved by:

Signature: 		Signature: 
Print name: Sean McSweeney		Print name: Ken Carroll
Title: **Chairperson to Panel**		*Title: Secretary to the Panel*
Date:10 Jan 2022		Date: 07Jan2022

Appendix: Proposed Course Schedule

Module title	Module Code	ECTS	Mandatory / Optional*	Weekly hours					Assessment		Pre/ co-requisite
				Lecture	Practical	Tutorial	Other Contact	Self-Directed	Continuous Assessment %	Examination %	
Stage 1											
Data An. and Programming	DATA H4001	5	Mandatory	1		1	0	6	100%	0%	
Statistics	ASDA H6019	10	Mandatory	1		2	0	12	100%	0%	
Stage 2											
Ethics & IT	ETHI 001	10	Mandatory	1		2	0	12	100%	0%	
Research Methods & Proposal	TBC	5	Mandatory	1		0	0	7	100%	0%	
AI & ML Modelling	TBC	10	Mandatory	1		2	0	9	100%	0%	
Future AI & Learning	AIML H6006	5	Mandatory	1		1	0	5	100%	0%	
Society and AI	ETHI 002	5	Mandatory	1		1	0	6	100%	0%	
Human Centric DL	TUDL	10	Mandatory	1		2	0	9	100%	0%	
Research Project											
HC AI Dissertation	TBC	30	Mandatory	1		0	0	39	100%	0%	

Regulation:

- Final Award Classification is based on performance across all modules contributing to overall award.
- Candidates able to demonstrate equivalent learning at a good honours level in Statistics and Data Analysis & Programming modules may apply for exemptions in respect of stage 1 modules.
- Note: Weekly self-study calculation assumes 13 weeks per semester and 20 hours effort per credit during these contact weeks. Additional self-study effort will occur during other periods up to and including final examination/submission of work.