The External Review of the Faculty of Engineering report that is made public here validates for me that the hard work and strategic vision of the Faculty's current and past leaders are bearing fruit.
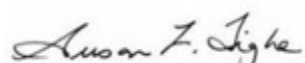
As noted by the reviewers, the Faculty is a teaching and research powerhouse that is well connected to industry. I believe the successful outreach and recruitment efforts toward individuals from diverse backgrounds and women have strengthened McMaster Engineering and position the Faculty to continue as a global leader.

I am pleased by the breadth of the recommendations made by the reviewers. They address distinct areas within the Faculty that were identified during consultations with students, staff and faculty members who felt empowered to speak openly about opportunities and concerns.

Thank you to everyone in the fireball family who shared their insights. Your thoughts and suggestions will contribute to shaping the future direction of the Faculty. By continually adapting and working toward excellence, we are able to attract and retain impressive students and top instructors.

I also look forward to seeing the evolution of the Pivot program as we celebrate successes and take action on feedback provided.

The Office of the Provost will continue to support the Faculty of Engineering and its core mission of excellence in teaching, research and service, and fostering the quality of academic life.

Susan Tighe
Provost and Vice-President (Academic)

External Review of the Faculty of Engineering
McMaster University
Review Team Report: August 30, 2023

Review Team

Cristina Amon	University Professor, Mechanical Engineering | Alumni Distinguished Professor in Bioengineering | Dean Emerita, Faculty of Applied Science and Engineering (2006-19) | University of Toronto
Elizabeth Croft	Vice-President Academic & Provost | Professor, Department of Mechanical Engineering & Department of Electrical and Computer Engineering | University of Victoria
James Olson	Dean, Faculty of Applied Science | Professor Mechanical Engineering, FPInnovations Professor | Faculty of Applied Science | Dean's Office | The University of British Columbia
Michael Brook	Professor, Chemistry and Chemical Biology | Faculty of Science | McMaster University

Review Coordinator

Nancy McKenzie	Senior Manager, Academic Projects and Reviews | Office of the Provost | McMaster University

Table of Contents

1. Executive Summary

The dean is a fantastic leader who has the confidence of the faculty, staff and students. Everyone is extremely complimentary of her leadership and it is clear that she has a strong strategic vision for the Faculty. The Faculty itself is very collegial and the leadership team seems to work together well and support each other. The students are very impressive and the student supports both academic and co-curricular are top notch. The investment in student success and in recruiting the next generation of diverse students into engineering is clearly paying off. Overall the faculty is a strong research powerhouse, and very industry connected. Strategic areas of investment are core to their mission and they are able to bring these together around funding. The following recommendations are made to further strengthen the Faculty.

Recommendations to Further Strengthen the Faculty

- Address the overload of administrative work at the departmental level. (Faculty)

- Conduct a review of and take action on the systemic issues in HR-Payroll. (University)

- Incentivise departments to generate opportunities and increase revenue. (Faculty)

- Implement a "balanced shortlist policy" to assist in reaching the faculty's 30by30 goal for women academics. (Faculty)

- Require departments to include their diversity goals in the departmental plans in support of the Faculty and University's strategic diversity goals. (Faculty)

- Establish a grants success team to foster early career research grant success and professionalize large competitive grants. (Faculty)

- Expand the industry partnerships team to accelerate and diversify industrial research support and partnership. (Faculty)

- Develop a university-level entrepreneurship and venture creation program that is strongly supported and co-invested in by Faculties. (University & Faculty)

- Continue to strengthen and invest in strategic research areas. (Faculty)

- Develop a housing assistance program to continue to attract and retain excellent young researchers. (University)

- Continue to advocate for high-quality research and teaching spaces, in the proposed new building and by upgrading current facilities with a thorough space audit for efficient space utilization. (University & Faculty)

- Address the need for student access to site licenses for engineering software. (Faculty)

- Complete the review of "the Pivot" and address the issues that have arisen due to this significant overhaul of undergraduate teaching. (Faculty)

- Address the accelerating need for mental health counselling and ensure that supports are available for students in a timely manner. Evaluate the success of the new mental health counselling support placed in the faculty. (University & Faculty)

- Support the development of universal design in pedagogy to address the rapidly growing requests for accommodation and to provide better access to all learners. Consider offering shorter training courses in UD that are accessible to more academics and creating universal design champions within the faculty. (University & Faculty)

- Address overload and concerns about burnout in teaching track academics by limiting the number of new courses a faculty member is asked to offer in each academic year. (Faculty)

- Consider ways in which the important contributions of the BTech program (students and faculty) can be better integrated into the mainstream of the faculty. (Faculty)

- Strengthen the financial position by considering additional sources of revenues and cost containment. Engage deeply in the philanthropic fundraising campaign. (Faculty)

- Consider alternative administrative structures that would free up time for strategic activity by the Dean. (Faculty)

2. Faculty of Engineering Mission and Mandate

The Faculty strategic plan is being developed. Based on the review and self-assessment, we note the following alignment between the Faculties activities and the pillars of the University strategic plan:

Inclusive Excellence

The efforts around Equity, Diversity, Inclusion and Belonging (EDIB) are very strong, particularly with respect to outreach and recruitment of under-represented groups.

Teaching and Learning

This effort is traveling very well given the investment in the undergraduate "pivot".

Research and Scholarship

The efforts here are very well aligned. However, there is a perception that engineering is not a priority at the university.

Engaging Local National Indigenous and Global Communities

Again, outreach is strong to local and global communities and it appears that these efforts are bearing fruit. To address Indigenous recruitment in particular, activities and lead strategies that focus specifically on this area are needed.

Engineering has an extremely strong culture. All academics, staff and students remarked on the high level of collegiality and the "fireball family" culture. It is evident that people truly appreciate each other, feel empowered to speak about concerns, and love the community that they work in.

The faculty has made a significant investment in outreach and recruitment starting from preschool through to grade 12 for BIPOC and women. The roughly 22000 interactions with students are very impressive and the connection with the CRM is a great way to feed the recruitment pipeline. The growth in women coming into the engineering undergraduate (B.Eng) is impressive and reaching over 40% this year is a significant milestone.

The faculty has made great strides in promoting diversity and inclusion and this is evident from the emphasis on diversity in new hires - in particular black hires and women hires. However, in order to achieve their 30 by 30 goal (30% representation by women by 2030

[Self Study Section 1.6.1]) the faculty will have to hire between 25-36 women in the next six years and at their current percentage hiring rate of women (23%) this would require more than a 50% increase in staff. Strategies like requiring a balanced shortlist (two women and two men on every shortlist) for all faculty hires can help focus the recruitment efforts of search committees.   Another important strategy is to actively encourage qualified women to apply for these roles - this can be done through ensuring that the search committees are appointed early enough in the process to *search* for excellent female candidates and then reach out and encourage them to apply.

The number of women in leadership roles in the faculty is still quite small but increasing, as is the number of women full professors. Attention to the progression of women through the ranks will be important going forward in order to develop a much stronger pool of senior women professors from which leaders can be drawn.

It is notable that all search committee chairs and members are required to complete the university-wide Equitable Recruitment Training for Selection Committees before they begin their work. The Dean's Representative from an outside department is also required to complete this training. The Faculty also has 35 certified Employment Equity Facilitators drawn from staff and faculty, who facilitate institutional EDI priorities related to recruitment.

The Faculty's "life events" program to support academics through life events - pregnancy and parental leave, intensive care for family members, major life trauma, etc. is an attractive benefit, particularly to younger diverse academics. This very progressive and supportive program was highly appreciated by early career and senior academic staff alike, as it contributes to the supportive and inclusive culture of the Faculty.

It is noted that many programs with low participation of women in their undergraduate student body do not have "increasing diversity" listed in their goals/highlights in the Self Study - notably CE & EE, Mechatronics, Engineering and Management, Computer science, and the BTech program, whereas the departments who are making progress in their student body (Mechanical Engineering and Engineering Physics) note these as important goals.

It is important that all departments and programs have diversity goals that are measured and managed. This should be integrated into the Faculty and Department strategic planning process.

Finally, it is clear that diversity and an inclusive environment is a key objective for the leadership of the Faculty. The current and previous deans are both highly appreciated

and respected and the associate deans are also greatly appreciated. The leadership is very strong and there are good relationships between the decanal and departmental leadership. The department and school chairs are very positive and collegial.

3. Teaching and Academic Programs

There is excellent support and enthusiasm for undergraduate learning from all quarters. The new "design spine" curriculum, the Pivot, is reported by academics and students to be going very well. The resources for the first year program are enormous but they are sufficient. Technicians, instructional assistants, undergraduate co-op students and TAs make this work possible.

The biggest pinch point for undergraduate education is space. This was highlighted particularly for the 2nd and 3rd year courses. The design studio courses do not have sufficient and suitable space - it is very difficult to deliver 2020's pedagogy in 1980's teaching spaces. The registrar's office is helpful but cannot "invent space". There is need for more flatfloor, reconfigurable teaching spaces with AV/Display systems that are suitable for "flipped classroom" workshop-style delivery for large groups.

Faculty report that the outcome of the Pivot is that the students are far better communicators and have much better project team skills. There were some questions raised at the second year level about whether students are gaining sufficient depth in the first year in individual technical competencies (e.g., calculus, coding, physics). There was a comment that it is almost impossible to fail out. The outcomes of the Pivot are being assessed over the summer and it would be important to ensure that all academics are informed on this major curriculum revision and investment - to celebrate successes and to ensure that feedback is provided and any adjustments in related and scaffolded curriculum can be put in place as part of the continuous improvement process.

Students remarked on the need for access to software licenses to support their work. They remarked that modern engineering modeling software licenses (Solidworks, NX, Comsol) were not available. They also noted that they needed access to an adobe (PDF) license.

Teaching academics and students are enthusiastic about interdisciplinary teaching and scholarship, and the Pivot is a great example of this. There are some areas of concern raised by students and academics; for example, an economics and design class that was merged together as part of the design spine has not provided sufficient depth in either

topic. As noted above, academics teaching in upper years also expressed concern about the depth of learning in the first year.

The faculty has done a great job of providing interdisciplinary options like the Integrated Bachelor of Biomedical Engineering/Bachelor of Health Sciences, the minor in Innovation with the DeGroote School of Business and a suite of 5-year programs.

The BTech program (SEPT) (in partnership with Mohawk college) is very successful but see themselves (and are seen by others as) separate for the rest of the faculty (SEAS). The program prides itself in offering the technical rigour of a college program with academic rigour of an engineering program. The students have a very practical and hands-on education and have training on instruments and machines. It is important that the excellent training of these students be provincially recognized.

However, there is a general feeling that SEPT is somehow "less than" SEAS rather than a partner at the table. The program is taught by a separate cohort of faculty, most of whom are teaching track. There are untapped opportunities for both programs in terms of student pathways, curriculum and new industry partnerships by considering how these two schools could be brought together allowing the BTech students and faculty to feel part of the "fireball family". There is also the need to refresh the relationship with partners around the BTech program.

Experiential education is top notch and there is high support for Co-op, Experience Ventures, the Hatch Centre and Student Teams. Once again space seems to be a limiting factor. The 93% coop participation rate (voluntary) is excellent. Co-op abroad is promoted but international exchange (study abroad) is not, and the students do not know about what opportunities might be available to them. Now that CEAB is allowing counting courses abroad as part of the accreditation requirement, it is an ideal time to increase students' study abroad programs and their international experiences.

Graduate students are encouraged to go on exchange with international labs (dependent on supervisor) and graduate co-op numbers have tripled. The Career readiness program that is required for all grad students is an excellent and well received initiative and it is speculated that has resulted in the higher take up of graduate co-ops.

Students report that the club and team resources are excellent and the committee was very impressed with the Hatch facility. The extra curricular opportunities foster a collaborative environment.

There was concern that mental health challenges have skyrocketed and faculty are seeing many requests for accommodations - estimated around 7.5% of the cohort. The central SAS office is not properly resourced, it takes months for students to get an appointment unless it is an emergency. As a result, students may not receive needed accommodations until well into the term.

The Faculty has invested in a mental health counsellor who has open appointments every day. This is very new but is noted and there are hopes that this will help address some of these challenges.

Students mentioned that healthy food options and fitness are also important for mental health. They mentioned that healthy food options on campus are expensive and closed at 4pm. They looked forward to the potential arrival of healthy food vending machines.

With respect to the requests for accommodation the faculty is looking at Universal Design and have hired one pedagogical advisor. Faculty members have access to the MacPherson Institute which assists with this work. The institute is running a 4-5 day Universal Design course over the summer. However, this is not suitable for research faculty who cannot commit an entire week to a teaching and learning course.

Faculty members are already shifting their pedagogy and embracing UD principles and the Faculty is running a pilot program. One of the challenges with working with MacPherson is that they are all generalist, and it is suggested to create Universal Design champions within the departments.

It takes time to redevelop curriculum to embrace UD principles. There is an open question whether academics have time to put this in place, and to implement the best practices. Courses will need upgrading but many courses in the BTech are taught by sessionals who are not hired early enough to upgrade the courses.

Students we met reported that they are more equipped and cognizant of their mental health needs. Students are realizing that it is ok to take longer. They are working to space their classes over time and shuffling them around.

Graduate students report that communication is a major issue. They would like to know what is going on in the faculty on a weekly basis. They mentioned that twitter and instagram were good channels, but the weekly emails were overwhelming and not read.

Support for international graduate students in terms of cost of living is concerning to faculty members. There is a concern that international PhD tuition will increase while cost of living is very high and PhD student stipends are very low.

The self-study indicates that program unit loads in the faculty are 30% higher than other McMaster degrees [Self Study Section 2.2.3]. This is typical of Canadian Engineering schools due to national regulatory body requirements. Academics estimate that students spend 60-80 hours per week on coursework if they are taking a full load. Many students underload and take courses over the summer resulting in average completion times for four-year-non-Co-op BEng students of 5.0 years and 5.3 years for four-year-Co-op BEng students. Faculty advisors recommend students extend their degrees and there are generous withdrawal policies. Students interviewed seemed comfortable with taking longer with their degrees.

There is no room in the curriculum for growth without equal pruning. Given the rapid pace of technological advancement this will require an ongoing careful balancing act by curriculum committees.

The corollary to the large number of units in the curriculum is that teaching loads are also high, particularly when the lab and design heavy nature of the curriculum is considered. These courses do not scale like traditional lecture based courses. Academics spoke of the need to limit enrolment in senior design courses to ensure quality.   The expectation for teaching track academics is 6 courses per year. Also some academics mentioned that they were faced with teaching numerous new courses each year. Since most courses are taught in the fall and winter this can result in overload and burnout. A policy that limits the number of new courses that an academic is required to teach each year would be helpful in addressing this concern.

Key Recommendations on Teaching and Academic Programs

- Address the need for space, both in quality (fit for purpose) and quantity (sufficient to address the current class size), for undergraduate teaching.
- Address the need for student access to site licenses for engineering software.
- Complete the review of "the Pivot" and address the issues that have arisen due to this significant overhaul of undergraduate teaching.
- Address the accelerating need for mental health counselling and ensure that supports are available for students in a timely manner. Evaluate the success of the new mental health counselling support placed in the faculty.
- Support the development of universal design in pedagogy to address the rapidly growing requests for accommodation and to provide better access to all learners. Consider offering shorter training courses in UD that are accessible to more academics and creating universal design champions within the faculty.

- Address overload and concerns about burnout in teaching track academics by limiting the number of new courses a faculty member is asked to offer in each academic year.
- Consider ways in which the important contributions of the BTech program (students and faculty) can be better integrated into the mainstream of the faculty.

4. Research and Scholarly Activities

The university has an exceptionally strong provincial, national and international research reputation as evidenced by global reputational rankings. The strong research rankings are due to the excellence of its globally leading established researchers and the ability to continue to recruit and retain excellent young hires.

The review team noted an extremely collegial and collaborative culture among researchers across the Faculty that is not only important in retaining and mentoring early career research it fosters interdisciplinarity and team research that is an essential component of institutional research excellence. However, it is important to note that housing prices are making it increasingly difficult to attract and retain excellent early career researchers. The University should consider the creation of a down payment assistant program to assist young faculty to purchase their first house in the region. The ability to purchase appropriate housing will also help in retention of faculty. Additionally, the scarcity of affordable day care near campus is also a concern of young early career researchers and the university should take steps to increase daycare as part of retaining early career faculty.

The research faculty have very strong partnerships and the support of industry and the community. This industry support is a major component of the total research funding of the Faculty. In the last two years there has been a notable decrease in overall research funding and research intensity. This decrease was attributed to several factors: 1) the change in NSERC industry matching from 2:1 to 1:1 with the transition from the CRD program to the Alliance program, 2) a decrease in partnership associated with the COVID pandemic as companies took a more conservative approach to university partnership during uncertain economic times and 3) decreased success of early career faculty in the discovery grant program.

This decrease means that the university may not meet its mandate to deliver industry partnered research funding and the decrease in NSERC funding will impact the ability to retain the CRC chairs in the next round of allocation.

To improve research success the Faculty has created a well-developed and effective mentorship program for early career researchers that does some level of pre peer-review of grants of all scales. The Faculty is also prepared to fund outside consultant grant facilitators and writers to help with large grants. The Faculty also has hired an industry partnership person to work with the Associate Dean of Research to increase and diversify the industrial support of research.

Junior Faculty and Research

Grants

Positive comments were made about the support provided to new researchers who received seed money, and further mentoring support, from the Faculty when a first NSERC Discovery grant application was not successful. Further support from the ADR, especially for junior faculty, would be welcome, including strategies to identify early grant opportunities from Tri-councils, other agencies (e.g., MITACS) and especially companies. The contributions of junior faculty can be particularly important to large interdisciplinary grants, as they can augment the chances for success with the application per se; such funding will also significantly and positively affect the ability of faculty members to grow their research group. Additional engagement and training in their completion is encouraged for developing large grants.

Interdisciplinary Research

To further incentivize development of interdisciplinary research, especially research that involves junior faculty members, the Faculty could consider adopting a seed funding program. The 3-tiered UBC model is attractive. The program begins with lower barrier access to funds for shorter time periods and becomes more competitive at higher tiers with higher rewards – more funding and longer funding times – for successful projects. The expectations are that these seed projects will acquire sufficient data to facilitate success in obtaining large external grants.

Equipment

In what appears to be an excellent though non-formalized process, faculty members can appeal to the ADR for assistance with purchase of small equipment. It is recommended that a more formal process – perhaps an analogue of the NSERC RTI program – be set up to aid in obtaining (lower cost) instrumentation that will be shared/available to several researchers.

To further professionalize research partnership and grant success we would recommend that the university and the Faculty expanding research support programs by:

- Creating an in-house grant success team that can work with all faculty to ensure increased success in individual Discovery and Alliance grants, as well as, professionalize the process and review of large team grants such as, CFI and CFREF proposals. This team should provide consistent internal review, facilitate pre-peer review, curate examples and best practices of grants, etc. Further, the team will be focused on ensuring all aspects of the proposals are competitive. Most large, research intensive universities have developed in-house professional staff support for grant success at both the University and Faculty level.
- Creating a more formal research leadership program for early career researchers in the first few years of joining the university. The program would provide training to onboard new research faculties; seminars on grant opportunities, how to manage a lab, how to recruit grad students and PDF, how to communicate and market research, how to plan your research career, etc. The leadership program would also provide a series of workshops aimed at ensuring discovery grant success.
- Create seed funding programs for both small equipment and research grants, particularly support new faculty.
- Expanding the industry partnership team to accelerate the development of new, diverse and perhaps non-traditional partnerships.

The Faculty has been very successful in large CFI grants that have created a number of shared facilities. Concern has been raised over the long term maintenance and operation of these shared platform facilities. The university should develop a program to provide some support for: 1) continued operational funding especially to offset the natural fluctuations in grant funding; 2) financial planning for the long term sustainability of these platform facilities; and 3) facilitate user fees or other mechanisms for cost recovery that equitably includes early career researchers who may need to be subsidized.

The university and the faculty have identified a number of strategic areas of research that are identifiable through the research centres and institutes. These include advanced manufacturing, energy and climate, automotive, etc.

The move towards strategic areas enable multiple grants with different objectives to be brought together to overcome the deficiency in any one granting agency competition, for example, CFI proposals provide infrastructure while large Alliance or NRF grants provide the required operational funding and CREATE can provide student funding.

University strategic mandate – industrial research funding is a key deliverable to the province. Engineering delivers most of the industry funding. However, colleagues feel that they are not receiving sufficient recognition for this contribution - particularly related to the resources that come back to the research centres. Centre leaders would like to see more overheads come back to the centre so that they can support the technical professional staff and continue to attract industrial funding. There is also a concern over an inequity in the research overhead tax between faculties.

McMaster engineering success in research and innovation has resulted in increased creation of new companies and entrepreneurial activity by its students, staff and faculty. Entrepreneurship and venture creation are increasingly important pathways for universities to move innovation and discoveries from the laboratory to having real impact on the local community and the world. Many globally leading research universities have built well established entrepreneurship and venture creation ecosystems to foster and inspire students to be entrepreneurial as well as to support real ventures to move innovations from the lab to the community. Creating an effective and competitive entrepreneurship and venture creation ecosystem requires the full support of the executive and Faculties.

An entrepreneurship and venture creation program could include:
- Extra-curricular education and training programs aimed at multiple levels including inspiring the entrepreneurial curious to the full professor learning how to create a company from the IP in the lab.
- Entrepreneurs in residence to support, foster and mentor emerging companies and founders. The Entrepreneurs also provide specific training and mentorship on how to pitch for funding, how to build a business case, etc.
- Executives in residence that can further support ventures as they scale with success and funding.
- A stage gate process for attracting angel and venture funding, such as the Creative destruction lab.
- Freely available incubator space for faculty, staff and students to assemble and build their emerging ventures in close proximity to a community of emerging ventures to learn from and collaborate with.
- Fellowships for graduate students or PDF to have the time to take IP from the lab to a venture.
- Well established and competitive IP terms for these new ventures that does not hinder their ability to attract funding or find additional partners.

High quality research space continues to be a challenge and limits the ability of the Faculty to make faculty hires. New research intensive faculty require high quality and

large space for research labs regardless of post-covid work from home policies for staff and students. The lack of ability to hire is preventing strategic growth in high demand areas such as computer engineering and software.

Key Recommendations on Research and Scholarly Activities

- Establish a grants success team to foster early career research grant success as well as to professionalize large competitive grants.
- Expand the industry partnerships team to accelerate and diversify industrial research support and partnership.
- Develop a university-level entrepreneurship and venture creation program that is strongly supported and co-invested in by Central and partner Faculties.
- Continue to strengthen strategic research areas.
- Develop a housing assistance program to continue to attract and retain excellent young researchers.
- Continue to advocate for high quality research space in the proposed new building.

5. Leadership and Administration

The Dean of Engineering has 16 direct reports including 8 chairs/directors, 3 Associate Deans, and other administrative units, including Finance, Undergraduate Studies, and research units. There is a general consensus that the Faculty is working very well and that the initiatives developed by the former Dean are bearing fruit and that new and relevant developments are being pursued by the current Dean. There was broad demonstration of enthusiasm for the inclusive, collaborative and warm interactions that are facilitated by the Dean; for example, Chairs noted a lower stress level exists in their current interactions with the Dean. Staff were universally pleased to work within the Faculty and frequently reiterated that, as a consequence of its welcoming environment, there is a very low staff turnover.

Some of the consolidation of units that has been done within the faculty, e.g., putting communication, outreach, and cooperative education in one unit, is seen to both strengthen these units and facilitate communication with the Dean. The committee notes, however, that additional consolidation should be considered so that fewer units report directly to her.

Multiple groups reported that there is an, at least, partial disconnect between the Booth School and other departments within the Faculty. Several different issues were raised in

this context, including teaching loads, funding with the Faculty and between McMaster and Mohawk, among others. The Dean was well aware of the issues and clarified that changes started with the previous Dean are continuing to address and bridge this unit with the other departments.

Thus, the Faculty is understood to be a very cohesive, productive unit with excellent leadership.

Recommendations on Administrative Structures and Entities

- Consider alternative administrative structures that would free up time for strategic activity by the Dean.
- Address the tensions between the Booth School and other entities within the Faculty.

There was strong consensus that Engineers are very happy within the faculty due in large part to the clarity with which the organization runs and, in particular, the important contributions of the Dean to maintaining transparency. The common complaints that might be expected, "unfair allocation of space; teaching loads," were essentially not raised. Individuals - staff, faculty, students - were all very comfortable speaking openly about both the benefits and detriments of life within the Faculty, which is seen as confirmation that the Faculty is already working well and its members trust the decisions that are being taken.

Financial issues can easily become sources of tension. The departments made clear that they understand well the budget model and the decisions made to keep all departments within the Faculty operating effectively, even when that involves some reallocation of resources between departments.

Faculty members are very engaged with the Faculty. There is a culture that is collegial, which facilitates recognition of disagreements, discussions to find common ground, and strategies to move forward. An example of this is the wide acceptance, particularly at the first year level, of the complete overhaul of teaching that resulted in the "Pivot" approach to learning. It is not uncommon for there to be resistance to change. While there are clearly some 'teething pains' with these changes in year 2 and 3, the willingness of faculty members to work through challenges together is emblematic of a cohesive group. It was very apparent that faculty members enjoy being teaching and research engineers in this Engineering Faculty.

There is widespread concern that as the needs of students grow, additional tasks fall onto faculty members. This is particularly challenging for junior faculty that are establishing a

research career. As an example, when an issue of student accommodation is identified and collaboration with Student Accommodation Services is required, this can sometimes be a time-consuming and burdensome process for all those involved. Some of this can be addressed by implementing universal design (again, a task for faculty) but the trajectory for the Faculty and more broadly the University is problematic. By contrast, the interface with the central Office of Academic Integrity once issues of academic dishonesty have been identified and declared is much more efficient and timely.

Recommendation on Universal Design and SAS

- Faculty members should increase their adoption of Universal Design within courses AND SAS or other central organizations must provide better support for issues of accommodation.

Hiring and Retaining Junior Faculty

New faculty expressed concern about the cost of living in Hamilton, which has dramatically increased in the last few years, including a doubling, or more, of house prices. This financial stress on young faculty could be ameliorated by low interest loans or other related support, as is provided by other major Canadian universities. Additional problems arise around accessible daycare at or near McMaster, particularly for young parents. The 'life event' fund that helps faculty deal with challenges around parenting, health, etc. was seen as a very important aid (some faculty noted that clear policies for maternity/paternity leaves were not apparent to all).

Spousal hiring is an ongoing challenge. Women candidates are not as likely as their male colleagues to inquire about spousal hires, so it is suggested that proactive discussion on this topic be initiated with faculty candidates.

Junior Faculty and Teaching

Some (teaching) faculty reported the need to create multiple new courses in a single year, which involves too much time, particularly with a 6-course teaching load. Restricting the number of new courses that could be taught in an academic year would address this issue.

Recommendation on New Courses

- Adopt and promulgate the maximum number of new courses that faculty will be required to offer in a given academic year, differentiating teaching and research professors.

The outreach provided by the very strong Cooperative Education (COOP) unit within the Faculty is forging bonds with companies that both want to hire current graduates and support research with faculty and future graduates. Employers often hire students from more than one faculty and they find having to deal with multiple offices (Engineering, Science…) is a disincentive to engage. It is suggested that a mechanism be developed that facilitates 'one stop shopping' for COOP employers, which would mean better integration of the Engineering COOP office with those of the other faculties while maintaining the strength of the current operation in the Faculty.

The Faculty of Engineering has collaborations with several other faculties, including joint undergraduate programs with the Faculty of Business and the Faculty of Health Sciences, and a proposed program with the Faculty of Humanities. In addition, they share research facilities with the Faculty of Science (e.g., Biointerfaces Institute). Inevitably, different cultures can challenge working together, but the main issue raised was the way in which funds, students and other interactions are shared between Faculties when constrained by Central Administration policy. In addition, there exists some concern within Engineering that there needs to be better transparency between contributions made and benefits received in interactions when there are joint mandates. For example, in research-based interactions and the Office of the Vice-President Research.

Recommendation on a COOP Employer Liaison

- Identify a liaison with the university COOP office to more efficiently manage interactions with COOP employers that hire from more than one faculty.

6. Resources

A strong financial position in an activity based budget model allocation is the enabler for the Faculty to foster new initiatives, seed collaborative research and innovation, support students and more. The budget of the Faculty has suffered in the last few years due to a number of circumstances, including the domestic tuition decrease in 2018, then grant freeze with the corridor structure from the Province, the pandemic that affected funding from industry partnerships which in turn have influenced the ability to obtain matching funds from provincial and federal grants, such as NSERC CRD/Alliance and ORF.

As the Faculty embarks in the upcoming academic planning, we recommend to look into strengthening the financial position, consider additional sources of revenues (e.g., Master of Engineering particularly from international students, deepening partnership with industries given the long tradition of the Faculty), containing costs and engaging in philanthropic fundraising. Consider also a financial structure in which Chairs can generate additional discretionary funds with corresponding incentives (e.g., sharing some additional income from MEng certificates) and responsibilities (e.g., graduate teaching of new or popular courses).

Recommendation to Strengthen the Financial Position

- Strengthen the financial position by considering additional sources of revenues and cost containment.
- Engage deeply in the philanthropic fundraising campaign.

The Faculty of Engineering has been highly successful in recruiting top notch early career and underrepresented minority faculty, and in participating in the 'Black Faculty Cohort Hiring Initiative'. Also, the number of woman faculty has been increasing which is important to support and serve as role models for the 40+% of first-year woman students. Retention of exceptional faculty is always of concern at top research universities such as McMaster, and it is important to continue efforts to retain faculty as well. As mentioned before, increase of housing and renting costs is of concern for newly hired faculty as well as graduate students and administrative staff.

Graduate students are key for driving research programs. Resources are also needed to top-up their typically modest research assistantships which come from research grants and contracts. The review committee heard concerns from graduate students as the cost of living in Hamilton has been increasing. Even though it seems that the graduate student internship with industrial partners is currently complementing their income, additional solutions should be considered. We applaud the recently established career preparation workshop for graduate students and recommend looking at whether additional efforts are needed for onboarding graduate students.

Recommendation on the Cost of Living for Recruitment

- Consider the increasing cost of living in Hamilton for recruiting effectively graduate students and faculty.

The review committee visited the state-of-the-art Hatch facility for student activities and clubs, and some of the teaching facilities which are in need of upgrading. The reviewers

also heard different views regarding a new building only for Engineering or part of a new building for McMaster. Within the upcoming strategic planning, it is an excellent opportunity to bring together the engineering community for thoughtful and careful consideration of physical facilities and spaces that the Faculty will need to accomplish its plans in the next 10 to 20 years. This should also include a thorough audit of the current spaces and their utilization.

Recommendation on Physical Facility Planning

- Carry out a physical facility planning to consider potential new building constructions, upgrading of facilities, and auditing of current space utilization, aligned in support of the strategic plan goals.

There is an effective integrated structure of Outreach and Engagement which coordinates activities of the offices of Student Recruitment, Engineering Co-op and Career Services, Communications, and Alumni Engagement and Advancement. There is a need to streamline the HR processes (e.g., PDF hires, casual contracts, payroll) at the central level, to free some time of the departmental administrative staff for other much needed activities. The Faculty recently added a position of HR coordinator to alleviate this issue though may not be enough until the central processes are streamlined.