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

Quality Review of the School of Engineering

25-28 November 2024

Review Team:

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2. Professor Ilse Jonkers, KU Leuven, Belgium
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Introduction

The external review of the School of Engineering at Trinity College Dublin (TCD) took place from 26-28 November 2024. The external review team consisted of Professor David Gillespie University of Oxford, Oxford (UK), Professor Ilse Jonkers, KU Leuven (Belgium), University Lecturer Mathias Wien, (RWTH Aachen,Germany) and Professor Bart van Arem (TU Delft, the Netherlands). In preparation, the external review team studied the extensive documentation provided by the School, particularly the Self-Assessment Report and the Strategic Plan 2022-2026. Professor Graeme Watson from the School of Chemistry at TCD provided local context.

The review team was impressed by the excellent preparation and organisation of the review, which resulted in three well-spent days. Although the documentation was already extensive, additional documentation was provided promptly when needed. The meetings with the various groups went smoothly, and the visits to the different locations, particularly the E3 Foundry Building, provided an excellent impression of the facilities. The review team wishes to acknowledge the excellent support by Michael Cleary-Gaffney and Seana Lynch from the Quality Office for the organisation of the visit and Yseult Thornley for meticulously and accurately taking notes.

The School of Engineering consists of three disciplines, Civil, Structural and Environmental Engineering (CSEE), Electronic and Electrical Engineering (EEEN) and Mechanical,Manufacturing and Biomedical Engineering (MMBE) and has some 250 staff members in total. The review team met many of them and appreciated the open and frank discussions. The review team was impressed by the strong commitment of all staff members to education and research, based on strong expertise at all levels and with a positive attitude even in challenging conditions.

The review team has interpreted its role as providing reflection and direction to the School to maintain and further strengthen as a national and international academic group, identifying typical strengths and opportunities, as well as barriers.

The School Strategy

In the 2020 – 2025 strategic plan for TCD, “Communities and Connection”, the E3 initiative in Engineering, Environment and Emerging Technologies and the development of an Innovation Campus at Grand Canal Dock were proposed as means to allow the challenges of globalisation, technology, and environmental change to be addressed. It was acknowledged that these developments would happen in a climate of reduced exchequer funding of higher education and research in Ireland.

In this context, and despite disruption arising from Covid and inflationary pressures, the E3 *teaching* building will be delivered and ready for use in the academic year 2025 / 2026, aligning the School and College strategies. Here, the School has designed an impressive space and planned for transformational change in the teaching experience and the ability for students to engage with new ways of learning. The School has been proactive in developing new courses and areas of research to train engineers and tackle emerging research and societal themes. The introduction of the Environmental Science and Engineering course is timely, and excellent feedback from students regarding its launch, content, and teaching has been received. The

core general engineering degree continues to educate multidisciplinary engineers at Bachelor and Master's levels, with numbers rising to an intake of ~240 per year. Professional accreditation of the courses has been renewed in all engineering disciplines. The number of students in the associated Engineering with Management course remains viable at 30 – 35. The School has engaged with the continuous professional development of engineers and technical staff in industry through Diploma and micro-credential courses in line with the University's Communities and Connection theme, though the number of participants for some of these courses is very low.

The School's personnel strategy has been to increase its academic staff to allow for an increase in undergraduate numbers and the volume of research conducted. Fiscal constraints have sometimes led to pragmatic decisions regarding the increase in staffing in different categories. To date, increasing administrative and technical support staff commensurate with the rise in academic activity has proved challenging. Therefore, it is unsurprising that administrative staff retention appears to be difficult. It is key that this is addressed in the short term and that the goal of reaching a 14:1 teaching ratio is achieved in an environment where new activities and academic appointees can be sufficiently administratively supported. Without a recruitment and succession strategy for technical and administrative staff, the successful operation of the expanded School, hands-on learning provision in E3, and higher volumes of research with more stringent reporting requirementsare threatened. Recommendation: Minimum norms for administrative and technical support should be identified, and further academic appointments should be made subject to this support being planned or already in place.

Internal and external financial constraints mean that it has not been possible to realise significant expansion of School research space on the main campus, nor to develop welcome space at Trinity East into a high-quality research resource. While the lack of high-quality space is the most significant strategic risk to growth in the quantity and quality of research, the cost associated with refurbishing existing spaces is perceived as a significant obstacle to achieving efficient occupancy and utilisation. The poor state of repair of some of the School Estate is of real concern, the most striking of these being the Civil Engineering Building (Redbrick Building).

The School has strengthened its global outreach, exchange, student placements, and joint degree programmes in Europe, the USA, and Asia. The appointment of a full-time administrator in this area now allows the School to focus these activities in areas with the greatest synergy to its emerging research priorities. Academic staff have developed and strengthened networks with researchers internationally.

The School's strategic response in all areas would be strengthened by developing a transparent and granular financial model in consultation with both the Faculty and College. **Recommendation**: The School should develop a financial cost and income model for all its activities with the assistance of the FSD. The model must enable more robust decisions to be made at School level regarding courses offered, strategic improvements to existing facilities and shared research and teaching equipment.

In summary, the School has successfully aligned its growth strategy well with challenges at the national and international levels and the College's stated overall strategy.

The School's teaching and learning provision

Undergraduate and graduate teaching programmes

The School meets the predefined teaching targets throughout all engineering programmes. There is increasing growth at all levels. Its key strength is the 'wide' general engineering basis provided in the first two years. The students highly appreciate this, and the staff recognizes this unique strength. Overall, the student experience is outstanding. Academic staff is described as highly committed, and this is particularly appreciated in the smaller courses.

Providing new modules (e.g., climate adaptation) exemplifies good practice and an innovative spirit. Likewise, the number of E3 students and MAI continues to increase.

There are some challenges in the distribution of students into discipline tracks in Year 3. The provided online information helps students make well-informed decisions but is for some programmes (e.g., biomedical engineering), but is perceived as being late. Communication of a target time line for providing this information would help students in anticipating the timeline for their decisions.'.Furthermore, the number of free modules offered makes timetabling nearly impossible. There is a need to optimize teaching efforts. Students attending free-standing master courses need to be assured of access to teaching material from previous classes. **Suggestion: Grouping courses in more coherent clusters/tracks would facilitate student orientation by providing a coherent pedagogic stream**.

It is stressed that continued effort will be needed to scale student support to match growing student numbers. This may come at the expense of the now highly appreciated small group sessions. Likewise, this will require strategic considerations regarding increased research and technical staff support for MAI/MSC students and student projects.

Given the high rental prices in Dublin, many students commute. **Suggestion: Grouping classes on dedicated days may be considered to optimize time lost in commuting (and even support environmental goals). The standard provision of lecture recordings (also given the availability of the infrastructure) seems an easy win.**

Timetabling is an essential problem that needs to be discussed with general management. The number of teaching weeks is very low when a reading week is included. Furthermore, it reduces revision time and sometimes even moves exams outside the typical exam time. This is particularly problematic if it causes delays in communicating (exam) schedules for overseas students. Furthermore, the closeness of the resit exams to the start of the term complicates staff and student planning.

The upcoming facilities of the E3 building provide a unique opportunity to further support the School's continued effort to deliver excellent quality undergraduate and graduate teaching. In particular, this provides an excellent opportunity for all undergraduate teaching labs.

Given the current teaching load of academics, it is unclear how the availability of the E3 teaching space can be supplemented with initiatives promoting new modes of teaching (e.g., intensive/blended learning). To ensure this opportunity for strategic educational innovation is fully realised, such development must be professionally facilitated, for academic and technical staff. **Recommendation: The School should interact with central teaching support services within the College, and provide dedicated time within the teaching and technical staff schedule to work on the development of new modes of teaching,**

particularly for E3. Of course, this endeavour also needs to consider the provision of dedicated technical staff support, as discussed above.

Graduate students are taking the initiative and are keen to be involved in teaching. TA support is well organized, and a general introductory pedagogic training module is already available. **Suggestion: Ascertain how the School can best complement the current centralized teaching resource organization with methodology-specific expertise for some courses**.

PhD students are generally highly committed to and proud to be part of the research programme. They appreciate the doctoral School's installed programmes that monitor progression and feel that there are sufficient facilities to support their research track (including mental support). However, different students work in a wide variety of offices which are of variable physical quality. **Suggestion: Significant investment to improve the office environment in specific buildings should be considered.**

Postgraduate and postdoctoral development

A wide selection of postgraduate courses (diploma and micro-credentials) has been steadily developed under the impulse of a now-finalized government funding scheme. Therefore, it is now time to critically revise the viability of these courses, considering their income and the effort required to administer and offer them. This is particularly true for micro-credentials. **Recommendation: Continuation of postgraduate and micro-credential courses in particular, should only be considered where they are financially self-sustaining and this is guaranteed in the long term.**

The School's research programme

The School of Engineering hosts four research centres, including the Trinity Centre for Biomedical Engineering (TCBE), the Trinity Centre for Transport Research and Innovation for People (TRIP), Trinityhaus, and Low Carbon Energy Technologies. It is associated with the three National Science Foundation Ireland Research Centres headquartered in College, including AI-Driven Digital Content Technology (ADAPT), Advanced Materials and BioEngineering Research (AMBER), and the Research Centre for Future Networks and Communications (CONNECT). It is noted that the School website reports only the first three out of the four research centers by the time of this report. The School has also funded investigators in CURAM (Centre for Next Generation Medical Devices) and I-FORM (Advanced Manufacturing Research Centre). The spread of topics and themes, as well as the number of research centers, is appropriate. By setting up research centers and collaborations in relevant emerging research fields, such as Low Carbon Energy Technologies, the School has demonstrated its awareness and capability to act. **Suggestion: The E3 educational track could be used to leverage the pursuit of previously identified research opportunities.**

The publication of material in leading journals indicates the opportunity for the academic staff to make a significant international impact. It is noted that current administrative and physical constraints may hamper the School's capability for further growth. At PI level, a potential improvement in the level of support provided has been identified for: the onboarding and operation of research projects from successfully acquired grants including hiring of staff; protection of the IP of researchers and the School; technology transfer activities. The resource from grant income overhead to provide such support appears inconsistent with overhead retention policies in the School and across the College. **Recommendation: We recommended an analysis of the School's and research centres' PI overhead retention policy to facilitate the provision of funding to support the setup and operation of research grants and the protection of IP, with appropriate School administrative support.**

Financial, facilities, human resources

Throughout the review, the need for enhanced clarity in the financial figures to enhance the School's capability for financial planning has been evident. **Recommendation: It is important to create a model that allows the financial consequences of student numbers, staffing, etc. to be understood and considered in the School's strategic decisions**. The model would need to be provided with information from the Faculty and the College as needed.

Concerning the School's facilities, the reviewers observed a diverse situation. While the availability of space is a general theme across most disciplines, the situation in some buildings appears to bear increasing risk to operation. The use of space in the Parsons Building seems to have reached its limits. The condition of parts of the Civil Engineering Building (Redbrick Building) may be considered critical. It is noted that the available space is used very intensively to enable and conduct as many activities as possible. The School is dependent on services within the wider College for the maintenance of its buildings. It is therefore both frustrating and disappointing that these issues appear to have been unaddressed after similar comments in the previous review report. It is acknowledged that consolidating or replacing the available facilities requires significant financial efforts that go far beyond a regular School budget.

Recommendation: Develop an strategic asset replacement plan to ensure that it is possible to deliver research and teaching in the event of failure of critical items of equipment. It is recognised that much of the upkeep of buildings lies beyond the agency of the School. **Recommendation: Develop a contingency plan to ensure the School's research and teaching can continue in the event of the physical demise of some of the College estate.**

The new E3 building provides an excellent opportunity to improve the situation concerning teaching facilities. **Suggestion: Explore possibilities which allow E3 facilities for research tasks outside teaching times, particularly if required improvement and expansion of existing research infrastructure is not feasible within a reasonable timeframe.**

The reviewers were delighted by the passion and dedication of staff at all levels throughout the review meetings. For the early-career academic staff, space availability is a major theme, besides the general challenge of finding their way into the School's teaching and research structures. A clear improvement in the onboarding process of the most recent staff is observed. **Suggestion: Early academic mentorship is reviewed and strengthened, potentially complementing the College mentorship by a School-appointed mentor from the pool of associate professors.** From discussion with the established academics, the change in teaching norms in the light of increased numbers of students was noted as a concern, along with unnecessary duplication in many aspects of administering the course. **Suggestion: The School should identify the optimum tradeoff between growing numbers of students, the quality of teaching, and the financial contribution provided. Recommendation: The interoperability of administrative systems used for timetabling, registration of students for courses and classes, recording of grades etc. should be assessed and where necessary updated to minimize the need for manual intervention, thus optimising work efficiency for academic and administrative staff.**

The administrative staff were perceived to strongly identify with the School. Despite their dedication to the work, the administrative staff mentioned the lack of a career development structure to the reviewers. An extended qualification programme with a structured path towards qualification and promotion goals could support such a plan. It is noted that for now, promotion can only be reached by changing role, most likely outside of the School. Concerning the transparency of decision-making and structures, it is noted that the administrative staff mainly has governance visibility through the School Manager. **Recommendation: Additional role-specific administrative representation on key School Committees should be instituted to ensure the communication of their concerns and needs. Recommendation: A strategy should be developed to provide** career progression paths for key administrative staff by recognising and assigning additional administrative responsibilities explicitly associated with the School's expansion e.g., in the context of the E3 programme.

In the discussion with the technical staff, a disparity between the perceived responsibilities of the technical and academic staff concerning work safety was observed. **Recommendation: Better recorded and structured training of staff at all levels should be implemented to maintain a safe working environment including fire safety, and first aid. The agency of the research officers to enforce safe working practices and the School safety policy should be clarified and strengthened.**

Over the past 5 years, an increase in academic staff has been observed, which is not yet reflected in a corresponding increase in administrative or technical staff. The School has pointed out that measures have already been taken to respond to this situation. **Suggestion: Closely monitor the relationship between the number of subscribed students and the number of academic, administrative, and technical staff, targeting an optimum operational point based on the School's financial situation.**

Related to EDI, the reviewers noted excellent progression since the last review. Significant strides were made in integrating EDI into the School's policies and practices. Most importantly, the Athena SWAN Bronze Award was obtained in 2020. This accreditation highlights the institution's dedication to improving gender equality and fostering a more inclusive environment. The reviewers complement the developed and implemented Action-Workload Model for further role definition/explication for staff, e.g. during appraisals. The workload model addresses the distribution of tasks to ensure fairness in workload assignments. Importantly, this includes a 10% teaching load reduction for staff after returning from parental leave. This policy aims to provide better work-life balance and support for staff transitioning back after parental leave. Furthermore, communication channels, such as newsletters and social media channels, were developed to keep the community informed about EDI-related initiatives and progress. Although a Dignity and Respect training programme has been implemented to address inappropriate behavior and ensure that the university community upholds respectful and supportive standards and central services are in place to handle harassment cases, there is a need for local contact persons who can offer support and guidance to those facing issues. Training for these local contacts is provided through the College. **Recommendation:** As there is no institutional support beyond short-term funding for initiatives like the Athena application, the reviewers strongly recommend that **the current support to grow EDI initiatives should be consolidated and structurally embedded into the School's work. Furthermore, activities and leadership related to EDI should be credited within the promotion process.**

The School's governance and management

The School's governance structure is appropriate, with leadership from the Head of School and policy development largely devolved to a School Executive Committee and a small number of key committees, which are subject to scrutiny by the School Committee. The School Committee's membership, consisting of academic, administrative, technical, and research staff and student representation, is applauded for its inclusivity.

A single Head of School spanning teaching and all research disciplines is key to the School's success and projection of itself as a multi-disciplinary center of excellence. The Head of School role's effectiveness is dependent on their ability to implement significant change within the School, understand the School / Faculty interface, and to build political capital within and outside the College. In this regard, the minimum term of office associated with the Head of School role, being three years, appears relatively short (noting the possibility of reappointment). **Suggestion: Increase the minimum term for HoS to 5 years, providing appropriate research support and buying out of duties *beyond* the term of appointment to make the role attractive to senior academics.**

We were very impressed by the leadership and support provided by the Director of Disciplines to the Head of School and their role in providing advice to staff. However, these roles' two-year term of office also seems rather short. **Suggestion: Overall governance might be more effective if these DoD posts were three-year posts with appropriate buying out of duties to allow senior academics to remain research active while undertaking the role.**

The School's self-assessment report notes that the role of the School manager is complex, challenging, and varied. The extensive and pivotal role of the School Manager within a large School creates a vulnerability in the School's management structure (notwithstanding the excellent regard in which the incumbent is held by current staff and students). **Recommendation: Given the School's current size and likely further expansion, there should be duplication and/or distribution of some of the School Manager's key responsibilities.** This would strengthen the administrative team and enable the School Manager to be proactive in more strategic duties.

The School's Curriculum Committee has actively developed new courses and reimagined teaching within the E3 environment. **Suggestion: The Committee would be further strengthened by strengthening undergraduate student representation, which would provide a more direct feedback mechanism.**

The School's Staffing, Facilities, and Resources Group and many of the strategic and leadership functions of the senior management team dealing with financial and space issues are hampered by the lack of a comprehensive financial planning model. However, they are clearly effective in operating management accounts.

As all aspects of the School's goals are delivered well, as noted elsewhere in this report, the committee structure may be considered adequate. Thus, while there have been no significant failures in administration, we have observed over-reliance on individual senior administrators, and note again our recommendation that additional resource is allocated to strengthen the governance in this area.

Public domain

Industry engagement is proactive and invigorated. It has established an industry advisory board, and industrial partners have already produced 87 BAI/BSc internships. Further work is being planned towards MSc internships, external MSc final projects, industry-funded PhD positions and industry-funded chairs. The industry engagement activities clearly benefit from using an administrator funded by the School. **Recommendation: We recommend further investment in the Industrial Engagement programme to sustain its professional**

administrative post and broaden the scope of the activities. This will also facilitate broadening of the scope of the activities**.** The payback is likely to foster industrially instigated research and thriving educational activities.

Global engagement activities are vibrant and mainly focused on managing student exchanges. Yearly, around 60 students go out, usually in the 2nd semester of the 4th year, to different partner universities in Europe, US, Australia and developing countries, and often as part of the Erasmus programme. The team is looking into reducing the number of partner institutions by focusing on the institutions that students frequently visit. In addition, the team is looking for ways to ensure incoming students have sufficient knowledge and skills to follow the TCD lectures. Leadership and coordination are very committed, enthusiastic, and connected to the TCD Global Office. The administration, however, seems inefficient, vulnerable, and privacy-sensitive because of the lack of professional tools. Although global engagement was considered strong and actively managed, the review team did not see this reflected in the School's profile. **Recommendation: We recommend that the organisation and administration of global engagement adopt professional tools for the centralised storage and management of personnel and placement data. We further suggest that the visibility of the School's global engagement is increased within the School's public profile.**

Conclusions

In summary, the review team was impressed by the preparation and organisation of the review by the College and School. The site visits were informative, the discussions were engaging and open, the background material extremely comprehensive. Staff enthusiasm for working within the School and College was tangible at all levels. The review team considers the competences and commitment of administrative, technical, and academic staff to be at a very high level, particularly when coping with challenging conditions.

Overall, the review team firmly believes that the School is on track to meet its strategic objectives. The engineering programmes are well-positioned, the new programme about climate change is well-timed, and overall student numbers are increasing. The new E3 building will offer state-of-the-art teaching facilities to enhance students' learning experience. The research programmes are well-developed, and academic staff members are successful in teaming up in research centres, developing research facilities, and attracting external funding for research. However, we must also note that the condition of much of the established infrastructure and restricted space for research activities poses a major risk to the future growth and continued success of research groups.

The review team was particularly impressed by the School's activities on Equity, Diversity, and Inclusion, workload balance, International Outreach, and Industry Engagement

Recommendations

The recommendations of the report are re-iterated below.

Strategic decision-making and general management

- A financial model for all the activities the School conducts and the volume at which they are undertaken is required to develop a more robust School budget that enables strategic improvements to existing facilities, shared research and teaching equipment. This should include reviewing the School's strategy for the partial hypothecation of research overheads to PI research budgets.
- Minimum norms for administrative and technical support should be identified, and further academic appointments should be made subject to this resource being planned or already in place.
- The current support to grow EDI initiatives should be consolidated and structurally embedded into the School's work. Furthermore, activities and leadership related to EDI should be credited within the promotion process.

Teaching Course Content Delivery and Administration

- The School should interact with central teaching support services within the College, and provide dedicated time within the teaching and technical staff schedule to work on the development of new modes of teaching, particularly for E3.
- Given the other pressures on the School's staff and administration's time, the Diploma and micro-credential courses require strategic review regarding their long-term financial viability and societal benefit. In particular, continuing micro-credentials should only be considered where they are self-sustaining and this is guaranteed in the long term.
- The interoperability of administrative systems used for timetabling, registration of students for courses and classes, recording of grades etc., should be assessed and where necessary updated to minimize the need for manual intervention, thus optimising work efficiency for academic and administrative staff.
- We recommend further investment in the Industrial Engagement programme to sustain its professional administrative post and broaden the scope of the activities.
- We recommend that the organisation and administration of global engagement adopt professional tools and suggest that the visibility of the School's global engagement is increased within the School's public profile.
- We recommend that the organisation and administration of global engagement adopt professional tools for the centralised storage and management of personnel and placement data. We further suggest that the visibility of the School's global engagement is increased within the School's public profile.

Administrative staff:

- A strategy should be developed to provide career progression paths for key administrative staff by assigning additional administrative responsibilities explicitly associated with the School's expansion.
- Additional role-specific administrative representation on key School Committees should be instituted to ensure the communication of their concerns and needs.

- Given the School's current size and likely further expansion, there should be duplication and/or distribution of some of the School Manager's key responsibilities.
- A review of the School's PI overhead retention policy should be conducted along with that of the research centres to develop a means to facilitate the provision of funding to support the setup and administration of research grants.

Technical staff and building facilities:

- Better recorded and structured training of staff at all levels should be implemented to maintain a safe working environment including fire safety, and first aid. The agency of the research officers to enforce safe working practices and the School safety policy should be clarified and strengthened.
- A strategic asset replacement plan to ensure that it is possible to deliver research and teaching in the event of a failure critical items of equipment should be developed.
- A contingency plan to ensure the School's research and teaching can continue in the event of the physical demise of some of the College estate should be developed.

Response from the School of Engineering to the Reviewers' Report

On behalf of my colleagues in the School of Engineering, I would like to take this opportunity to thank our external reviewers (Prof. David Gillespie, Prof. Ilse Jonkers, Prof. Mathias Wien and Prof. Bart van Arem) for their conscientious and thorough review of all aspects of our School, one of the largest in the University. The time they took to review the extensive documentation with which they were provided, detailing all aspects of the operation of our School, as well as their extensive interactions with staff at all levels and their detailed inspection of our dispersed locations is evident from the thorough and insightful report which they have provided. The reviewers were provided with specific terms of reference by the School and they have provided expert feedback in relation to these.

What follows is a high-level response from the School to the reviewers' report. It is our intention over the coming months to work with the Dean of STEM and other College officers to develop a comprehensive implementation plan that will respond to the specific recommendations in the report, noting that some of these fall within the field of influence of the School but others require an institutional response.

Overview from the Reviewers

It is pleasing to note that the review team was very satisfied by the preparation and organisation of the review by the College and School and by the interactions which they had during their on-site visit. The consensus of the reviewers, as expressed in their report and their recommendations are very much in tune with the feelings of the School community. Generally, they feel that '*the School is on track to meet its strategic objectives*' despite challenges around staffing, facilities and resources. They particularly and repeatedly highlight '*staff enthusiasm for working within the School and College*' and emphasise '*the competences and commitment of administrative, technical, and academic staff to be at a very high level*'. Furthermore they are complimentary of the Schools teaching and learning provision at under- and post-graduate levels, the Schools research activity and particularly '*the School's activities on Equity, Diversity, and Inclusion, workload balance, International Outreach, and Industry Engagement'*. The latter are particularly pleasing and are seen as a vindication, given the considerable effort which the School has devoted to these activities in recent years.

The reviewers make comprehensive recommendations for the School and we will endeavour to act upon those which are within our influence and to raise those which fall at an institutional level with the relevant College Officers. Below, is a high level response to a selection of the External Quality Reviewers' School Report which will be further expanded in the detailed implementation plan.

School Strategy

We very much agree with the recommendation that the School should be assisted by FSD in developing a financial cost and income model for all of our activities. We are not alone in this regard and many Schools are in a similar position. We have and will continue to

lobby for the necessary information to be provided as it is central to appropriate multi-annual planning and financial certainty within the School. Furthermore, it is central to the recommendation around identifying and achieving minimum norms for administrative and technical support staff.

Undergraduate, Postgraduate and Research Programmes

The panel are very complimentary of the Schools teaching and learning provision. They note (i) the uniqueness of the two year general programme, (ii) the enthusiasm which students have for the course and the student experience which they describe as '*outstanding'*, (iii) the innovative and timely introduction of new programmes such as Environmental Science and Engineering and the new E3 MSc in Climate Adaptation Engineering and (iv) the transformative educational opportunities offered by the E3 Learning Foundry (E3LF).

They make suggestions around grouping (i) courses to provide more coherent pedagogic streams and (ii) classes to optimise time for commuting students. Furthermore, they recognise the timely opportunity offered by the E3LF to develop 'new modes of teaching, particularly for E3.' The School will endeavour to investigate these suggestions via the Curriculum Committee. They further recommend consideration be given to the interoperability of administrative systems for timetabling, student registration, recording of grades etc. Whilst such an overhaul of IT systems is a college wide initiative, the School will raise this point as opportunities arise.

Regarding the post-graduate student experience, the reviewers noted the considerable variety of quality of space occupied by post-graduate researchers. This is a constant challenge for the School. We face considerable space pressures and are working with the Bursar's Office to address these. Further, we recognise that plans exist for repurposing space within the School following the decanting of activities to the E3LF. Ultimately, in the short term we simply need more quality desk space whilst in the longer term the College's space masterplan must be cognisant of the growth trajectory of schools such as ours and plan accordingly.

In the context of post-graduate taught offerings the reviewers recommend that activities '*should only be considered where they are financially self-sustaining and this is guaranteed in the long term.'* We absolutely agree with this.

The reviewers recognised the excellent high impact research being conducted across the School with the emphasis to '*train engineers and tackle emerging research and societal themes*' however they noted the challenges faced in securing appropriate space and the varied and sometimes poor quality of space (e.g. Red Brick Building) within the School. They recognise that '*internal and external financial constraints mean that it has not been possible to realise significant expansion of School research space on the main campus, nor to develop welcome space at Trinity East into a high-quality research resource*', this they feel is the '*most significant strategic risk to growth in the quantity and quality of research.'* The School is acutely aware of this constraint and is engaging with the Bursar's Office to develop long term plans to alleviate its consequences. However, this is largely

a financial issue which is beyond our control or indeed that of the University which is critically underfunded by Government.

Regarding administrative support for research the reviewers note the consideration '*the School's and research centres' PI overhead retention policy to facilitate the provision of funding to support the setup and operation of research grants and the protection of IP, with appropriate School administrative support*.' This is an important point which will be considered by the School.

Finances, Facilities and Human Resources

The reviewers consistently noted the importance of the development of a financial model with sufficient transparency to facilitate strategic planning by the School. They recommended that the School identify an optimum trade-off between growing numbers of students, the quality of teaching provision and the financial contribution provided. This is very much in line with the School's own thinking. As an E3 School, our finances are tied to the previous financial model in addition to the E3 baseline. This dual model is quite opaque and places the school in a difficult financial position for a number of reasons, which have been communicated to FSD, this despite the fact that we consistently achieve our E3 targets. The school looks forward to a more equitable financial situation following the current review of the financial model, which is being undertaken by FSD. We commit to working with FSD to develop an equitable and transparent model which better serves all Schools and enable certainty for strategic planning.

Issues of concern, as raised by the reviewers, regarding physical infrastructure in the School have been identified above (i.e. condition of the Red Brick Building), the reviewers also suggest that the School '*develop a strategic asset replacement plan to ensure that it is possible to deliver research and teaching in the event of failure of critical items of equipment*.' They further suggest that contingency plans be put in place '*ensure the School's research and teaching can continue in the event of the physical demise of some of the College estate*.'

The dedication of staff is repeatedly referenced by the reviewers. Furthermore, issues regarding technical and administrative staff numbers have been raised, in the context of keeping pace with School growth. Additionally, the lack of an appropriate promotions mechanism for technical and support staff has been highlighted. The former will be addressed in the implementation plan, regarding the latter the Head of School will continue to raise this important issue in appropriate College fora. Particular attention is also given to the School Managers role which is recognised as '*complex, challenging and varied*.' The reviewers go on to recommend that '*given the School's current size and likely further expansion, there should be duplication and/or distribution of some of the School Manager's key responsibilities*.' In this context the creation of a Deputy School Manager could be seen to not only '*strengthen the administrative team and enable the School Manager to be proactive in more strategic duties*.' This is an important initiative for a School of our size and should certainly be actioned as a part of the implementation plan.

The reviewers provide additional recommendations around adequate resourcing of (i) the Industrial Engagement programme so that it can sustain and expand its activities and (ii) the Global Engagement portfolio to facilitate optimal storage of data sources. This is entirely in tune with the strategic plans of the School.

Commentary is provided concerning structured training of staff at all levels particularly in the areas of fire safety and first aid. These important recommendations will be acted upon in the implementation plan.

Additional Commentary/Response

In conclusion, we would like to extend our deep thanks to the Reviewers for giving so generously of their time to conduct a thorough review of our School. They genuinely have left no stone unturned and have provided valuable guidance for us in cementing our place as a leading School of Engineering internationally. We commit to focus on implementing those recommendations which are within our control and to continuing to raise those which fall under the College's remit with the relevant Officers and Committees. In the meantime we will continue to focus on achieving teaching and research excellence and in fostering a supportive, welcoming, and inclusive culture that enables both students and staff to thrive.

Professor Alan O'Connor
Head of School

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

Response from the Faculty Dean to the Reviewers' Report

First and foremost, I take this opportunity to extend my sincere thanks on behalf of the Faculty, to the members of the expert review panel (Professors David Gillespie, Ilse Jonkers, Mathias Wien and Bart van Arem), the internal facilitator (Professor Graeme Watson) and staff in the Quality Office. I valued my face-to-face meetings with the entire review team which book-ended the review process.

The reviewers undertook a comprehensive review of the School of Engineering, meeting members of its three constituent disciplines (26 – 28th Nov 2024 inc.), students, researchers, technical and administrative support teams. As an output from their discussions they have crafted a pragmatic and considered report with clear recommendations and starting-points from which to act.

A common theme throughout the report is the transformative potential of the E3 Learning Foundry and the formative role of the school in designing and imaging new teaching offerings in this space. They comment on the vibrancy and growth of the degree programmes at UG and Master's level while recommending some rationalisation of the professional development and microcredential courses is undertaken. They also recognize the success of the School and its achievements in internationalizing its research and teaching e.g. through student placements and joint degree programmes, and suggest that this might be better captured in the School's on-line profile.

In several places the reviewers call-out for greater granularity and understanding of the financial model with a view to this becoming the corner-stone of decision-making at School level, both operationally (e.g. terms of prioritising the renovation/usage of space) and strategically (in terms of distributing resources and addressing staffing needs). In particular they recommend a data driven approach to identifying the areas where further technical and administrative supports might be used to greatest effect.

The quality and availability of space is called out as a threat to research growth, echoing the bursar's review of teaching spaces and the use of the College's estate more broadly. Within the report, the reviewers spot-light the Civil Engineering Building for attention and note the disparity in the quality of spaces available to Ph.D. and graduate students within the School and the consequences of this in terms of student experience.

The report points to a number of items that might be addressed through a focused effort on timetabling, course scheduling and improvements in the interoperability of administrative systems. In particular they note that the truncated academic year is adding to exam stress. The timetabling of student courses is challenging and complicated by the deadline for and the extent of student choice especially in Year 3. The report urges the school to consider further clustering of the course offerings, consolidation of teaching into particular days and scheduling to optimise the on-site experience of students. For changes to happen they recognise that dedicated time needs to be set aside for technical and support staff to propose, plan and implement improvement and to further realise the opportunities of the E3LF which might embrace how it could be used to support research.

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From a governance perspective the reviewers felt that the greater presence of technical and administrative support staff on the School Executive Committee would strengthen their representation. It would highlight their role in promoting a culture of inclusivity in decision-making and in cross-cutting activities, such as staff on-boarding and the promotion of safety training. Interestingly the reviewers comment on the duration of the terms-of-office of both the Head of School (currently 3 years, with a further term via renewal), and the Heads of Discipline (currently 2 years) which they felt might be extended (with appropriate supports) to promote longer-term strategic thinking.

Several of the recommendations resonate with on-going College actions and priorities. These include a reconsideration of the Research Centre and School overhead policy (resonating with items discussed at Faculty level, in Planning Group and the BPA review), the potential for collective action/funding to enable post-award supports and enhanced IP protection (Dean of Research/Provost research expansion programme) and the need for contingency planning to consider the consequences of equipment failure or 'the physical demise of some of the College estate'.

In conclusion, I welcome the reviewers' comments and agree with the focus and/or intent of their very sensible and pragmatic recommendations.

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Terms of Reference for School Quality Reviews

Context: The School of Engineering is one of eight School in the Faculty of Science, Technology, Engineering and Mathematics. (STEM) The School has three key disciplines:

- Civil Structural and Environmental Engineering
- Electronic and Electrical Engineering
- Mechanical, Manufacturing and Biomedical Engineering.

The School offers academic programmes on the National Framework of Qualifications at Level 8 (Honours Bachelors); Level 9 (Postgraduate Taught and Research Masters) and Level 10 (Doctoral Programmes). All of the School's programmes are accredited by Engineers Ireland and were last reviewed in March 2021. Details on the School's undergraduate programmes and resultant awards; postgraduate taught offerings, including microcredntials; and the postgraduate research programmes can be found on the School website.

The School offers a number of programmes in partnership arrangements with other Schools e.g Electronic and Computer Engineering (joint programme), with the School of Computer Science and Statistics. Strategically the School is one of three schools (with Computer Science & Statistics and Natural Science) leading the E3 Initiative (Engineering, Environment and Emerging Technologies). Together these Schools are partnering in a major capital works project to build the E3 Learning Foundry and create new undergraduate and postgraduate programmes. These include a Bachelor Degree in Environmental Science and Engineering and MSc in Applied Environmental Science/MAI specialising in Environmental Engineering with the School of Natural Science.

In terms of International partnerships, the School has:

- Articulation Agreement with Thapar University and with Manipal University, India
- Dual Masters Pathway programme with Columbia University
- Double Degree programme with INSA in Lyon (France).

The School employs 188 staff and has over 1400 student places. Research in the School is aligned with Trinity Research Institutes and Centres including:

- Trinity College Institute of Neuroscience (TCIN)
- Trinity Biological Sciences Institute (TBSI)
- Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)
- CONNECT- (Research Centre for future Networks and Communications (SFI funded)
- AMBER – (Advanced Materials and Bioengineering Research (SFI funded)
- ADAPT – (Center for Digital Content Technology (SFI funded).

The School of Engineering houses the following research centres:

- Trinity Centre for Biomedical Engineering
- TrinityHaus
- Trinity Centre for Transport Research and Innovation for People (TRIP)

A new Trinity Research Centre for Low Carbon Technologies was approved in 2022/23 and is still in the process of being established.

Purpose of a School Review is to:

(i) to provide a structured opportunity for a School to critically reflect on its activities and plans for development in the context of the school and college strategic plans and other strategic initiatives;
(ii) to benefit from a constructive commentary by reviewers who are external to College and are experts in their field at a senior academic level;
(iii) to ensure that quality and standards in teaching, research and administration are being maintained and enhanced, and that any areas of concern are identified and addressed;
(iv) to promote the enhancement of the School's provision as part of a strategy for continuous quality improvement.

Outcomes of a School Review:

The Review Team is invited to assess and make recommendations to the University under the following categories:

i. School Strategy in terms of its fitness-for-purpose to respond to the College strategies, the internal and external environment, emergent trends, risks and opportunities in Engineering research and education, nationally and internationally.
ii. The quality of the School's teaching and learning programme offerings (taught and research) and facilities in the context of national and international comparator institutes i.e. curriculum structure/design, learning resources and learning environment (internal and external to campus).
iii. The quality of the School's research strategy, including any research centres within the School, participation in College Research Themes and engagement with Trinity Research Institutes.
iv. Resources available to the School to deliver on its academic mission. These might be Financial, Facilities, Human, EDI supports, Philanthropic, Industry-generated)
v. The effectiveness of the School's governance, management and administration structures in delivering, supporting and promoting the achievement of its strategy and mission.