Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Report to Council on the Review of Trinity Research & Innovation

January 2015

This report presents the outcome of a Quality Review of Trinity Research & Innovation (TR&I) which was undertaken from 23 -25 June 2014 by Dr. Burton Lee, Stanford University, USA; Prof. Dr. lr. Koenraad Debackere, KU Leuven, Belgium and Dr. Phil Clare, University of Oxford, UK. The internal facilitator was Ms. Deirdre Savage, Trinity College Dublin.

The report attached includes (i) the External Reviewers' report received on the 9 November 2014, (ii) the response from the Director of Trinity Research & Innovation received on the 1 December 2014 and (iii) the response from the Dean of Research received on the 3 December 2014.

The main purpose of the Quality review is (a) to provide a structured opportunity for the Unit to reflect on its activities and plans for development, while benefiting from a constructive commentary by senior colleagues external to College; (b) to ensure that quality and standards in service and provision are being maintained and enhanced and that areas of concern in this regard are identified and addressed. Each administrative/service support area in College is reviewed systematically once every seven years.

The Review Report and recommendations, along with the responses from the Director of Trinity Research & Innovation and the Dean of Research were discussed at the Quality Committee on 10 December 2014. The Director of Trinity Research & Innovation and the Dean of Research were in attendance.

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Reviewers' Report

The findings and recommendations herein are the agreed, unanimous views of the reviewers.

0. Introduction

The reviewers noted that many challenges faced by TR&I reflect systemic issues within the broader Trinity institution - the governance structure, administrative hierarchy and processes, personnel system, university culture and external financial environment - and which thus lie outside the formal scope of authority and control of the Director of TR&I, and even of the Dean and Vice President of Research (DoR). Accordingly, we clearly identify in the report both Findings and Recommendations that pertain to either "College-level" or "TR&I-level" observations and actions.

Trinity College sits in the heart of Ireland's innovation and entrepreneurship ecosystem in and around Dublin, and is highly dependent on - and constrained by - the strengths and weaknesses of key elements in this system, including the quality and availability of strong industry collaborators, experienced coaches and mentors, investors and legal services, to name a few. Accordingly, the reviewers have also identified issues and opportunities for improvement regarding TCD's and TR&I's interaction and engagement with the external industrial ecosystem.

A. Summary of the Review Panel Recommendations

Based on the analyses of the materials received and the extensive interviews, the recommendations developed in Section C of this report are:

1. Organisation Structure, Management and Culture

- **Organisation Structure**. The Quality Reviewers find that TR&I has a well-defined organisation structure with clear lines of authority, task divisions, job assignments and supervisory responsibilities. Now this structure needs a diligent and consequent implementation, with clear support from the highest executive level in the College.

- **Management.** The following recommendations are offered by the review panel with regards to improvements in management at TR&I:

    - Pursue change management as described in the self-assessment report much more vigorously and in a consistent manner.
    - Give annual performance awards (non-financial recognition such as a plaque, certificate, ceremony and public announcement) to selected TR&I managers or staff for excellent work done, and publicise widely across the university and outside Trinity.

- **Culture.** The following recommendations are offered by the review panel with regards to securing changes in TR&I's internal work culture:

    - Develop a clear identity for staff around being a "Professional" rather than an 'Administrator'; this should be done in close consultation with senior managers and influential staff members, as well as with the College HR department, and should aim to empower and incentivise staff to pursue more ambitious career paths for themselves.
    - Manage and balance workload of managers and staff by securing additional resources such as student interns where feasible.
    - Develop targets depending on role for all managers and staff to spend a sufficient and relevant time outside the office visiting academic units at Trinity and corporate partners. This could range from 4 hours per week to 75% of time.
    - Work with the HR department to provide high quality management training to selected TR&I staff, through a combination of in-university and external professional association courses.

2. Resources

- We understand the current resource constraints both at college-level and at TR&I-level. The College, supported by TR&I, is particularly reliant on exchequer funding sources for research and faces an urgent need to diversify into new sources of funding, whilst at least preserving and preferably increasing their market share of core government funding streams.
- We thereby recommend the College develop and resource a programme to train staff across TR&I, enabling staff to be more skilful in their roles, and more aware of the roles of the rest of the Unit.
- Ensure that TR&I has access to good legal advice and takes it appropriately.

3. Systems and processes

- We recommend that TR&I should pursue the cohesive integration of contracts, research, IP and spin-off activities through transparent, lightweight formal and informal processes within TR&I, and between TR&I and other TCD units (e.g. finance, legal), including the necessary IT improvements as well as a strong emphasis on staff training and development to facilitate the transitions envisaged. These IT improvements should follow the integrated business logic and avoid silo concepts at all times.

- We recommend that the detailed proposals on staff training and development, as described in the self-assessment report, to be fully and duly implemented.

4. Management of Risk

- The main sources of risk identified concern financial risks, legal risks and reputational risks because of insufficient alignment or cohesion within TR&I and between TR&I and the other relevant domains at TCD-level. As a consequence, we recommend TR&I management (in concert with the TCD executive level) to pay sufficient attention to the different TR&I risk areas mentioned and to articulate the proper supervisory processes.

5. Alignment to Strategy

- We strongly endorse the ambitious targets College has set for growth and diversification, and for the strengthening of Research and Innovation. The work that College has done so far to reorganise and bring together TR&I is entirely appropriate, and we encourage the Director and Staff to work together to complete the planned changes and support the delivery of these goals.

6. Performance

College-level performance recommendations

The following recommendations are offered by the review panel to improve research and innovation performance at the College level:

Research Grant Funding. The reviewers recommend that greater attention be paid to 1) increasing the number of grant proposals written and submitted annually by Trinity, and 2) raising the quality of proposals with a view to improving success rates in calls. Successful approaches here need to be widely disseminated and scaled up across campus through organised workshops around best practices, online archives of video interviews with model Principal Investigators, and archives of example successful proposal templates. Suggested ways of achieving higher quantities and quality of submissions include the following:

- Partner with leading multinational corporations based in Ireland for Horizon 2020 topics and projects. At the same time, build strong European networks of academic partners who can act as cornerstones in various Horizon 2020 programmes. Approach prospective corporate-university partners on the Continent together as a team with the goal of securing stronger enterprise and academic consortia partners within Europe.
- Increase the number of Trinity professor 'Expert Evaluators' who are listed in EU expert databases, and who can participate in Horizon 2020 proposal reviews in Brussels. Encourage them to share their insights on the proposal evaluation process with colleagues back in Dublin via video interviews or workshops.
- Bring in greater numbers of Adjunct Professors to assist Principal Investigators with writing grant-funding proposals. This may be of considerable value in increasing the number of funding proposals emanating from Trinity to SFI, the ERC, EU and companies each year.
- Undertake a formal survey among Principal Investigators to ascertain the primary reasons for proposal success/failure.
- Improve training content, and participation in training programs, around proposal writing and understanding the proposal evaluation process.

- **Industry Collaborations**. We recommend that Trinity's schools and departments proactively explore new avenues and models for building industry collaborations in important emerging research and technology domains, such as robotics, product design, artificial intelligence and manufacturing, to name just a few. The new Mechanical Engineering course '*User-driven Product Design*' (4E5, delivered by the Assistant Professor Mechanical and Manufacturing Engineering) has, for example, pioneered a new model of TCD-industry collaboration built around multinational ICT enterprise support (SAP Ireland) for a groundbreaking project-based engineering course. Industry engagement around other taught courses in engineering, science, medicine and business is also worth exploring, with the objective of moving some of

these connections into research-oriented collaborations in the future (see also GOVERNANCE).

- For Trinity to become more successful in developing industry collaborations of mutual benefit to companies and the university, faculty and staff will need to upgrade the level and manner in which relationships with top enterprises are developed. Specifically, we strongly recommend that the College place greater emphasis on the following types of activities and training for faculty and staff:

    - Increase onsite visits to companies (in Ireland, UK, Germany, USA, Asia), with the objective of understanding each firm's culture, key personalities, downstream customer base, and business challenges.
    - Develop improved methods of building and tracking the 'pipeline' of new corporate prospects and established relationships. Engage in better-organised and coordinated efforts to move major strategic corporations up the 'value chain' and sales pipeline inside Trinity (aka 'upselling').
    - Clarify policies as to how the 'ownership', coordination and hand-off of enterprise relationships should be handled between professors, staff, departments, schools, faculties and the College, when engaging in strategic upselling to major corporates.
    - Develop a system of tiered industry sponsorships that employ multiple mechanisms, template agreements and instruments, at various levels of financial commitment, and at the different levels of the college, which allow quicker closing of 'deals' with companies according to the collaboration type: course support, departmental support, laboratory support, research project support, faculty/school-level support, college-level support.

  Finally, as has been discussed elsewhere in this report, the review panel recommends the establishment of a College-level mechanism for coordinating strategic industry relationships (a 'Committee' or 'Working Group') that meets on a regular basis, with representation from TR&I, Trinity Foundation, research institutes and other enterprise relationships 'owners' and stakeholders (see also GOVERNANCE).

TR&I-level performance recommendations

The following recommendations are offered by the review panel with regards to securing improvements in research and innovation performance metrics within TR&I:

- It is recommended that TR&I begin tracking, as best as possible on a bi-annual survey, the 'informal' start-ups being created at Trinity by undergraduate and post-graduate students in residences, dining halls, clubs and classrooms, and that do not often employ formal IP developed in Trinity research laboratories. While exact numbers of such 'informal' companies will not be possible to obtain, estimates will give Trinity innovation and entrepreneurship leaders and administrators a better sense of how many companies are being founded, where on campus outside of labs they are coming

from, how and where co-founders are connecting, and what patterns of 'founding' are being seen.

- **Entrepreneurship Education and Training for Undergraduate and Post-Graduate Students**. We recommend that TR&I supports the I&E strategy roles of the Business School and I&E hub by increasing attention to, and involvement with, entrepreneurship training and support of undergraduate/post-graduate students and new companies formed by them. This strategy should include an objective to increase the number of undergraduate/postgraduate students taking entrepreneurship education and training programs to twice the current level by 2016.

- Consider adopting an existing entrepreneurship education and training method and course materials in TTEC and LaunchBox pre-campus company formation programs. One such might be the 'Lean Launchpad' approach, which was developed by Steve Blank at Stanford University and is now in use at numerous American universities including UC Berkeley and Columbia.

- **On-Campus Incubators of Start-ups**. The reviewers recommend that TR&I take a broader view of 'start-up incubator' to include both existing programs and facilities – e.g. LaunchBox and TTEC – as well as non-traditional 'campus incubators' such as entrepreneurship clubs, robotics clubs, student residences and project-based product design courses. Efforts should be made to extend university financial and in-kind support to these non-traditional incubators wherever possible, and to include them in the formal TR&I campus entrepreneurship network.

- We recommend that Trinity support the expansion of LaunchBox from its current summer-only program to a year-round format. This may require engaging the Trinity Foundation to assist with additional fundraising from alumni.

- Efforts should be made to improve the quality and quantity of coaches and mentors available to student and faculty founders. Compiling best practices in identifying, interviewing and doing performance evaluation and monitoring of coaches and mentors should be considered. As this is a problem that is faced broadly across the Irish entrepreneurship ecosystem, it is suggested that Trinity consider working with other Dublin-based universities and start-up organisations to developing onsite and online training/orientation programs specifically aimed at business coaches and mentors in the region.

- **Entrepreneur-in-Residence (EIR) Programs**. Building on the ongoing EIR experience of CRANN, the panel recommends that TR&I take broad responsibility for scaling up and coordinating EIR programs across the university. The reviewers support the creation of an expanded EIR on-campus presence across the College, to include other research institutes, as well as the various science, engineering, medicine and business schools and faculties. It is also recommended that TR&I create

a pool of 'floating EIRs' who move between the arts and humanities schools – as well as within the student residences - with the goal of working with students and professors to identify new commercial opportunities from non-technical research and teaching programs and activities.

- TR&I's role should be to loosely coordinate the use of EIRs around the campus, disseminate best practices, develop a common EIR contract/agreement template for individual academic units to use, assist with interviews and due diligence of prospective EIRs, provide a degree of quality control over the EIRs, and generally support and maintain a sustained EIR presence across all research and teaching units of the College.

- **Venture Seed Fund**. We endorse the proposal from TR&I that it assess the feasibility, and take early steps towards, the establishment of a venture seed fund between TCD and UCD.

- **Product Design Education and Training for Undergraduate and Post-Graduate Students**. We recommend that TR&I support the I&E strategy by increasing attention to, and support for, product design education, teaching, and associated prototyping facilities for undergraduate/post-graduate students. Product design competencies, which have recently been introduced in the Mechanical Engineering Department, are an essential skill for students to master when building successful new companies. The I&E strategy should include an objective to increase the number of undergraduate/postgraduate students taking product design education and training programs in the Trinity Engineering School to twice the current level by 2016.

- **Licensing and Contracting.** The Panel recommends that the research contracts section be formally responsible for the whole contract, rather than the piecemeal approach now adopted. We recommend that the technology transfer specialists continue to provide input, and that the research contracts and technology transfer contract functions work towards an ever closer integration of activity. Further, the opportunity should be taken to review the approach taken to contracting, with a view to optimising the policy approach for growth of long-term industry relationships whilst continuing to protect the interests of TCD

- We also wish to encourage ambitious targets for growth of research activity as a proportion of overall college turnover, and therefore recommend that TCD through the instrument of TR&I increases its access to competitive external funding. We are concerned that the number of KPI's presented on pp. 51-52 of the self assessment report is too large for easy management oversight and to have a real impact on steering and monitoring R&I performance. We therefore recommend that the TCD Executive management and TR&I leadership pick and monitor the 5 most relevant College-wide & the 5 most relevant TR&I-focused KPI's.

- Research Development and Business Development should work together to quickly develop a partnering approach for all existing industrial collaborators, using industrial funding to leverage increased H2020 funding. TCD should propose to work in partnership with Irish firms and cornerstone academic institutions across Europe to create consortia together, leveraging each other's names and networks.

7. Communication

- We recommend that the Senior Management of the University work with TR&I leadership to develop a comprehensive communications strategy for Research and Innovation with internal and external goals.

- TR&I must see marketing as the responsibility of all staff, and appropriate training is required to implement this.

- TR&I should be asked to create and support a dedicated section for 'research, innovation and entrepreneurship' content directly on the college homepage, which can be updated weekly, and where it will be seen by the greatest numbers of prospective students, companies and media organisations.

  Consideration should be given to inviting a TR&I representative to attend the TCD Communications Dept weekly college-level communications coordination and planning meetings, in order to ensure that research, innovation and entrepreneurship topics and themes are receiving adequate and proper placement in all college-level media channels, including the TCD homepage, Facebook fan page and Twitter feeds.

8. Governance

- TCD senior leadership should actively engage in further developing the appropriate governance for the Trinity innovation & entrepreneurship ecosystem; with TCD acting as its magnet. This also requires TCD to clearly articulate the position and responsibilities of TR&I within the broader TCD innovation and entrepreneurship ecosystem.

- We therefore strongly support the explicit inclusion of an entrepreneurship and industry relations' role and responsibility at TCD Executive level as a fully integrated part of the Dean of Research's role.

B. Reviewer Comments linked to the Recommendations Presented in TR&I 'Self-Assessment Report' of June 2014

In the interest of completeness and alignment with TR&I's prior efforts, this section presents a full listing of reviewer endorsements and comments on the detailed recommendations originally presented in "Summary of Key Recommendations for change within TR&I" in the "Self-Assessment Report" (SAR) of June 2014 (pages 11-15). In general, with few exceptions, the reviewers endorse the recommendations presented in the SAR but also suggest additional actions to be undertaken. The 'Summary Recommendations' section presented above in this document contains the full listing of reviewer recommendations in priority order, and represents our final and complete assessments as discussed in the subsequent sections of this report.

Recommendation 1: Review and modify the operational structure of TR&I

- The SAR recommendations are ENDORSED by the panel.
- **Also Endorsed**: Recommendation that a bigger portion of the TR&I unit costs should be mainstreamed into TCD funds over time (page 28)

Additional Actions Recommended by the panel:

- The KT&IC external Advisory Committee should be expanded to 11 persons, in order to accommodate at least 4 private sector serial entrepreneurs/venture investors, so that 'entrepreneurship' is sufficiently represented in committee and TR&I activities;
- Appoint a formal 'ICT Liaison' from within the existing TR&I staff, whose responsibility will be 1) to collect requirements and staff feedback for improvements/features needed for the TR&I ICT systems and applications, and 2) to liaise with the IS Department on these issues;
- Increase use of interns as part-time TR&I staff. Internships should be open to any student across the university, at any level, who has an interest in learning about commercialisation and tech transfer, including MBA and medical students;
- See also Section 1.0 below, "Organisation Structure, Management and Culture", page 14, for additional recommendations offered.

Recommendation 2: Contracts Office Function

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:

- The approach to and management of service contracts is a structural problem that should be remedied in order to fully capture the potential of service activities by TR&I. At present, both the process flow and the pricing policy are unclear. We suggest that a clear process for service contract definition and management be articulated and that ownership of this process be clearly defined. TR&I could become this process owner given the customer base targeted by this type of

contracts.
- See also Section 3.0 below, "Systems and Processes", page 21 for additional recommendations offered.

Recommendation 3: Trinity Strategy for External Engagement

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:
- The OCPKE should focus not just on companies in Ireland, but also on developing relations to technology multinationals in Europe (UK, Germany, Netherlands, Switzerland, Sweden, Norway, Finland, Denmark), USA and Asia (Japan, Korea, China, etc);
- Concrete metrics for assessing and incentivising direct engagement with companies, with the right groups and at the right levels, should be developed;
- Multiple mechanisms, template agreements and instruments for tiered industry sponsorships, at various levels of financial commitment, and at the different levels of the college (course support, departmental support, laboratory support, research project support, faculty/school-level support, college-level support) should be established and disseminated to Principal Investigators;
- See also Section 6.0 below, "Performance", page 27 for additional recommendations offered.

Recommendation 4: Trinity to improve supports for new companies

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:
- The integrated entrepreneurship activity plan for Trinity should include a clear and strengthened focus on undergraduate and post-graduate students
- Adopt the proven 'Lean Launchpad' entrepreneurship education and training teaching methods and course materials in TTEC and LaunchBox pre-campus company formation programs;
- Increase financial support and program format flexibility for LaunchBox to enable year-round operation and the inclusion of significantly larger numbers of undergraduate students;
- The TR&I Entrepreneur-In-Residence (EIR) program should be campus-wide, with some EIRs 'floating' between departments/schools, and others attached to one or more research institutes;
- TR&I should undertake a detailed bi-annual survey of students, researchers and post-doctoral fellows to determine which on-campus 'locales' (labs, research groups, courses, student residences, etc.) are most conducive to encouraging new company formation and to co-founder networking across the college;
- Assign the role of "Student Organizations Liaison" to a current TR&I staff person, who will liaise with and monitor student entrepreneurship activities on an

ongoing basis;
- The entrepreneurship activity plan should also address ownership and coordination of entrepreneurship education and training activities across the different administrative and academic units of the college;
- Continue and increase support for product design teaching and education courses, programs and facilities currently under development within the Mechanical Engineering Department (e.g. Course 4E5, 'Innovation in Product Development'), with the goals of including significantly larger numbers of students who are interested in entrepreneurship, building tighter linkages between entrepreneurship and product innovation teaching, and improving internal financial support for the course;
- 'Entrepreneurship strategy' is a key component of the recently launched strategic plan and we support its TCD-wide deployment within the colleges Strategy for Innovation and Entrepreneurship;
- See also Section 6.0 below, "Performance", page 27 for additional recommendations offered.

Recommendation 5: Building stronger relations to Trinity Research Strategy by TR&I

- The SAR recommendations are ENDORSED by the panel.

Recommendation 6: Improved personnel management structures

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:

- Institute formal 'staff recognition awards' to highlight superior performance by TR&I staff in key unit functions, processes and results;
- See also Section 1.0 below, "Organisation Structure, Management and Culture", page 14 for additional recommendations offered.

Recommendation 7: Development of Communications and Marketing Strategy

- The SAR recommendations are ENDORSED by the panel.
- **Also Endorsed**: new role of a communications and marketing officer (self-assessment report page 45).

Additional Actions Recommended by the panel:

- Upgrade and expand the role of social media – Twitter, Facebook, LinkedIn, YouTube, etc – as a central and priority channel for the TR&I communications and marketing strategy on a weekly basis;
- Set clear weekly targets and metrics for social media postings on research,

innovation and entrepreneurship success stories and events at college- and TR&I levels;
- Secure a dedicated section for 'research, innovation and entrepreneurship' content directly on college homepage, which can be updated weekly, and where it will be seen by the greatest numbers of prospective students, companies and media organisations;
- Request an invitation for a TR&I representative to attend the TCD Communications Dept weekly college-level communications coordination and planning meetings, in order to ensure that research, innovation and entrepreneurship topics and themes are receiving adequate and proper placement in all college-level media channels, including the TCD homepage, Facebook fan page and Twitter feeds;
- Consider use of enterprise social media tools such as Jive or Yammer to manage TR&I multiple social media channels more effectively and with greater impact, given staffing constraints;
- Meetings with key industry stakeholders (venture capital, entrepreneurship community) should be held at least Quarterly vs Bi-annually;
- See also Section 7.0 below, "Communications", page 35 for additional recommendations offered.

Recommendation 8: Commitment to benchmarking, culture review and customer feedback

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:

- Broaden formal definition of TR&I 'customer' to include undergraduate and post-graduate students, so that it is not limited just 'Trinity researchers and academics';
- Annual off-site review meetings should include industry stakeholders and advisors.

Recommendation 9: Establishment and management of a TR&I Risk Register

- This item was not considered within the scope of the present TR&I review.

Recommendation 10: Assessment of a venture seed fund

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:

- Coordinate and link this initiative with 'Trinity Angels' investor group
- See also Section 6.0 below, "Performance", page 27 for additional recommendations offered.

Recommendation 11: Annual analysis of research performance leading to new targets

- The SAR recommendations are ENDORSED by the panel.

Additional Actions Recommended by the panel:

- Results of this annual TR&I performance review meeting should go beyond a mere 'revision of the Trinity research funding strategy' and a 'short memo', to include 1) analysis of research performance at the department/faculty/school level, 2) the broad dissemination of the full report to all college PIs, and 3) meetings/workshops at faculty, school, institute or department level to discuss how each department/PI etc can improve its performance for the next year;
- See also Section 6.0 below, "Performance", page 27 for additional recommendations offered.

C. Detailed Reviewer Analysis and Recommendations

1. Organisation Structure, Management and Culture

The Quality Review panel assessed issues relating to organisation structure, management and culture, both internal and external to TR&I, insofar as these affect TR&I's ability to perform its core mission. Some of those issues are also related to the governance or systems and processes review (see below). They therefore will occur in a complementary manner across several sections of this report. The recommendations presented in this section are aimed both at College-level and TR&I management, as they address challenges and constraints across the College as well as those that fall inside the immediate scope of decision-making authority of TR&I.

Legal Affairs Oversight and Coordination. Whilst the realignment of contract negotiation and legal roles within TR&I remains a work in progress, we were concerned that the link to the College Legal Service must be further improved. As TR&I now have approval to recruit their own legal advisor, and are in the process of doing so, we assume that it will be possible to better oversee and coordinate all legal issues and risks pertaining to the research and innovation function, including contract negotiations with industry (see also RISK MANAGEMENT section). It is not clear that there is a comprehensive view of the full degree of legal exposure for the College in its research and innovation-related activities (see also PROCESSES section).

Management. The Quality Review panel finds a strong Leadership team for the Research and Innovation Vision and Mission in the Dean Prof Cahill and TR&I Director Dr O'Brien. Three layers of management are evident, starting with the four TR&I departments till 2014 (Research Office, Contracts Office, Technology Transfer Office, Entrepreneurship Office) that are now reconfigured into two departments (Research, Development and Contracts Office, Office of Corporate Partnership and Knowledge Exchange). These report to the TR&I Executive Director, who in turn reports to the DoR. The DoR overseas the concurrent missions of research and innovation.

We note, however, several specific College-level management-related issues during our visits, interviews and documentation review, which include the following and which are directly relevant to the TR&I review and recommendations:

- A personnel culture where administrative staff and members of the academic community fulfil truly complementary roles, in support of one another, should replace the current personnel culture where the complementary roles of administration and academic membership are still underdeveloped and under defined. This culture implies that members of the administrative staff are considered "professionals" throughout the organisation and are allowed to act accordingly. Academic and professional cultures thereby become two sides of the same coin throughout TCD.

- The complementary nature of academic and professional culture throughout the College should also enable the fusion of academic and administrative responsibilities at Executive and senior management level in the College. This is particularly important and relevant for the College-wide Executive leadership role in the area of Entrepreneurship.
- It is not the practice at present to give annual performance awards to College managers or staff in administrative units (including non-financial award plaques, certificates or other similar recognitions), leading to difficulties in providing meaningful incentives and rewards

Culture. The Quality Review panel believes that 'institutional culture' – the common mindsets, language and values that shape the daily and long-term priorities and behaviours of academics, professional administrators and students – deserves continuous and heightened attention given its ability to accelerate TR&I's innovation and entrepreneurship mission. The reviewers note a need to increase attention to institutional culture at Trinity, including the implementation of a focus on how Trinity must 'pivot' towards an innovation-centric culture that is inclusive of all disciplines and communities inside the College.

In order to build and grow "openness" to TR&I's innovation and entrepreneurship mission, we advocate a culture of strong academic leadership ethos across the various faculties and schools engaged. We also advocate a truly professional attitude at the level of the administrative staff, avoiding a "not-my-job" attitude that reflects a deep siloing and fragmentation of the professional organisation of the university that should continuously be corrected through the development and implementation of appropriate governance mechanisms, management systems and sustaining processes (cfr. infra).

TR&I specific issues

Organisation Structure. Based on the self-assessment report, the Quality Reviewers find that TR&I has a well-defined organisation structure with clear lines of authority, task divisions, job assignments and supervisory responsibilities. Now this structure needs a diligent and consequent implementation, with clear support from the highest executive level in the College.

Management. We find that TR&I leadership, management and staff so far have worked very hard to successfully introduce the much needed internal processes, structure, systems and management changes in recent years. These improvements, achieved within often severe, resource constraints, have had the combined effect of raising TR&I's performance, visibility and reputation within the College. TR&I managers are experienced, dedicated and competent in achieving localised performance targets for their respective areas. The TR&I 'Self-Assessment Report – 2014' is thorough, detailed and well written, and demonstrates that TR&I leadership has a strong understanding of its management challenges, constraints and potential solution paths. TR&I possesses highly competent leadership that demonstrates substantial prior experience and credibility within the academic and administrative communities in the College.

Interviews with TR&I managers and staff indicate that TR&I currently still faces numerous challenges, several of which we enumerate below:

- TR&I leadership and senior management need to fully embrace the fundamental change management process that is going on and is much needed throughout the TR&I organisation. Senior management at TR&I needs to understand its pivotal role in this process and to accept it fully and unequivocally.
- There should be more attention to create sufficient incentives and rewards for managers and staff to change current structure, processes, culture and mindsets; staff should receive adequate recognition from the rest of College for their work.
- There are no annual performance awards (non-financial or other recognitions) given to TR&I managers or staff for excellent work done.
- Workloads for several managers and staff are high and this situation should be recognised.
- Management Tools: as a rule, managers and staff should better employ or use effectively management tools such as graphic and visual representations of datasets, rather than to rely solely on text to describe underlying data. The current limitations result in part from the current difficulty of extracting required data and reports from the IT system, but also from a lack of sufficient training in the effective use of data to manage a TR&I

Culture. The review panel finds that dominant TR&I culture is still heavily built around individual 'administration', 'paperwork' and 'document processing' tasks as the unit's core function; staff, however, might better self-identify first-and-foremost as 'professionals' rather than 'administrators', in full support of an innovation-centric culture inside TR&I.

Interviews with TR&I managers and staff indicate that the group currently faces numerous culture-change challenges:

- Staff are confused about who they are supposed to be:
    - "Are we administrators or professionals?"
    - "Are we a team, or mostly a group of independent staff members?"
- Staff do not feel sufficiently empowered or incentivized, and they feel disconnected from their core constituencies throughout the College.
- Staff spend most of their time behind their desks, and rarely 'get out' to visit academic units at Trinity, or corporate partners, although the new TR&I policy actively seeks to remedy this situation.
- Some staff feels that they do not have sufficient training to perform their tasks, particularly in the area of making legal assessments.

Recommendations

TR&I specific issues

- **Management.** The following recommendations are offered by the review panel with regards to improvements in management at TR&I:

    - *Pursue change management as described in the self-assessment report much more vigorously and in a consistent manner.*
    - *Give annual performance awards (non-financial recognition such as a plaque, certificate, ceremony and public announcement) to selected TR&I managers or staff for excellent work done, and publicize widely across the university and outside Trinity.*

- **Culture.** The following recommendations are offered by the review panel with regards to securing changes in TR&I's internal work culture:

    - *Develop a clear identity for staff around being a "Professional" rather than an 'Administrator'; this should be done in close consultation with senior managers and influential staff members, as well as with the College HR department, and should aim to empower and incentivise staff to pursue more ambitious career paths for themselves.*
    - *Manage and balance workload of managers and staff by securing additional resources such as student interns where feasible.*
    - *Develop targets depending on role for all managers and staff to spend a sufficient and relevant time outside the office visiting academic units at Trinity and corporate partners. This could range from 4 hours per week to 75% of time.*
    - *Work with the HR department to provide high quality management training to selected TR&I staff, through a combination of in-university and external professional association courses.*

2. Resources

Although the focus of this review is on TR&I, a number of college-level resource issues do warrant attention. Therefore, both college-level and TR&I level issues are highlighted in this section.

College-level

- It is clear that the environment is one of significant financial constraints concomitant with the national financial position. This has led to declining core funding from the Irish government for universities, and a decline in government funding for competitive research grants. TCD is particularly reliant on exchequer funding sources for research and faces an urgent need to diversify into new sources of funding, whilst at least preserving and preferably increasing their market share of core government funding streams.

- The college is exploring a number of opportunities for expanding income streams under the "commercialisation" banner, with the recent appointment of a Director of Commercialisation, which we applaud.

- The system for obtaining professional legal advice did not seem to be functioning well. However, the ongoing recruitment of a legal advisor at TR&I should remedy this.

- Despite success in obtaining funding for new research institutes in previous years, TCD remains constrained in physical space and facilities. It is therefore strongly recommended to consider more adequate physical space and facilities for the TR&I operation.

TR&I-level

- As noted above, TR&I have been reorganised to meet the new strategic priorities of the College. There have been investments in some new staff, but there are still some difficulties in meeting the many demands on the unit with the existing resources. It seems that in some areas these needs can be at least partly addressed by an examination of and improvements in processes, particularly looking at the interfaces between the different TR&I teams.

- It is hard to judge whether process improvement would be sufficient in the short term to meet growing need; in the long term it is doubtful whether staffing levels would remain sufficient if the College succeeded in meeting its targets for the growth of research income. The College must look ahead and plan for success, investing in a timely way to ensure administration and support for research

grows along with the research itself, subject to a successful programme of process improvement to maximise the efficient use of existing and future investments.

- We heard on several occasions that staff was seeing an increase in complexity. This is a general issue across the HE sector, and is certainly to be expected, given the strategy to expand EU and industry funding, two of the most complex areas of funded research. This will require more time and expertise from contracts staff, and the reported difficulties in finding funds for training following reductions in non-pay costs give much cause for concern. Suitable training of staff should be a priority (and indeed can be an incentive in itself when opportunities for advancement are limited).

- In particular, the skill sets of staff were excessively siloed, which will limit the ability of TR&I to take advantage of the merger of different functions. In some cases there seemed limited understanding of the roles of adjacent functions within TR&I, and programmes of training and sharing to address this and create an end-to-end pipeline approach are advisable. Research and Innovation staff must have a good understanding of the whole business if they are all to be able to see and seize opportunities for the College to reach its goals.

- The recent appointment of a marketing officer is a positive move, as TR&I seems to have been historically underserved with communications expertise. Careful consideration of marketing strategies both within and outside the college will be needed.

- The use of student interns is being explored and management should consider how to extend this to improve the resource base, in areas where the cost of management does not exceed the benefits gained.

- The imminent retirement of Enterprise Director will leave a significant gap in the ability of TR&I to interact with the entrepreneurship training and support structure at TCD. This is a key growth area across the College and, although it is not solely of interest to TR&I it would be a mistake to sever this link. Whilst there is an absolute requirement to reduce staff numbers it is recommended to at least reconfigure the position to one that can be shared by other TR&I members.

- The current TR&I office accommodation accommodates TR&I staff on different levels and therefore is unsuited to the unified business function that TR&I aim to be, making it difficult to improve communication and cross-functional learning, build a team culture and the needed end-to-end pipeline business processes.

- *We recommend the College develop and resource a programme to train staff across TR&I, enabling staff to be more skilful in their roles, and more aware of the roles of the rest of the Unit.*

- *Ensure that TR&I has access to good legal advice and takes it appropriately.*

3. Systems and Processes

In this section we focus on the various operational processes in place. In addition, we take into account the IT systems in place and the degree to which they are fit for purpose.

- The current management of TR&I puts (rightfully so) a lot of emphasis on streamlining and optimising business processes both internal and external to TR&I. Internal business processes focus on the workflows and interactions amongst the various offices within TR&I (research office, contracts, etc.). External business processes focus on the workflows and interactions between TR&I and other College services (finance, legal, IS, etc.). The general conclusion of our analyses and interviews is that (1) the plans that are being developed definitely go in the right direction while (2) significant improvements can still be implemented and efficiency gains achieved.

- The new organisational principles currently being articulated at TR&I should further stress the importance and relevance of both informal and formal coordination mechanisms within the unit. For example, regular staff meetings and formal information exchange amongst the key staff and management of TR&I will help a lot in improving information flows on specific files and will generate more transparency as to how the various competence areas within TR&I can better interact and align both at the level of specific cases and at the level of general TR&I workflows. The continuous and stimulated interaction between IP experts and contract experts is especially relevant in this respect. Both dimensions of innovation contracts are so intertwined that it should be inconceivable to have them separated or isolated in the internal TR&I workflow. TR&I management understands those needs and we fully endorse its endeavours to improve upon them.

- Such structural mechanisms should be complemented by informal interactions amongst the TR&I staff members that are actively stimulated. Given the relatively limited size of TR&I, a healthy co-existence of formal and informal coordination mechanisms is both feasible and effective. In order to further stimulate those interactions, the physical structure of the TR&I offices should be taken into account as well. Coordination and communication are best stimulated when coupled to an architectural layout that enhances them. In this context, the search and the plans for office space, that better connects and supports TR&I workflows is judged relevant and important.

- In addition to the coordination and communication processes within TR&I, we also come to the conclusion that sufficient emphasis should be paid to visibly improving the College-level workflows external to TR&I. As mentioned already, the START programme will enhance the performance of the College-wide workflows. However as far as TR&I is concerned, we definitely want to point to the following gaps requiring significant attention and action:

- Interface with financial processes for award management;
- Post-award project management;
- Interface with legal advice;
- Interface with IS for the development and improvement of appropriate TR&I IT solutions.

- In addition, the approach to and management of service contracts is a structural problem that should be remedied in order to fully capture the potential of service activities by TR&I. At present, both the process flow and the pricing policy are unclear. We suggest that a clear process for service contract definition and management be articulated and that ownership of this process be clearly defined. TR&I could become this process owner given the customer base targeted by this type of contracts.

- Those business process reflections bring us to the need to further improve the IT systems supporting workflow processes and connectivity. At the moment, RPAMS and Inteum are the primary IT 'workhorses' used by TR&I to undergird their daily operations and processing of documentation. While an improvement over prior approaches to information management at TR&I, RPAMS still has notable shortcomings, including the absence of capturing documentation and data in an end-to-end workflow process manner, and the absence of good report extraction tools that are easy-to-use by TR&I staff. As a consequence, RPAMS faces silo problems similar to the ones mentioned at College-level. Connectivity of RPAMS applications to business intelligence and financial applications would be a welcome and major step forward, improving both the intra- and extra-TR&I workflows.

- Similar remarks hold for Inteum. As a stand-alone system, Inteum does a good job in supporting various TTO activities such as the electronic storage of documents relating to technology and their related patents, intellectual property agreements (including NDA's and MTA's), and contact details of researchers, individuals, academic and industry partners. It is managed by the High Performance Computing group within TCD. However, when it comes to accessibility by and connectivity to other systems operated within TR&I and at College-level, gaps are still to be filled. It is therefore recommended that all staff who require access to Inteum IP have access to it.

- It is good to notice that IS Services is fully aware of those limitations and the room for improvement that exist. IS Services is willing to operate in close partnership with the business process owner, i.e. TR&I, in order to prioritise IT systems improvement areas and to put them on the agenda of the College-wide priority list of IT systems' investments. We are convinced that a development partnership between IS Services and TR&I should be a high priority within the College. It will both enable and support TR&I to further implement the critical review of its

proper business processes in which it has now engaged as well as to further develop the systems necessary to underpin them.

In order to accomplish the above, TR&I will benefit from engaging in a formal and professionally supported process of change management. As we are convinced that the implementation of the above is by no means trivial, as it requires to critically review and redistribute responsibilities and activities within the TR&I operation, professional change management support will help to meet the challenge. In addition, and in line with the actions being taken at present by TR&I management, the importance of continuous staff training and development can and should not be underestimated. Therefore, we fully endorse the actions currently taken by TR&I management in this respect.

Recommendations

As a consequence, we recommend that TR&I should pursue the cohesive integration of contracts, research, IP and spin-off activities through transparent, lightweight formal and informal processes within TR&I, and between TR&I and other TCD units (e.g. finance, legal), including the necessary IT improvements as well as a strong emphasis on staff training and development to facilitate the transitions envisaged. These IT improvements should follow the integrated business logic and avoid silo concepts at all times.

We recommend that the detailed proposals on staff training and development, as described in the self-assessment report, to be fully and duly implemented.

4. Management of Risk

Risk and compliance are cornerstones of good governance practices at any institution. Although a full review of risk management processes was not within the scope of the analyses we conducted, we nevertheless paid attention to potential areas of risk regarding the TR&I operation.

It is our conclusion that TR&I related risk management processes can still be better articulated, understood and managed by the stakeholders involved. The following broad areas of attention are identified:

- general awareness of the overall and specific risk profiles of the major TR&I business activities (spin-offs, IP, contracts);
- potential reputational and financial risks in case of insufficient alignment of IP management and contract management;
- potential financial risks accruing to the research and innovation mission, function and administration;
- potential reputational and financial risks in case of limited coordination between the different legal functions at TR&I and TCD-level. The ongoing recruitment of a legal advisor at TR&I will improve this situation.

We note the intent to establish and manage a TR&I Risk Register, but offer no opinion as this issue was not discussed during the visit of the Review Panel to Dublin.

Recommendations

The main sources of risk identified concern financial risks, legal risks and reputational risks because of insufficient alignment or cohesion within TR&I and between TR&I and the other relevant domains at TCD-level. As a consequence, we recommend TR&I management (in concert with the TCD executive level) to pay sufficient attention to the different TR&I risk areas mentioned and to articulate the proper supervisory processes.

5. Alignment to Strategy

College-level issues

- The recent reorganisation of TR&I to bring together a number of disparate functions reflects well the extent to which research, innovation and entrepreneurship are woven throughout the 2009-2014 College Strategic Plan, and a key part of 6 of the 10 college-level objectives. The College has set challenging but appropriate objectives and have reorganised and invested towards those ends.

- Innovation in particular (technology transfer, industry collaboration and entrepreneurship) is championed by only a handful of individuals, reflected in the low level of business research funding compared to TCD's international competitors. TCD have recognised the urgent imperative to grow engagement and income from this source, reflected in the creation of the OPCKE.

TR&I-level issues

- The strategy to grow Horizon 2020 funding significantly is appropriate and TR&I have applied staff resource towards this end. The innovation focus of H2020 suggests a need for close collaboration between the research development and business facing of TR&I that is not yet strongly evident.

- Although the restructuring of TR&I reflects well the interlinked nature of research, innovation and entrepreneurship, the organisation does not yet have a culture that will allow it to fully realise its new potential.

- Firstly, many of the staff and management team see themselves solely as an administrative "back office", providing an important service but without a strong imperative to drive change. Whilst the delivery of an efficient and effective administrative service is necessary for research and innovation to function at all, it is equally important that all TR&I staff recognise their critical role in achieving strategic goals, working alongside the academic community.

- Secondly, the Office is still excessively siloed, with incomplete appreciation of the roles that others play in the same unit, and therefore of the opportunities to work together more effectively towards delivering college objectives.

- Adjacent administrative units have a key role to play, but the extent to which they recognise the need to work together to deliver college strategy is variable. On the one hand the finance department is working closely with TR&I to provide a better structure and approach for the management of service contracts; on the other hand the coordination of legal services can be

improved. The ongoing recruitment of a legal advisor at TR&I will address this issue. The Foundation recognise the positive role they can play in fundraising and external relationship building. The new "commercialisation function" will also be a key collaborator in the area of facilities for industry. The IT Service will be critical in delivering support for process design and system specification. TR&I must work hard to establish good process and cultural overlap with other support services, which must be persuaded to take as much ownership of these key strategic objectives as TR&I do.

- The Research Project Officers seeded throughout the institution are an important introduction, as are local supporters for business development and technology scouting in the research institutes. They will provide a bridge between concentrated TR&I expertise, and the departments and institutes. Research Institute Directors expressed an enthusiasm for working in partnership with TR&I, and RPOs and other staff seem a very appropriate way of building such partnerships. TR&I could consider where this model could consistently and usefully be applied in other areas of the TR&I function, although it may not be applicable everywhere (signing authority for research contracts, for example, may be considered too risky to devolve in this way).

Recommendation

We strongly endorse the ambitious targets College has set for growth and diversification, and for the strengthening of Research and Innovation. The work that College has done so far to reorganise and bring together TR&I is entirely appropriate, and we encourage the Director and Staff to work together to complete the planned changes and support the delivery of these goals.

6. Performance

The Quality Review panel assessed issues relating to the College's performance on key innovation metrics. The recommendations presented are aimed both at College-level and TR&I management, as they address challenges and constraints across the College as well as those that fall inside the immediate scope of decision-making authority of TR&I.

College-level

- The review team assessed the College's innovation performance along several relevant dimensions: external research grant funding objectives, level and depth of industry engagements, and entrepreneurship, e.g. the formation and spin-out of new companies. Broadly speaking, we find that the foundations for very strong performance in research, innovation and entrepreneurship are in place at Trinity College. The science base is excellent and thereby allows for a strong involvement in innovation and entrepreneurship activities. The financial performance objectives for the growth of research income are appropriate and necessary and should not be compromised.

- **Research Grant Funding Performance**. The panel finds that grant funding from Irish, European and other science funding agencies aimed at supporting scientific research today accounts for approximately one-third of the total Trinity budget. EU proposal success rates currently stand at 22-25%. Within the university, leading research institutes such as CRANN appear to be the highest performers in terms of research funding secured, IP generation and new company formation, with some variation across institutes.

- Data and views from external contributors to the review panel suggested that Trinity's performance metrics (such as collaborative proposals, licensing and spin-offs, see p. 41-43 of the self-assessment report) on its involvement with industry be closely monitored and compared to the accomplishments of its peers. Expectations of Trinity are high, and there is disappointment that it is not always ranked #1 or #2 (as might be expected from TCD's excellent science base). Trinity clearly has enormous potential, which is currently not being fully realised in its economic and social impact. To this end, Trinity could more regularly perform formal surveys among Principal Investigators to ascertain the primary reasons for proposal success/failure (like the one done in preparation for the Quality Review).

- **Industry Collaborations.** The review panel finds that Trinity has developed numerous relationships with enterprises aimed at supporting research collaborations funded in large part by SFI and European science and research funding programs. Taken as a whole, the overall level of funding from enterprises, however, remains quite low (currently at €2,5 million, with an objective of doubling this amount). We share concerns expressed by

interviewees that TCD's performance in this area could be higher, definitely in comparison to other Irish higher education institutions (see also p. 46-48 of the self-assessment report). Reasons stated for the performance around industry collaborations include lack of a strong domestic industry base around manufacturing and new product development, strong competition among all Irish universities for partnerships with multinationals in Ireland, and reluctance/lack of skills by Trinity faculty in approaching major enterprises with a view to understanding their business challenges.

- **Entrepreneurship and Spin-out of New Ventures.** The panel finds that Trinity has established a reasonable track record – for the Irish context – in entrepreneurship education and in the formation and spin-out of new ventures. We also note that Trinity Mechanical Engineering has recently created a new course in product design - Course 4E5, 'Innovation in Product Development' – which is filling an important gap in entrepreneurship education and training in Ireland. In the past two years, Trinity professors and students have created 2-to-8 new technology-based spinout companies each year (2007-2012 period), comparable to Oxford and KU Leuven. Non-technology companies (SMEs) in design, food and beverages and services are also formed from time to time, and can generally find incubator space in the TTEC facility.

There is (in common with most universities) no good data on numbers of start-ups which do not involve university IP (from undergraduate and post-graduate students, for example) and TR&I should consider collating and publishing this information, to set targets for growth in this key area.

TR&I-level

The review team also assessed TR&I's innovation performance along several relevant dimensions: startup creation and spin-outs, licensing of intellectual property, contracting and responsiveness to university and industry clients. Based on our interviews, there exists a broad sense within the College academic community today that TR&I has improved its services in recent years, and that it is generally responsive to the needs and requests of both academic and administrative units.

- **Start-up Creation and Spinouts.** The panel assessed the current state of entrepreneurship, start-up creation and spinout through interviews, meetings, site visits and the review of official documents. Our findings are grouped into three main areas:

- **Start-up Creation Performance Metrics.** We are cautious about metrics around numbers of companies, as pursuing this risks compromising quality. Nevertheless, benchmarking to ensure the metrics as measured nationally are competitive within Ireland and internationally should continue to be pursued.

- TR&I today tracks only formal 'campus companies' that come out of research laboratories with intellectual property generated and owned by the university. "Informal" companies started by students in residences, entrepreneurship and robotics clubs, and classrooms, that do not employ university-owned intellectual property, are not tracked. As a result, the official statistics for Trinity do not capture the full picture of on-campus start-up activity, including new companies created by students in product design courses.

- **On-Campus Incubators of Start-ups.** Trinity has developed two start-up incubators on its campus, the first being TTEC, and the second and most recent being LaunchBox. The TTEC program is operated under TR&I's supervision, and has engaged a full time entrepreneurship support person for some years (the Enterprise Executive); the postholder is retiring and the Enterprise Executive position is being eliminated as a part of the ongoing broader financial rationalisation across the College. There is some uncertainty about the future engagement of TR&I in this space, which should be clarified urgently. We suggest that it is appropriate for TR&I to have a strong role leading entrepreneurship across TCD. We applaud the diversity of firms in TTEC, including tech, design, crafts etc, and wish to encourage this, particularly if this were a route for deeper engagement with the arts and humanities. We would also encourage continued outreach to the business community to bring in high quality coaches and mentors with concrete business growth skills.

- The LaunchBox summer program was established in 2013 as a Trinity alumni initiative, and is supported largely through alumni donations; while its main focus is on technology-based companies, it does support non-tech teams as well. The budget for running the summer program is around Euros 100,000. It possesses its own mentor network that is also of variable quality. Being only two years old, and operating only during the summer, we believe that it is too soon to judge LaunchBox's success on the how much private venture capital that its teams might have raised.

- **Entrepreneurs-in-Residence (EIR) Programs**. Selected research institutes – most notably CRANN – are exploring the use of EIR programs for increasing and accelerating the number of spinout companies. The CRANN program is still experimental, and is being watched closely by TR&I and other research institutes for lessons learned and evidence of success. The reviewers did not observe a coordinated approach and strategy towards the use of EIRs across all research institutes, or more broadly across faculties.

- **Licensing and Contracting.** The panel heard both criticisms and plaudits for the research contracts function from external businesses. The panel is cautious in assessing these, as such criticism is regularly heard from companies by every

university; some is warranted, and some is not. Nevertheless, it seems that there is certainly room for improvement in delivering contracts that deliver mutual wins for companies and the new closeness with the tech transfer and business development functions present an opportunities to reassess policies and approaches to negotiation. As well as developing more effective processes, there may be room for more industry-friendly stances whilst still protecting the interests of academic freedom to publish and conduct research.

- We welcome the intended move to better integrate the IP & contract activities; developing staff competences & interactions on specific files and workflows. The self-assessment report contains a good overview of relevant items for improvement, though what is really needed to make them work is a cohesive, user-friendly interactive process between IP experts & contract experts. We take the view that one function ought to have responsibility for the whole contract, which is not currently the case.

- **Responsiveness to University and Industry Clients.** A frequent comment from both internal and external clients was that TR&I "should get out more". The focus on administrative activity over networking and advising is clearly inhibiting the staff from spending enough time in contact with academics and businesses. Although staff feel that pressure of work prevents this, this is potentially a false economy – time spent building personal relationships tends to reduce transaction time over deals and contracts. As noted above, concrete, planned steps should be taken to ensure that staff members in all sections spend more time listening and speaking to business and academics.

- There is a clear and shared ambition between TCD and the major corporations (or their subsidiaries) based in Ireland to increase participation in and revenues from Horizon2020 programmes. This is a partnering opportunity that could be addressed as a joint priority by the research development and business development teams.

Recommendations

College-level

The following recommendations are offered by the review panel to improve research and innovation performance at the College level:

Research Grant Funding. *The reviewers recommend that greater attention be paid to 1) increasing the number of grant proposals written and submitted annually by Trinity, and 2) raising the quality of proposals with a view to improving success rates in calls. Successful approaches here need to be widely disseminated and scaled up across campus through organised workshops around best practices, online archives of video interviews with model*

Principal Investigators, and archives of example successful proposal templates. Suggested ways of achieving higher quantities and quality of submissions include the following:

- *Partner with leading multinational corporations based in Ireland for Horizon2020 topics and projects. At the same time, build strong European networks of academic partners who can act as cornerstones in various Horizon 2020 programmes. Approach prospective corporate-university partners on the Continent together as a team with the goal of securing stronger enterprise and academic consortia partners within Europe.*
- *Increase the number of Trinity professor 'Expert Evaluators' who are listed in EU expert databases, and who can participate in Horizon 2020 proposal reviews in Brussels. Encourage them to share their insights on the proposal evaluation process with colleagues back in Dublin via video interviews or workshops.*
- *Bring in greater numbers of Adjunct Professors to assist Principal Investigators with writing grant-funding proposals. This may be of considerable value in increasing the number of funding proposals emanating from Trinity to SFI, the ERC, EU and companies each year.*
- *Undertake a formal survey among Principal Investigators to ascertain the primary reasons for proposal success/failure.*
- *Improve training content, and participation in training programs, around proposal writing and understanding the proposal evaluation process.*

- **Industry Collaborations**. *We recommend that Trinity's schools and departments proactively explore new avenues and models for building industry collaborations in important emerging research and technology domains, such as robotics, product design, artificial intelligence and manufacturing, to name just a few. The new Mechanical Engineering course 'User-driven Product Design' (4E5, delivered by the Assistant Professor Mechanical and Manufacturing Engineering) has, for example, pioneered a new model of TCD-industry collaboration built around multinational ICT enterprise support (SAP Ireland) for a ground-breaking project-based engineering course. Industry engagement around other taught courses in engineering, science, medicine and business is also worth exploring, with the objective of moving some of these connections into research-oriented collaborations in the future (see also GOVERNANCE).*

- *For Trinity to become more successful in developing industry collaborations of mutual benefit to companies and the university, faculty and staff will need to upgrade the level and manner in which relationships with top enterprises are developed. Specifically, we strongly recommend that the College place greater emphasis on the following types of activities and training for faculty and staff:*

  - *Increase onsite visits to companies (in Ireland, UK, Germany, USA, Asia), with the objective of understanding each firm's culture, key personalities, downstream customer base, and business challenges.*
  - *Develop improved methods of building and tracking the 'pipeline' of new corporate prospects and established relationships. Engage in better-organised*

and coordinated efforts to move major strategic corporations up the 'value chain' and sales pipeline inside Trinity (aka 'upselling').

- *Clarify policies as to how the 'ownership', coordination and hand-off of enterprise relationships should be handled between professors, staff, departments, schools, faculties and the College, when engaging in strategic upselling to major corporates.*
- *Develop a system of tiered industry sponsorships that employ multiple mechanisms, template agreements and instruments, at various levels of financial commitment, and at the different levels of the college, which allow quicker closing of 'deals' with companies according to the collaboration type: course support, departmental support, laboratory support, research project support, faculty/school-level support, college-level support.*

Finally, as has been discussed elsewhere in this report, the review panel recommends the establishment of a College-level mechanism for coordinating strategic industry relationships (a 'Committee' or 'Working Group') that meets on a regular basis, with representation from TR&I, Trinity Foundation, research institutes and other enterprise relationships 'owners' and stakeholders (see also GOVERNANCE).

TR&I-level

The following recommendations are offered by the review panel with regards to securing improvements in innovation performance metrics within TR&I:

- *It is recommended that TR&I begin tracking, as best as possible on a bi-annual survey, the 'informal' start-ups being created at Trinity by undergraduate and post-graduate students in residences, dining halls, clubs and classrooms, and that do not often employ formal IP developed in Trinity research laboratories. While exact numbers of such 'informal' companies will not be possible to obtain, estimates will give Trinity innovation and entrepreneurship leaders and administrators a better sense of how many companies are being founded, where on campus outside of labs they are coming from, how and where co-founders are connecting, and what patterns of 'founding' are being seen.*

- **Entrepreneurship Education and Training for Undergraduate and Post-Graduate Students**. *We recommend that TR&I* supports the I&E strategy roles of the Business School and I&E hub by increasing attention to, and involvement with, *entrepreneurship training and support of undergraduate/post-graduate students and new companies formed by them. This strategy should include an objective to increase the number of undergraduate | post-graduate students taking entrepreneurship education and training programs to twice current level by 2016.*

- *Consider adopting an existing entrepreneurship education and training method and course materials in TTEC and LaunchBox pre-campus company formation programs. One such might be the 'Lean Launchpad' approach, which was developed by Steve Blank*

at Stanford University and is now in use at numerous American universities including UC Berkeley and Columbia.

- **On-Campus Incubators of Start-ups**. *The reviewers recommend that TR&I take a broader view of 'start-up incubator' to include both existing programs and facilities – e.g. LaunchBox and TTEC – as well as non-traditional 'campus incubators' such as entrepreneurship clubs, robotics clubs, student residences and project-based product design courses. Efforts should be made to extend university financial and in-kind support to these non-traditional incubators wherever possible, and to include them in the formal TR&I campus entrepreneurship network.*

- *We recommend that Trinity support the expansion of LaunchBox from its current summer-only program to a year-round format. This may require engaging the Trinity Foundation to assist with additional fundraising from alumni.*

- *Efforts should be made to improve the quality and quantity of coaches and mentors available to student and faculty founders. Compiling best practices in identifying, interviewing and doing performance evaluation and monitoring of coaches and mentors should be considered. As this is a problem that is faced broadly across the Irish entrepreneurship ecosystem, it is suggested that Trinity consider working with other Dublin-based universities and start-up organisations to developing onsite and online training/orientation programs specifically aimed at business coaches and mentors in the region.*

- **Entrepreneur-in-Residence (EIR) Programs**. *Building on the ongoing EIR experience of CRANN, the panel recommends that TR&I take broad responsibility for scaling up and coordinating EIR programs across the university. The reviewers support the creation of an expanded EIR on-campus presence across the College, to include other research institutes, as well as the various science, engineering, medicine and business schools and faculties. It is also recommended that TR&I create a pool of 'floating EIRs' who move between the arts and humanities schools – as well as within the student residences - with the goal of working with students and professors to identify new commercial opportunities from non-technical research and teaching programs and activities.*

- *TR&I's role should be to loosely coordinate the use of EIRs around the campus, disseminate best practices, develop a common EIR contract/agreement template for individual academic units to use, assist with interviews and due diligence of prospective EIRs, provide a degree of quality control over the EIRs, and generally support and maintain a sustained EIR presence across all research and teaching units of the College.*

- **Venture Seed Fund**. *We endorse the proposal from TR&I that it assess the feasibility, and take early steps towards, the establishment of a venture seed fund between TCD and UCD.*

- **Product Design Education and Training for Undergraduate and Post-Graduate Students**. We recommend that TR&I support the I&E strategy by increasing attention to, and support for, product design education, teaching, and associated prototyping facilities for undergraduate/post-graduate students. Product design competencies, which have recently been introduced in the Mechanical Engineering Department, are an essential skill for students to master when building successful new companies. The I&E strategy should include an objective to increase the number of undergraduate/postgraduate students taking product design education and training programs in the Trinity Engineering School to twice the current level by 2016.

  Licensing and Contracting. *The Panel recommends that the research contracts section be formally responsible for the whole contract, rather than the piecemeal approach now adopted. We recommend that the technology transfer specialists continue to provide input, and that the research contracts and technology transfer contract functions work towards an ever closer integration of activity. Further, the opportunity should be taken to review the approach taken to contracting, with a view to optimising the policy approach for growth of long-term industry relationships whilst continuing to protect the interests of TCD*

- *We also wish to encourage ambitious targets for growth of research activity as a proportion of overall college turnover, and therefore recommend that TCD through the instrument of TR&I increases its access to competitive external funding. We are concerned that the number of KPI's presented on pp. 51-52 of the self assessment report is too large for easy management oversight and to have a real impact on steering and monitoring R&I performance. We therefore recommend that the TCD Executive management and TR&I leadership pick and monitor the 5 most relevant College-wide & the 5 most relevant TR&I-focused KPI's.*

- *Research Development and Business Development should work together to quickly develop a partnering approach for all existing industrial collaborators, using industrial funding to leverage increased H2020 funding. TCD should propose to work in partnership with Irish firms and cornerstone academic institutions across Europe to create consortia together, leveraging each other's names and networks.*

7. Communications

- The recent appointment of a Marketing Manager is vital. TR&I need to address internal and external audiences with strong messages about the value of Trinity and external organisations working together on research and innovation. However, this cannot be the role just of one individual. Communication of the value and importance of Research and Innovation at Trinity must become the responsibility of all TR&I staff, because they all come into contact with internal and external stakeholders as part of their jobs.

- A clear and consistent message was received from stakeholders (internal and external) that TR&I staff "need to get out more." For all areas of TR&I the recognition by all staff that their approach to their daily job *is* a key part of the communication strategy is very important. This is beginning to happen and must be supported.

- The siloed approach to job roles in TR&I mentioned earlier inhibits the cross promotion of the many opportunities to work with Trinity to external organisations. Technology transfer staff must be able and willing to promote the benefits of research collaboration. Business Development staff must know enough about Horizon 2020 to promote it to businesses they speak to as a source of funds for collaboration. There are many other opportunities, and searching for them must become second nature.

- TR&I senior staff have a key role in formulating communications, data and messages for the DoR and his colleagues to promote the strategy and activity of TR&I across the college. This must be borne in mind as the reorganisation of TR&I is followed through, and systems are upgraded.

- The culture of TR&I is in transition from one of administrative support to one of professional support and management. Completing this culture change and communication this is a necessary goal for TR&I to fully support College Strategy, and should also increase job satisfaction and professional standing for TR&I staff.

- *We recommend that the Senior Management of the University work with TR&I leadership to develop a comprehensive communications strategy for Research and Innovation with internal and external goals.*

- *TR&I must see marketing as the responsibility of all staff, and appropriate training is required to implement this.*

- *TR&I should be asked to create and support a dedicated section for 'research, innovation and entrepreneurship' content directly on the college homepage, which can be updated weekly, and where it will be seen by the greatest numbers of prospective students, companies and media organizations;*

- *Consideration should be given to inviting a TR&I representative to attend the TCD Communications Dept weekly college-level communications coordination and planning meetings, in order to ensure that research, innovation and entrepreneurship topics and themes are receiving adequate and proper placement in all college-level media channels, including the TCD homepage, Facebook fan page and Twitter feeds*

8. Governance

The governance of the technology transfer function in an academic environment focuses on the development and implementation of a structure, processes and context within the university conducive to innovation and entrepreneurship. An appropriate structure should provide adequately designed incentive and organisational mechanisms, which translate into effective processes, i.e. day-to-day operations, of knowledge creation and a drive for innovation within the institution. Processes central to managing academic science toward commercial and societal exploitation are related to knowledge management, project management and new venture creation. But, of course, an appropriate organisational structure needs to be embedded in a supportive context. Context is related to the institutional and policy environment, the culture and the history that have unfolded within the academic institution. It shapes and configures the norms, values and attitudes of academic researchers towards combining "curiosity-driven" research and actively seeking and supporting the "market-relevant" opportunities that originate from this same research. In addition, effective governance of the technology transfer function requires a sufficient level of autonomy for its operations. It is against this background that we studied the governance in place at TCD in relation to its TR&I operation. Those governance issues are best considered simultaneously at TCD- and TR&I-level, taking the perspective of the activities of research, innovation and entrepreneurship at the College. We therefore conclude that:

- Trinity senior leadership responsible for the research and innovation strategy and mission of the College (i.e. the DoR) has a good and well-balanced overview of the challenges facing the College as to the development of an innovation-centric culture and an appropriate execution environment. Based on the self-assessment report, on the documents provided during our visit and on the interviews we did, we are convinced that the executive management of the College maintains good and straightforward communication lines with the leadership of TR&I and is closely involved in the strategic thinking on TR&I issues and activities.

- In addition, the creation of a new champion role for 'entrepreneurship' is recommended. If TCD and TR&I want to become a centrepiece in an entrepreneurial ecosystem, then there is a need to visibly champion the entrepreneurship drive at the senior leadership level of TCD. This will enable and direct TCD and TR&I efforts to diffuse entrepreneurial ambition and activity throughout the academic curricula as well the various Schools and Research Institutes. Whereas the TCD champion role will support the presence of entrepreneurial spirit and effort throughout all segments and activity areas of the college, the TR&I role will be specifically focused on the start-up process, including the specific technology transfer issues involved, the business plan development, the coaching and nurturing of the entrepreneurial team(s) and access to venture capital and other relevant sources of (incubation) funding needed during the start-up process. Those TR&I activities are well described in the self-assessment report. We fully endorse them.

- We see this governance structure at the level of research and innovation, though we think it is still lacking at the level of entrepreneurship activities. TR&I has a clear role to play in both instances (in line with what is described in the TR&I business plan and self-assessment report). However, the position and governance of TR&I in the broader scope of entrepreneurial activity throughout the College would then also receive proper (and hence better) attention. At present, the coherence and the cohesion of the various efforts in the areas related to entrepreneurship, and the role of TR&I therein, could be better articulated and hence less fragmented throughout the College.

- As part of this College-wide governance, we also want to pay special attention to fine-tuning the organisation of legal support throughout TCD (in conjunction with TR&I) as TR&I is now in the process of recruiting its own legal support function, including the College-wide coordination across the different legal functions and their respective topical responsibilities. As already mentioned in the Risk Management section, we see significant improvements possible in this area.

- Finally, we see a lack of clarity around the ownership of industry relationships of the College. TR&I can definitely play a strong role in this respect (e.g. the business case managers present at TR&I), however the ownership of the industry relationship should also be clarified at TCD Executive level (and it may be different for different companies).

Recommendations

- *Hence, TCD senior leadership should actively engage in further developing the appropriate governance for the Trinity innovation & entrepreneurship ecosystem; with TCD acting as its magnet. This also requires TCD to clearly articulate the position and responsibilities of TR&I within the broader TCD innovation and entrepreneurship ecosystem.*

- *We therefore recommend the explicit inclusion of an entrepreneurship and industry relations' role and responsibility at TCD Executive level (either combined with an existing Executive mandate or as a new Committee membership) that will liaise directly with the management of TR&I.*

Response from the Director of TR&I

Overview:
TR&I welcomes the external reviewers report. We greatly appreciate the time and energy they have contributed to this process; the clarity of their recommendations and their willingness to share their best practice and experience for the benefit of TR&I and Trinity College Dublin. In particular we appreciate the positive feedback in relation to the self-assessment document; the reviewers noted that *"The TR&I 'Self-Assessment Report – 2014' is thorough, detailed and well written, and demonstrates that TR&I leadership has a strong understanding of its management challenges, constraints and potential solution paths"*. In particular we are pleased that recommendations which TR&I as a unit developed were all strongly endorsed and in many cases enhanced by the reviewers. This recognition provides the unit with confidence that it is moving in the correct direction and that its leadership can deliver the changes which are required to achieve its ambition to deliver an internationally leading service for Trinity.

Comments on the core issues identified:
The reviewers report had numerous recommendations which covered a broad spectrum from incremental changes to transformational reform of some parts of TR&I. At the core of these recommendations were four core themes which are addressed below.

HR Issues and Change Management:

TR&I has developed a roadmap for organisational change. This roadmap was endorsed by the reviewers and they also emphasised some key points which are noted below.

An overarching challenge identified by the reviewers was how TR&I staff define their roles – are we "professionals or administrators"? This point captures the clear differentiating proposition of the unit. Is it our role to act in a passive capacity to process paperwork and provide a regulatory function for Trinity or should we have a clear focus on where we add value? In other words are we a "back-office" or "front of house" unit. Through the self-assessment process the unit has clearly determined – in agreement with the reviewers – that we are and must be both "professional" and "front of house" if we are to successfully serve the needs of Trinity.

In the context of the above challenge it is recommended that TR&I continue to implement a *"vigorous pursuit of change management"*. This view had already been self-determined but we hope the validation of this recommendation will enable the required supports from within Trinity to be provided to support this process. As the reviewers highlight, a successful change management process will need support from senior management within Trinity and in

particular from Human Resources (HR). TR&I cannot, and should not be expected to, transform in a vacuum.

The reviewers noted that this change process will be challenging with many staff already having high work load levels. TR&I will require flexible HR approaches which embrace restructuring, retraining of staff, continued professional development of staff, the utilisation of internships and where appropriate the addition of new resources. Specifically the reviewers "*recommend the College develop and resource a programme to train staff across TR&I, enabling staff to be more skilful in their roles, and more aware of the roles of the rest of the Unit.*" It is also recommended that clear deliverables for all staff and the unit be established. This view is wholly supported by the management team and work is already in train to implement accordingly; but it is critical that the full support of Trinity is provided to enable the implementation of these recommendations.

Structure of TR&I

Although the reviewers noted that *"TR&I has a well-defined organisation structure with clear lines of authority, task divisions, job assignments and supervisory responsibilities"* it is also recognised that change is required to further optimise this structure to ensure the unit is able to deliver on its developing mandate. Specifically the reviewers supported the recommendations made within the self-assessment document in relation to:

- The proactive development of an industry engagement mandate and the establishment of an office of corporate partnership and knowledge exchange. This is already happening with some success.
- The evolution of the contracts office function to be in charge of the whole contract negotiation – including intellectual property. It is noted this change of responsibilities will have consequences for both resourcing and training.
- The creation of improved inter-unit collaboration e.g. the research development and the OCPKE team working together to support collaborative programmes with industry.
- The development of a clear mission statement for TR&I aligned with the entrepreneurship agenda for Trinity and the continued need for TR&I to have a leadership role in the running of the incubation activity in TTEC.
- The development of Launchbox into a year round incubator for student companies.
- The development of a stronger focus on communications and the clarification that communication is a responsibility of all the staff.

TR&I is currently undertaking many of the structural changes endorsed by the quality review but these changes to be successful will require the HR supports and senior management buy-in as articulated previously.

Resources

Throughout the reviewers report it was noted that resourcing was required to support the development of TR&I as it increased its responsibilities and looked to deliver on the growing research and impact ambitions of Trinity. Specific resources noted included:

- Staff. As the report noted *"The College must look ahead and plan for success, investing in a timely way to ensure that administration and support for research grows along with the research itself, subject to a successful programme of process improvement to maximise the efficient use of existing and future investments."*
- IT capability. The reviewers noted that the IT infrastructures currently in place to support TR&I are not suitable for the increasing complexity of the organisation and need to be developed or replaced. This will require both finance and expertise to be focused on these challenges.
- Space. The current space which houses TR&I was recognised as not being fit for purpose. The plan for TR&I to move to the new business school is now off the agenda. There is an immediate need to address the space for the unit to ensure it allows both an effective external interface with industry and also the appropriate internal environment to maximise the synergies across the unit. This in the view of the Director is one the biggest issues in enabling the appropriate change required.
- Financing. The reviewers noted the dependence of TR&I on non-core funding and recommended that Trinity support a higher percentage of the unit from core funding.
- Seed fund. The vision for establishing a seed fund with UCD was endorsed as a sensible next step in the evolution of Trinity's role as an active player in entrepreneurship and commercialisation.

Culture:
TR&I welcomes the positive recommendations from the panel in relation to the development and evolution of the internal culture – both within the unit and Trinity. Specific recommendations worth noting include the following:

- KPIs. TR&I should identify 5 to 10 key performance indicators which define the mission and measure the success of the unit. This work is already in progress.
- External focus. The clear message from the reviewers is that the staff must be more externally focussed and "get out more". This is a clear message from our own self-assessment and aligns strongly with the desire of the unit to be front of house. In addition the need for annual surveys of the units customers was also recommended. TR&I carried out a survey this year and we will continue to do so into the future.
- The review articulated the goal of improving the harmony between the academic and professional leadership with both roles becoming mutually enabling and amplifying. Although TR&I believes it has strong support from the senior management within Trinity we are committed to improving these relationships to ensure we develop a more effective organisation for Trinity.

It is noted that all of these recommendations are wholly consistent with the self-assessment report and the mission of the unit to be responsible for the development of research capacity and the translation of that capacity to achieve impact for Trinity and Ireland.

Conclusions:

TR&I believes the quality review has fully endorsed its strategic vision, its roadmap for change and the core recommendations it brought forward in the self-assessment. TR&I fully acknowledges that the implementation of these changes are, and will be, challenging and welcomes the recommendations of the quality review in relation to the need for well-defined supports from both HR and the senior management in Trinity. In addition we note the need for Trinity – in conjunction with the optimisation of existing resources – to be open to the provision of appropriate additional resources (space, people, IT etc.) to enable these changes to be implemented successfully. We commit to working with the Dean of Research and the Vice Provost to address fully the recommendations arising from the report to create an improved TR&I which will be better positioned to serve the best interests of Trinity. We will prepare a detailed Implementation Plan outlining the timeframe for implementation in the near future.

Response from the Dean of Research

Introduction

I would like to begin by thanking the reviewers for the depth of their engagement in the review of Trinity Research and Innovation (TR&I) as well as their consideration of the implementation of other aspects of the College's Innovation and Entrepreneurship strategy to which they were exposed during the review process. This is well reflected in the quality of their very detailed report which shows a deep understanding of the role and positioning of TR&I within the College, its increasing importance as a professional support organisation to colleagues across the College and also the challenges that it faces.

Overall response

The recommendations made by the reviewers are clear and concise and in very many cases support the unit's self assessment and its self-determined recommendations for improvement. The unit has a key role to play in supporting a number of major College strategies including the Innovation and Entrepreneurship strategy, the development of the Innovation and Entrepreneurship Hub (working title), the Industry Strategy and the Research Funding Diversification Strategy. The report paints a picture of an organisation that is committed to successfully playing this role for Trinity but also one that, while already undergoing significant change, is aware of and committed to the need for further change. At the highest level, the role of TR&I as a team of professionals partnering with the College community to enhance Trinity's impact across the whole spectrum of research-related activity from identification of research funding opportunities, to research proposal submission, and contract negotiation through to licensing of the resulting intellectual property and/or the establishment of spin-out companies is clear. While individual staff have a role to play at different points along this spectrum, it is important that the organisation is structured to provide a seamless service to the College community.

Conclusions

In summary, I look forward to working with the staff of TR&I to plan the implementation of the key recommendations made by the reviewers and their execution.