



University College Dublin

Quality Improvement Plan

School of Chemical and Bioprocess Engineering

December 2018

1. Introduction

The School sees the quality review process as an opportunity to reflect on the changes and developments of the last six years, to recognise challenges and to plan for the future, based on the resources available.

A QIP Co-ordinating Committee was assembled to coordinate the development of the Quality Improvement Plan. As with the preparation of the Self-Assessment Report, the process was made open and transparent to the School and all staff were encouraged to provide feedback and contribute to the development of the Quality Improvement Plan. Responses to recommendations were drafted by committee members based on inputs from staff and then opened to staff for further commenting.

Quality Improvement Committee

Eoin Casey (Chair)

Philip Donnellan

Sinead Kerins

Categories

1. Recommendations concerning academic, organisational and other matters which are entirely under the control of the unit
2. Recommendations concerning shortcomings in services, procedures and facilities which are outside the control of the unit
3. Recommendations concerning inadequate staffing, and/or facilities which require recurrent or capital funding

Timescale

- A. Recommendation already implemented
- B. Recommendations to be implemented within one year
- C. Recommendations to be implemented within five years
- D. Recommendations which will not be implemented

Report	RG Recommendation	Category (see list above)	Action Taken/Action Planned/Reason for Not Implementing	Timescale (see list above)
ORGANISATION AND MANAGEMENT				
2.6	Using the strategic plan 2015/16 as the basis, an annual review of progress against each year's objectives should be conducted by the School community together with its key internal and external stakeholders and refreshed objectives formulated for each subsequent year and the remaining period of the plan. This would allow progress to be evaluated against defined outcome measures for each objective and facilitate a joint prioritisation and focusing exercise for the subsequent year. As well as focusing on what activities need to continue and commence, the School should consider what areas of activity it needs to reduce or stop in	1	<p>Comment: there is now a greater emphasis within the university on the assessment of progress made by each school against its strategic objectives. Annual strategic plan meetings with the College Principal (CP) and with the UCD Research Office take place along with periodic catch-up meetings with the CP. KPI and other data provided by the UCD Office of Institutional Research help to inform these discussions.</p> <p>Action: The School will engage with a wider range of stakeholders in the formulation of its next strategic plan. In terms of an annual review, prioritisation of objectives will be discussed at relevant School meetings.</p>	A

	order to create the capacity required to achieve its stated strategic objectives. Capacity-building activities should include a faculty mentoring initiative as discussed in recommendation 8.15.			
2.7	Such prioritisation and focusing is important and necessary because the RG was of the view that the School does not currently have the necessary infrastructural and human resources to realise all of its stated ambitions, therefore its strategic objectives and the capacity-building activities required to attain them should be subject to ongoing re-appraisal. This may require difficult choices and decisions to be made. The calibre and commitment of the School's faculty and staff, its culture of collegiality and openness, and the esteem in which it is held by external stakeholders will be a major asset in debating these choices and making decisions that can command the support of the School community and its key internal and external stakeholders.	1	<p>Comment: The School is highly effective in its mission despite capacity constraints and we welcome the observation by the review group on the calibre & commitment of the staff in the School.</p> <p>Action: The School will prioritise capacity building in line with its ambitions and strategic plan. In terms of infrastructure, the School will work closely with the College Principal and UCD Estates. In terms of staffing, the School will prioritise Ad Astra academic recruitment opportunities and will work with the College Finance manager to identify optimal solutions for funding new staff that align to the School strategic plan</p>	C
2.8	The annual review should integrate the findings of a continuous strategic planning and deployment cycle arising from ongoing strategic dialogue within the School, with relevant schools in the College of Engineering and Architecture, with the College Principal and with key external stakeholders, and should align and be integrated with annual financial, staffing and student enrolment planning. The Head of School should consider engaging regularly with relevant peer Heads of School in the College in a structured way to develop and advance shared objectives and to identify enablers of, and barriers to, their achievement.	1	<p>Comment: As stated above (Recommendation 2.6), there is now a greater emphasis within the university on the assessment of progress made by each school against its strategic objectives. Annual strategic plan meetings with the College Principal (CP) and with the UCD Research Office take place along with periodic catch-up meetings with the CP. KPI and other data provided by the UCD Office of Institutional Research help to inform these discussions</p> <p>Action: In addition to the response to Recommendation 2.6 above, the HoS will ensure that an annual formal meeting with other HoS in cognate disciplines is undertaken to discuss opportunities.</p>	C

2.9	This dynamic approach to strategy formulation and implementation would promote better strategic engagement, alignment and ownership within the School and enable its strategic objectives to be tested against current capacity, and internal and external constraints. It would also structure and inform the work of School committees and facilitate their closer alignment with the strategic plan. This would ensure a more efficient, effective, coherent, cohesive and integrated annual strategic review and planning process without creating additional administrative work; in fact, done well it should reduce the administrative burden.	1	<p>Comment: The School agrees with this comment</p> <p>Action: the School will incorporate this recommendation into its annual strategy updates and the next strategy development exercise.</p>	A
2.10	The RG recommends that in implementing the new management structure mentioned in its SAR the School's committee structure should be formalised so that it aligns with and supports its strategic plan in a coherent, effective and efficient manner. Committees' Terms of Reference should derive from the latest iterations of the strategic plan. Only high-level, action-oriented synopses of meetings on a simple template are required to monitor progress and actions should be designed to advance strategic objectives with defined, named responsibilities and timelines. Committees should be convened at least once a semester. Brief oral reports from chairs of committees should be provided at each School Council with brief written summary reports for each School Executive Committee meeting.	1	<p>Comment: The School's relatively small size means that not all functions in the school have, in the past, required a committee structure.</p> <p>Action: as the School grows it will become necessary for a more formal committee structure for all its key functions. The suggestions made by the review group in terms of committees will be implemented.</p>	B
2.11	The RG notes the concentration of a considerable number of key leadership roles in a	1	<p>Comment: The School staffing profile in terms of age and experience might have created a situation whereby leadership roles were distributed to a relatively small number of</p>	B

	<p>relatively small number of faculty and staff and therefore recommends a greater distribution of responsibility among all faculty and staff in the new management structure. Individuals should be assigned responsibility for leading each key strategic area and work with a team to implement the key objectives for that area. These leadership roles should rotate after a defined period to be determined by the School in order to promote succession planning, build capacity, distribute expertise and facilitate leave of absence to build capacity in research and innovation.</p>		<p>staff.</p> <p>Action: The School will assign term limits (with opportunity for renewal) into key positions of responsibility. A “role description” for each administrative role will be defined and junior staff will be assigned greater levels of responsibility.</p>	
2.12	<p>The RG notes that the administrative staff complement has decreased since the last review, that the School in its SAR recognises the need for greater administrative resourcing, and the high administrative load on faculty and staff. We therefore recommend that priority be given to obtaining additional administrative support, including by exploring the extent to which such support could be shared among relevant schools within the College of Engineering and Architecture. Such support should be aligned with the School’s key strategic objectives, for example in research, innovation and external engagement. The RG was particularly concerned at the risk in terms of succession planning and access to professional development opportunities of reliance on a single administrative officer. At the very least the School should immediately commence discussions on the potential of ‘cross-cover’ arrangements within the College to support the</p>	1	<p>Comment: The School acknowledges the high administrative load on staff and the reliance on a single administrative officer</p> <p>Action: There are several possible solutions to this issue and the School will work with UCD Agile to explore options that enable decisions to be made by the School that are in the best interests of the School’s strategic objectives.</p>	C

	professional and career development of its sole Administrative Officer.			
2.13	The RG recommends that the mix among and within the employee categories of faculty, administrators and technicians be reviewed so that it aligns with and supports the School's strategy to build research capacity and diversify funding sources; innovate, 'de-crowd' and rationalise the curriculum; attract international students and engage proactively with its key external stakeholders.	1	<p>Comment: The recommendation is important and is something that is under constant review not only in strategy but in terms of delivery of ongoing programmes.</p> <p>Action: The School will continue to review the mix among and within the employee categories of faculty, administrators and technicians as part of its annual financial cycle and its next strategic planning plan.</p>	B
2.14	The RG recommends formalising an External Advisory Board and refreshing its membership on a regular basis so that it functions to test, challenge, evaluate and support the School's progress towards the achievement of its strategic objectives. Terms of reference should be established to govern and guide this work. The Board should be chaired by an appropriate senior external stakeholder and should meet at least annually.	1	<p>Comment: The School agrees with this recommendation</p> <p>Action: A new External Advisory Board will be selected to be aligned with the incoming Head of School who will commence in Q4 2019.</p>	B
2.15	The RG recommends that the School, with the full support of the College, give serious consideration to mechanisms that would enable the School to recruit cohorts of international students directly to its undergraduate programme.	2	<p>Comment: While the School does not disagree with the thrust of this recommendation, we feel that it falls outside the remit of the Quality Review process.</p> <p>Action: the School will work with the College Marketing Team to identify relevant international undergraduate student recruitment target markets.</p>	B

STAFF AND FACILITIES

3.22	The School should engage with the Athena Swan scheme with the aim of improving gender balance within the School, mindful of the impact of gender imbalance upon the student profile and concomitantly on the career progression of female engineers with the profession.	1	<p>Comment: An application for Athena Swan Bronze recognition is currently underway. This is being led by the College of Engineering & Architecture with a representative from the School on the steering committee.</p> <p>Action: continue with the process of securing Athena Swan recognition but also ensure the University strategy on EDI is fully incorporated in the School strategy and management.</p>	A
3.23	The School should consider the development of a new chemical and bioprocess practice laboratory facility to enhance the student experience in the teaching of chemical process engineering principles and design. This should encompass both computational modelling and experiment facilities together with resources needed to support design group and final-year research project work.	1	<p>Comment: The School is located in a building that was completed 30 years ago and there have been no significant changes to the lab facilities.</p> <p>Action: An Architect has been appointed (Q3 2018) and a detailed survey of the existing School facilities is underway. A planning workshop involving stakeholders will take place in Q3 2019 with a view to having a detailed plan ready by the end of 2019. The plan will encompass the needs of the school in terms of teaching, research, staff offices and facilities and enhancing the student learning environment.</p>	C
3.24	Building on Recommendations 2.6, 2.7 and 2.9, the School should review the current planned staffing numbers and profile (among faculty, technical and administrative staff) and align this to the effective development of its faculty consistent with its strategic ambition to obtain a significant increase in its current QS ranking. This will involve a critical assessment regarding which of its current activities to stop, continue and enhance, and what new activities to start.	1	<p>Comment: The recommendation is important and is something that is under constant review not only in strategy but in terms of delivery of ongoing programmes.</p> <p>Action: The School will continue to review the mix among and within the employee categories of faculty, administrators and technicians as part of its annual financial cycle and its next strategic plan.</p>	B
3.25	Despite the School's excellent industrial connections, there are clear opportunities to further enhance industrial connectivity though	1	<p>Comment: The School is proud of its long-standing and excellent relationship with industry.</p>	B

	involvement in UG teaching and hosting students for design project work, the latter particularly for companies within the Dublin area.		Action: The School will seek further opportunities to enhance industrial connectivity	
3.26	Opportunities for ongoing career development of faculty and staff should be clearly articulated and communicated to all, building on the quarterly meetings that are required for newly-appointed employees. A mentoring scheme for early career faculty and staff should be established and supported by senior colleagues.	1	Comment: Staff development is an area that is of critical importance and has in the past been given less priority than it deserves, partly due to lack of resources for provision of meaningful staff development opportunities. Action: (i) A mentoring Scheme will be established for new staff (ii) the School will lobby for resources for staff development.	B
3.27	Mindful of the changes to the School's staffing profile, the School should develop a clear road map for succession planning for all the major school administrative roles. This should be communicated to all faculty and staff, and updated annually.	1	Comment: The School agrees with this recommendation Action: The School will develop a clear road map for succession planning for all the major School administrative roles.	B
TEACHING, LEARNING AND ASSESSMENT				
4.14	Reduce the reliance on space- and labour-intensive pedagogies. The RG commends the use of learner-centred pedagogies in the curriculum; however, there was a concern over space- and labour- intensiveness of instruction. The RG recommends that SCBE examine how space requirements might be reduced through efficient design of multipurpose, collaborative, smart learning spaces or the use of delivery modes such as blended learning. The RG also recommends implementing strategies to reduce the labour-intensiveness of module work on both the staff and the students, for example, through the redesign of assignments to focus on specific learning outcomes, and the effective use	1&3	Comment: While blended learning approaches have been used introduced in several modules throughout the School, such processes could be advantageously used to improve efficiency of delivery in several additional modules. All SCBE modules are currently being transitioned to the new university VLE system Brightspace, which will provide a range of additional tools available to module coordinators to facilitate such blended approaches. All module coordinators have been provided with ongoing access to training relating to this platform, and will be encouraged to utilise all of its features (e.g.: such as online quizzes) to streamline and automate module delivery. Redesign of the SCBE teaching and research space is an ongoing and active topic on the school meeting agenda, with an architect engaged for assistance. This engagement provides a platform for examination of how and where planning and space utilisation may be used to improve and streamline the delivery of curriculum content. The RG recommendation identifying the potential reduction in assessment labour-intensity (staff and student) by increasing their focus on specific learning outcomes will be raised as a recommendation to all module coordinators such that it will become a	C

	of teaching assistants and/or graders to provide formative feedback.		<p>school-wide approach.</p> <p>The payment of teaching assistants has been recently initiated within the School, enabling more optimised use of such resources as part of the module delivery process. This increased use of teaching assistants will be continued in conjunction with the School's strategic plan to increase its postgraduate research student contingent.</p> <p>Action: Establish a school wide focus as part of the regular school meeting agenda to increase the streamlining of curriculum delivery mechanisms with a particular focus on specific learning outcomes and the use of blended learning tools to assist in their achievement.</p>	
4.15	Streamline assessment. Both undergraduate and graduate students indicated that there was a very high weighting of summative assessment (final examination) in many modules. In some modules the students felt over-assessed, for example, through multiple lengthy laboratory reports. The RG recommends that the School continue its iterative refinement of a coordinated assessment plan to decrease the emphasis on summative assessment. In addition, for laboratory courses with multiple reports, the School should consider designing more learning-efficient assignments (for example, by replacing some lengthy laboratory reports with a memo that focuses on data analysis). This will help mitigate the discrepancy between credit load and student effort hours reported for some modules.	1	<p>Comment: Striking a balance between a decreased emphasis on end of semester summative assessment and managing in-semester student workload represents a challenge which the SCBE will continue to engage.</p> <p>Efforts are made at present to manage the timing of continuous assessment delivery dates throughout the semester by the creation of an assessment calendar which is distributed to both staff and students.</p> <p>Following the RG recommendations, increased efforts will be made to re-examine the format of reports requested from students on a regular basis throughout the semester (e.g.: such as laboratory reports) in order to potentially streamline their focus on the core elements of the learning objective.</p> <p>Increased efforts will be made across modules to communicate with students the anticipated effort hours expected/required for continuous assessments based upon standard guidelines, which should enable increased balancing of expectations on both sides and which should in turn enable improved ongoing iterative improvement efforts based off targeted feedback mechanisms.</p> <p>Action: Conduct an internal review of the format of repeating reports requested from students within modules and publish clear expectations which outline the effort hours anticipated for credit bearing activities.</p>	B
4.16	Provide timely feedback. Both undergraduate and graduate students indicated that there was a lack of timely feedback on continuous assessments. The RG recommends that in developing its assessment plan it establishes	1	<p>Comment: The delivery of timely continuous assessment feedback to students has recently been established and formalised across the university as a whole, ensuring that feedback is delivered within a defined period of time.</p> <p>Action: Modules within the SCBE will adhere to the new university regulations regarding</p>	A

	mechanisms to increase the amount of formative feedback provided to students throughout the module. As mentioned above, teaching assistants can greatly alleviate the burden of providing timely feedback on formative assessments.		the timely delivery of feedback to students.	
4.17	Introduce peer assessment and reduce summative evaluation in design and laboratory modules. Feedback from students indicated that there was a need for increased peer assessment of contributions to teamwork. Consider using research-based tools (such as CATME online peer evaluation) to provide multiple opportunities for efficient peer assessment throughout the module, and assigning a weight to a teamwork component of the grade in a given module. By providing a mechanism to evaluate an individual's contribution to teamwork, this would also support the reduction of the emphasis on summative individual assessment (final examination) recommended above.	1	<p>Comment: Assessing teamwork contributions as part of assessment activities can have very beneficial impacts as outlined in the RG recommendation, and therefore increasing the emphasis upon the use of such tools will be examined within modules which place heavy emphasis upon such student collaboration.</p> <p>Action: Modules where high levels of teamwork are required will be identified and reviewed in order to identify whether it would be feasible and beneficial to put in place a plan for the introduction of such increased emphasis upon peer review.</p>	C
4.18	Transfer Assessments and Doctoral Studies Panels for PhD candidates. The RG recommends that the School develop and implement a system to ensure compliance with academic regulations in its graduate research programme with particular reference to the scheduling of Transfer Assessments and Doctoral Studies Panels, eliminating sole dependence on the individual research supervisor for decisions relating to progression and the quality of the overall student experience.	1	<p>Comment: The doctoral studies panel review process has been changed in 2018. All such reviews are now managed and conducted by the School Graduate Studies Committee. This will allow for significantly improved oversight of alignment with university regulations that all PhD students should be assessed within their first 18 months.</p> <p>Action: An oversight process will be implemented to ensure all PhD students will be assessed by the School Graduate Studies Committee for progression within their first 18 months.</p>	A
4.19	Number of modules taught per faculty member. The RG recommends the development of a	1	Comment: The SCBE is currently in the process of recruiting several new academic staff members (at assistant professor level) who will begin to contribute to the School's	B&C

	<p>faculty staffing and workload plan to reduce the teaching load of staff to a level consistent with the research expectations of the School. The School should explore the opportunity to better engage industry partners in adjunct teaching, which will leverage industrial partnerships to provide relevant practice-based academic experiences and reduce the teaching load of faculty.</p>		<p>teaching load. As part of this transition, the recommendation by the RG to implement an overarching workload plan ensuring balanced teaching workloads will be implemented. An investigation will also be conducted as part of this process to identify areas where increased industry engagement may be beneficial.</p> <p>Action: Establish a faculty workload plan which will enable improved oversight and balancing of teaching workloads, and which will enable identification of areas where increased industry engagement may be beneficial.</p>	
4.40	<p>Effective, Efficient Teaching. The RG recommends that SCBE consider requiring all new faculty members to engage in training and development for effective, efficient and innovative teaching and learning practices.</p>	1	<p>Comment: The university provides a number of opportunities for staff members to engage in teaching and learning training courses however currently such engagement is not explicitly required from faculty members. Early exposure to such formal training for new staff members may positively influence student experiences.</p> <p>Action: A process will be established to require newly appointed faculty members to engage in teaching and learning training activities as part of their onboarding procedure.</p>	A&C
4.21	<p>Safety training. The School should ensure that the centrality and importance of its mandatory laboratory safety training is communicated to all faculty, staff and undergraduate and postgraduate students, and that that training complies with relevant legislative, regulatory, professional and organisational requirements. In order to ensure universal compliance, the School should maintain accurate and up-to-date records of students who have attended mandated safety training and ensure that any students who have missed training are excluded from the laboratories until they are provided with opportunities to undertake it. The Review Group recommends that the School conduct regular safety audits to ensure that (a) planned safety training is being delivered in accordance with</p>	1	<p>Comment: Safety training and risk assessment are of upmost importance within the School and represents a standing item on the school meeting agenda. Safety training is provided to all students/research staff who conduct laboratory work. This training covers legal and other requirements, good laboratory practice, hazardous risk assessment, waste chemical handling, lone-working policy, out of hours policy.</p> <p>Action: The School has already acted upon the core tenant of recommendation 4.21, namely reinforcing rigor with regard to the safety culture and training within the School. These actions include i) an ongoing review of our Safety Statement and associated procedures, ii) the requirement that all safety training records are also to be held electronically (currently held in paper copy only) and iii) including explicit training-related checks as part of our existing internal audit practices</p>	A&C

	relevant guidelines and planned provision, and (b) that the training translates into consistent practice across all its laboratories.			
CURRICULUM DEVELOPMENT AND REVIEW				
5.7	Balance of experimental laboratory work and modelling. Feedback from students and employers indicated that the current exposure to chemical engineering practice is heavily weighted toward laboratory work, and that students would benefit from increasing their exposure to computational process engineering throughout the curriculum. The RG recommends that the School continue to expand on the current model of integrated modelling and simulation with hands-on laboratory work and data analysis, by increasing the emphasis placed on modelling and simulation.	1	<p>Comments: Several modules taken within the School by undergraduate students include elements of chemical engineering simulation and modelling using software packages such as Matlab, Aspen, DynoChem and gProms. Thus as recommended by the RG, capacity exists to increase the use of such tools as a means of providing students with increased process engineering experience which may operate in parallel to more traditional experimental laboratories. A review of where such opportunities exist and how they may be best availed of will be conducted.</p> <p>Action: Conduct a review of where/how chemical engineering simulation may be used throughout the curriculum to provide students with increased (virtual) process engineering experience.</p>	C
5.8	Future-readiness and industry engagement. Feedback from employers indicated a need for students who are future-ready, prepared to contribute to advanced manufacturing, process innovation (e.g., factories of the future, industry 4.0), and product design. The RG recommends engaging industry more closely in refreshing the curriculum to ensure the future-readiness of its graduates. As part of this process, benchmarking should be done against identified international peer and aspirational institutions such as Imperial College London.	1&2	<p>Comment: Engaging representative industry bodies and learning from respected academic institutions should be established on a regular and systematic basis by the SCBE in order to ensure that it continues to deliver a program incorporating best practices and to graduate students who are in high demand. This is best achieved by scheduling periodic engagements with such bodies/institutions, leading to a continuous program improvement approach being adopted within the School.</p> <p>Action: Establish a periodic program review process and an associated continuous improvement approach enabling implementation of identified improvements.</p>	C
5.9	Industry involvement in design projects. Feedback from industry partners indicated an enthusiastic willingness to assist with the	1&2	<p>Comment: Engaging industry partners in aspects of design modules could potentially be beneficial to the student experience. The primary design modules taken by undergraduate students in their third and fourth years of study will be examined in</p>	B

	teaching of design courses. Consider models of instruction that engage industry experts in the teaching of the design sequence, e.g., by providing real-world design problems with support for obtaining hard-to-find data, or by mentoring student design teams.		order to identify what aspects of these designs processes would be amenable to such engagement and what such an engagement could potentially look like. Action: Examine the design modules in order to establish if/where/how industrial engagement may benefit the student experience.	
5.10	Multidisciplinary exposure in the curriculum. Examine the opportunity to develop multidisciplinary team-based experiences within the curriculum by leveraging existing coursework across the College or with schools in other colleges.	1&2	Comment: The establishment of multidisciplinary projects/activities involving other schools within the university is something which is supported by the SCBE, but which would require very careful planning and coordination between the schools in question. Therefore it will firstly be identified what aspects of the current programs could potentially facilitate such cross-school engagement, before beginning to work with the established school(s) to plan and develop how such an engagement could work on a practical level. Action: Identify what aspects of the current programs would be amenable to the potential establishment of multidisciplinary experiences and engage the other school(s) in question in order to establish a practical plan of action.	C
RESEARCH ACTIVITY				
6.7	Realign current research strategy, student education strategy and administrative duties to enable delivery of the School's mission to secure a significant improvement in its worldwide QS ranking. Specifically, this should address the need for an optimal profile of research and innovation activity; develop a forward looking, lean and creative student education experience; and provide enhanced professional development for both faculty and students.	1	The Schools mission is centred on education and research and is not actually <i>"..to secure a significant improvement in its worldwide QS ranking..."</i> . Nevertheless, it is desirable for the School to improve its QS ranking and, as such, will continue to ensure that, while its strategic plan is aligned with its mission, it will ensure its research strategy also is mindful of the metrics used by ranking organisation and the overall school research performance is measured against appropriate metrics that maximise the quality and recognition of its research output. Moreover, the School will aim to increase faculty numbers so that teaching and administrative loads are reduced to acceptable norms.	B
6.8	Industry confirms the School's strong performance in delivering research to match to current industrial need. The School should	1	Comment: The industry-compatibility strategy of SCBE is based on alignment to, and anticipation of, key underlying trends in the development of industry in Ireland and internationally, e.g., 'Industry 4.0'. To this end, SCBE seeks to lead in the development of	B&C

	develop strategies and activities to deliver industry's future needs post-2020 notably by exploiting opportunities afforded by industry 4.0 to enable the factories of the future (continuous manufacturing, PAT closed-loop process control, portable reconfigurable processing systems etc.)		<p>research activities geared towards industry need including but not limited to continuous manufacturing, reconfigurable process systems, closed-loop process control). A member of the school faculty has recently become an investigator in the iForm centre, directed from the School of Mechanical and Materials Engineering. This is an advanced manufacturing research centre, established by Science Foundation Ireland (SFI) to deliver high-impact research in advanced manufacturing. The Centre has significant focus and expertise in the use of digital technologies in manufacturing. Other faculty members are investigators in the SFI SSPC centre which has a focus on pharmaceutical manufacturing, Engagement with these research centres will help inform the School research and education activities in the field of "industry 4.0"</p> <p>Actions: 1. Continue to develop IP for deployment in industry via licensing and spin-outs. 2. Promote advanced R&D topics in teaching (e.g., Six-Sigma, Design of Experiments, PAT tools) 3. Continue to take active roles in SFI Centres (e.g., SSPC, MaREI, BEACON, iCRAG) and EI Technology Centres (e.g., PMTC) 4. Make changes to selected modules to render them more industry-oriented (with greater prevalence of industry case-study examples and exercises). 5. Set up an R&D seminar- and workshop series with invited presenters from industry and postgraduate credit for attendance and preparation of reports thereon 6. Encourage greater communication of industry with SCBE by having SCBE Industry-Research Open Day (one per year), to showcase industrially relevant research, and inviting industry attendees</p>	
MANAGEMENT OF QUALITY AND ENHANCEMENT				
7.5	The School takes part in various review and accreditation processes, which results in increased administrative loads. There is therefore a need for a coordination function among these processes.	1&2	At a meeting in Q3 2018, the HoS obtained agreement from Engineers Ireland (EI) that they would accept the exact same documentation for EI accreditation as the IChemE accreditation. This is an example of how coordination can result in reduction in administrative loads The School will seek other opportunities for time saving, including lobbying for a new model of accreditation which places less emphasis on the 5 year accreditation cycle involving a significant workload in preparing documentation and a site visit in favour of an alternative approach which involves an annual "light-touch" approach whereby the accreditation is renewed. This model is in place for some other professional programmes outside of our discipline	A&B
7.6	The School should make better use of available	1	Comment: survey data is becoming increasingly available, for example from the UCD	B

	survey data.		Culture and Engagement Survey, with its associated school and College level data, the survey undertaken as part of the 2018 Athena Swan application etc. Action: The above-mentioned survey results will be reviewed at the School Executive committee as it becomes available with a view to identifying priority areas for action.	
7.7	The School needs to ensure PhD Transfer Assessments and Doctoral Studies Panel processes are undertaken in line with Academic Regulations.	1	Comment This recommendation arises from the fact that a small number of PhD transfer assessments were not completed in a timely manner prior to 2018, UCD regulations specify that they take place within 18 months of the PhD start date. The School has improved its procedures around PhD transfer to ensure that full compliance with the regulations is ensured. Action: this was addressed as a priority action during 2018 with the backlog fully cleared and new processes put in place to ensure PhD students do not exceed the 18 months time limit in future.	A
7.8	The School could consider using public domain reports from the UK Research Excellence Framework (REF) exercise, for example, for benchmarking research quality.	1	Comment This recommendation is welcome, and the School has looked at an initial sample of these reports and found them useful. Action The School will review these reports to help inform its strategic plan,	B
7.9	The School must prioritise high-quality independent evaluation to develop a quality culture that goes beyond accreditation requirements.	1	Comment The school views this Quality review as serving that purpose	A
SUPPORT SERVICES				
8.10	Feedback from employers indicated a need for students who are socially and emotionally competent (non-cognitive skills). The School should embed evidence-based social and emotional learning programmes and practices across the curriculum to ensure the future-	1	Comment: The School periodically surveys recent graduates, to solicit their opinions on the Programme, from the perspective of 1-5 years' experience, focusing on subject material/skills which they believe could be usefully introduced or further developed within the Programme. The recent introduction of the ME with its associated Professional Work Placement was, in part a response to this feedback and goes a long way towards preparing graduates who are socially and emotionally competent.	A&C

	readiness of the School's graduates.		Action: The School Head of Teaching and Learning, in partnership with the College T&L committee and support from the UCD T&L community will continue to identify if and where there are gaps in the skills development of the students. Periodic surveys of recent graduates will also support this action.	
8.11	Administrative supports are needed in targeted areas to support the School's strategic plan	2	Comment: the College has very recently appointed a Business, Analysis and Intelligence Manager to produce data to inform the School strategic plan and the College Office Manager supports College strategic planning. Action: the School will work with the College Business, Analysis and Intelligence Manager on metrics to inform the School strategic plan and the College Office Manager will work with the Head of School to support School strategic planning.	B
8.12	The School should operate a rotation scheme so that faculty are provided an opportunity to avail of leadership roles.	1	Comment: This is a useful suggestion Action: The Head of School will implement this recommendation, commencing from September 2019	B
8.13	The School should avail of and engage with University supports such as UCD Agile to build a community of practice for faculty and staff.	1	Comment: This is a useful suggestion Action: The HoS and the School Head of T&L will meet with the director of UCD Agile in 2019 to initiate this recommendation	B
8.14	The School should engage with the Athena Swan scheme to improve gender balance within the School.	1	Comment: The School is committed to improving the gender balance, particularly for academic staff Action: A College-level Athena Swan Bronze application was submitted in April 2019. This is being led by the College of Engineering & Architecture with a representative from the School on the steering committee.	A
8.15	The RG recommends implementing a faculty mentoring initiative to support and facilitate the development of early career and mid-career faculty. The initiative should provide mentorship in the areas of academic support and career development, including scholarship, teaching, service, and leadership. The aim should be to help mentees build relationships to achieve their	1&2	Comment: The School agrees with this recommendation. <i>Ad hoc</i> but nevertheless high-quality mentoring has been an important feature of the Schools management. However, there has been a lack of formal structure for mentoring in the School. Action: in order to address this, the HoS will maintain a record of mentor and mentees within the School. The HoS will seek support from UCD HR for mentor training.	C

	specific professional goals, aiding them in forging connections with internal and external networks of colleagues, and fostering professional and intellectual independence.			
EXTERNAL RELATIONS				
9.9	The School should provide evidence-based emotional competencies programmes and practices, broadly non-cognitive skills, to better prepare graduates for the demands of industry and the profession.	1	Comment , this is identical to recommendation 8.10 and the School response is the same as for 8.10	C
9.10	An additional and explicit focus to the mission of the School: outreach and service in addition to research and education. The School might serve as model of a School that responds to local needs while working in partnership with community, and simultaneously using that work as a springboard for international research.	1	Comment: This recommendation is noted, and the School will consider this feedback as part of its strategic planning processes	B
9.11	Strategic alignment of research and partnership activities should be a long-term goal of the School.	1	Comment: This recommendation is noted, and the School will consider this feedback as part of its strategic planning processes	B
9.12	The School should organise more formal events (e.g., industry forum/conference) and touchpoints to further develop informal contacts with alumni and employers. This will enhance relationships, better inform the curriculum and potentially develop into fundraising opportunities.	1	Comment: academic staff are encouraged to bid to host international conferences. The College of E&A recently held a workshop for staff on this topic.	B
9.13	The School should focus on establishing relationships with universities and organisations outside Europe and the UK, particularly Asia.	1&2	Comment: The School has a small number of such relationships (e.g. Beijing University of Chemical Technology, China, which is particularly relevant to the pre-master's programme), and more recently with AMRITA , India through the Erasmus Plus programme.	C

			Action: The School will engage with UCD Global and the College Marketing Team to identify opportunities to build on these existing relationships and to develop new opportunities aligned to the School mission. In addition, College Academic champions for the US and China are in progress to facilitate relationship building/collaborations/MoUs in these regions.	
9.14	The School should prioritise student recruitment from outside Europe, particularly Asia.	1&2	Comment: This recommendation is noted Action: The programme directors, particularly the M.Eng.Sc programmes, will continue to engage with UCD Global and the College of Engineering and Architecture marketing team, to ensure targets are met. The School will set specific targets for student recruitment in the context of its resourcing capacity.	C
9.15	The School should develop a strategy for maintaining, enhancing and leveraging strategic partnership with industry.	1	Comment: While the School is proud of its very strong and long-standing links with industry, the School has not in the past had a detailed strategy for the development and maintenance of these relationships. Action: This is an action that will be part of the next School strategic planning cycle and will involve consultation with (1) UCD Director for Strategic Partnerships (2) existing industry partners and (3) industry representative bodies such as BioPharmachem Ireland (part of IBEC).	B
9.16	A reflective and outward-looking School is recommended with careful consideration of where industry is going (e.g., Industry 4.0).	1	Comment: The School agrees with this comment Action: through its research, innovation and industry engagement activities, the School will continue to incorporate emerging industry developments into its strategic plans.	B

3. Prioritised Resource Requirements

This section should only contain a list, prioritised by the Quality Improvement Committee, of recommendations outlined in the Review Group Report, which require additional resources. The planned action to address each recommendation with an estimate of the cost involved should also be included:

1. Arising out of Recommendation 3.23 the School needs a new chemical and bioprocess practice laboratory facility to enhance the student experience in the teaching of chemical process engineering principles and design. In particular, the upgrade of laboratory 006, with replacement of teaching equipment.
2. Also arising out of Recommendation 3.23 the School needs improved and larger facilities to support computational modelling and experimental facilities together with resources needed to support design group and final-year research project work.
3. The RG recommended implementing a faculty mentoring initiative to support and facilitate the development of early career and mid-career faculty (recommendation 8.15). The School would benefit if training was made available to potential mentors to ensure this initiative is fully realized.