

ACADEMIC PROGRAM REVIEW
DEPARTMENT OF CONSTRUCTION MANAGEMENT
UNIVERSITY OF WASHINGTON
14 SEPTEMBER 2017

Contents

Section I: Overview of Organization	2
<i>Mission & Organizational Structure</i>	2
<i>Budget & Resources</i>	6
<i>Academic Unit Diversity</i>	6
Section II: Teaching & Learning	8
<i>Student Learning Goals and Outcomes</i>	8
<i>Instructional Effectiveness</i>	11
<i>Teaching and Mentoring Outside the Classroom</i>	13
Section III: Scholarly Impact	14
Section IV: Future Directions	17
Part B Unit-Defined Questions	21
Part C Appendices	38
Appendix A: Organization Chart	39
Appendix B: Budget Summary	40
Appendix C: Information about Faculty	41

Section I: Overview of Organization

Mission & Organizational Structure

- Describe the overall mission of the unit. What does the unit believe in and what are its goals?

The department's mission is:

To prepare individuals for careers in the construction and related industries by providing high quality education, conducting research that will benefit the construction industry, and providing service to the community. This includes teaching students to develop a sustainable built environment and applying innovative construction techniques based on cutting edge research to advance current and future needs in construction.

The department seeks to provide the highest quality undergraduate and graduate construction education in the nation. At the undergraduate level, the department's mission is to provide a broad-based education that enables graduates to address the multi-faceted challenges they will face as members of the construction and related industries. At the graduate level, the department's mission is to impart the knowledge and provide the intellectual environment that will foster the highest level of research and critical innovative thinking. In research, the department is committed to conducting outstanding, intellectually stimulating, and relevant research and to integrating its research into its instructional programs and thereby contribute to industry innovation. In service, the department is committed to contributing to the industry, the university, and to the surrounding community. This includes faculty service on committees or task forces or the completion of community-service projects.

The department's vision is:

To be an internationally-recognized leader in education and research in construction management.

The department's objectives are

Instructional Objectives

1. Provide accessible, high quality, and contemporary educational programs that prepare individuals to assume technical and managerial positions in the construction and related industries.
2. Provide a diversified accredited undergraduate curriculum, such as tracks for residential, heavy civil, other specializations.
3. Provide tailored graduate curriculum with strong connection to faculty research
4. Provide experiential learning opportunities for students.
5. Provide interdisciplinary opportunities for students.

Research Objectives

1. Conduct high-quality research that pushes the boundaries in construction technology and management and improves construction processes.
2. Engage in high impact and ground-breaking research.
3. Recruit post-doctoral, Ph.D. and master’s degree students to support department research activities.
4. Leverage the Center for Education and Research in Construction’s resources to enhance research activities.

Service Objectives

1. Cultivate close relationships with the construction and related industries.
2. Conduct service that benefits the community.

Quality Improvement Objectives

1. Promote professional development of the faculty.
2. Increase department endowment funding to \$2 million by 2017.
3. Improve department visibility.
4. Recruit additional high quality students.

Degree programs

(1) Undergraduate and graduate degrees offered in the unit, including program options, or majors/minors, and fee-based programs within these degrees;

BS Construction Management

Year	Graduates
2012	48
2013	52
2014	35
2015	40
2016	45
2017	56

Dual Degree in Architectural Science and Construction Management

Year	Graduates
2012	7
2013	5
2014	6
2015	6
2016	10
2017	12

MS Construction Management

Face to face, state assisted

Year	Graduates
2012	12
2013	12
2014	15
2015	20
2016	24
2017	22

MS Online, fee-based

Year	Graduates
2012	13
2013	17
2014	10
2015	6
2016	7
2017	6

The department participates in the college interdisciplinary PhD in Built Environment (degree not offered through department)

(2) Certificate programs offered. Certificate in Construction Management

Online, fee based

Year	Graduates
2012	13
2013	17
2014	12
2015	12
2016	12

Face to face, fee based

Year	Graduates
2012	24
2013	29
2014	34
2015	45
2016	34

- How is academic and non-academic staffing within the unit distributed? (Please refer to the organizational chart in Appendix A)

The department consists of 10 full time faculty members, one ½-time lecturer, about 18 affiliate faculty members, and two staff members.

- Describe the manner in which shared governance works in the unit, along with how the unit solicits the advice of external constituents.

The department chair is the main coordinator of assignments based on input from faculty. Curriculum, new hires, major initiatives, key faculty assignments, and admissions into the undergraduate program are all based on a faculty vote. Merit, Promotion, and Tenure procedures follow the faculty code.

Budget & Resources

- Provide an outline of the unit's budget (Please refer to the budget summary in Appendix B).

The department currently receives approximately \$1.4 million annually in state revenues. We have some additional sources of revenue which include about \$130K a year from our online Masters and Certificate programs. Our endowments generate about \$60,000 a year. The endowment money is spent primarily on student scholarships and some research support for faculty. Faculty salary expenses account for approximately 90% of all expenses annually and for more than 100% of our state revenues. See Appendix B for more details and future projections.

- Indicate how the unit evaluates whether it is making the best use of its current funding and human resources?

Currently, funding for our 10 full-time professors and lecturers consumes all of the funds provided by the state. As these expenditures are non-negotiable, along with fixed operational cost, discretionary spending is quite limited. We spend about \$200,000 a year on affiliate instructors who come from industry to teach specific classes. We have reevaluated our staffing needs and reduced our staff. We've also looked at our teaching loads and increased the size of class sections. When it comes time to replace retiring tenure-track faculty, the Department needs to consider hiring full-time non tenure track lecturers instead of tenure track faculty. Alternately, we could increase our Department teaching load to the college-norm of five classes per year.

- Describe any fund raising/development plan, or grant/contract-getting strategies used to seek additional funding

The department raises funds through corporate and individual giving. Individual faculty seek grants to fund research projects. During academic year 2016/17, our Construction Industry Advisory Council helped to review lists of potential donors. Also during this past academic year, a fundraising task force was set up to start making specific asks. Our focus has been to raise funds for undergraduate scholarships, graduate student fellowships, undergraduate student support, and faculty applied research.

Academic Unit Diversity

- Does the academic unit have a diversity plan?

The Department does not have a diversity plan.

- Does the unit have a diversity committee and, if so, what is the representation on the committee?

The Department does not have its own diversity committee, but the department's administrator is actively involved in the college-wide diversity committee.

- What is the diversity of the unit's faculty, administrative support services and technical staff?

The Department has 10 full-time faculty: three of them are Asian or Asian-American, one is Arab-American, two are Iranian-American, and four are Caucasian. The staff consists of one Caucasian woman and one Asian-American woman.

- Describe how the unit utilizes institutional resources or partners with organizations such as the Graduate Opportunities and Minority Achievement Program (GO-MAP) in the Graduate School to conduct outreach and to recruit and retain underrepresented minority undergraduate and graduate students.

To date, we have had some limited engagement with GO-MAP. We have sent representatives to their informational fairs and last year we applied for a travel grant from GO-MAP in order to sponsor an admissions visit from a potential graduate student from California who is a member of an underrepresented minority group. This was a first for us and we hope to do more.

On the undergraduate level, we have had more success as we have launched several initiatives to reach out to OMAD (Office of Minority & Diversity) to find ways to connect directly with students in the UW's EOP (Equal Opportunity Program). Last year we worked with OMAD's undergraduate advising office to give several seminars about our program. We plan to continue this initiative.

- Describe outreach strategies the unit employs with underrepresented minority students, women, student with disabilities, and LGBTQ students to diversify its student body.

On the undergraduate level, we are working hard to forge connections with a more diverse audience across campus (see previous section).

On the graduate level, the challenges for the Department in this arena are considerable. In the first place, our graduate students consist primarily of international students. It is difficult to find a lot of domestic students who are interested in our program. Of the small number (2-4 a year) that do apply, it's even more difficult to attract a pool of diverse students. There just aren't the numbers.

- Describe initiatives the unit has employed to create an environment that supports the academic success of underrepresented minority students, women, students with disabilities, and LGBTQ students.

So far, our efforts to create a supportive environment for students from diverse backgrounds have been only informal in nature. Our department administrator takes a particular interest in supporting these students, but there is no set structure for her activities/interests.

- Describe how the unit utilizes institutional resources such as the Office of the Associate Vice Provost for Faculty Advancement to recruit and retain faculty from underrepresented minority groups.

We have not availed ourselves of any of these resources heretofore.

- What specific strategy has the unit employed to support the career success of faculty members from underrepresented groups, and where applicable, women faculty? To what extent has the unit been successful in diversifying its faculty ranks?

Although we don't have a specific strategy in regards to diversifying the faculty, we have a good representation of women faculty in a male-dominated field.

Section II: Teaching & Learning

Student Learning Goals and Outcomes

BS Construction Management

- What are the student learning goals (i.e., what students are expected to learn)?

The undergraduate program is accredited through the American Council of Construction Education (ACCE). We have 20 Student Learning Outcomes (SLO). Our goals for accomplishment of these outcomes are expressed in terms of performance outcomes. Each outcome has a separate and discrete performance measure. For example, one SLO may have a standard that 100% of the students earn at least an 80% on the item being assessed.

- In what ways does the unit evaluate student learning (e.g., classroom- and/or performance-based assessment, capstone experiences, portfolios, etc.)?

Our performance on these SLOs is directly assessed each academic year by instructors in individual courses. In addition, we conduct an indirect assessment of each SLO via an annual exit survey of graduating seniors. Data collected from these assessments are put into an annual assessment report (Academic Quality Improvement Plan Annual Report) by the department chair during the summer. In the fall of each year, the report is reviewed by faculty and CIAC. Any suggested improvements to the educational process are documented as an amendment to this annual report.

- What methods are used to assess student satisfaction? What efforts are made to gauge the satisfaction of students from under-represented groups?

The department chair and academic advisor meet with all juniors in the spring of each year. Additionally, the department chair and academic advisor meet with the seniors in the spring of each year to conduct an exit interview. During these sessions, we seek to assess student satisfaction by soliciting suggested improvements and discussing issues related to the CM program. Informally, our department administrator seeks to gauge student satisfaction by engaging students on an informal level. We do not have a program that specifically tries to gauge the satisfaction of under-represented groups.

- What are the findings of the assessment of student learning in each program of study?

The findings of assessment of students learning (departmental accreditation documents) can be found at: http://cm.be.washington.edu/about_cm/accreditation/

These documents include:

Academic Quality Improvement Plan: provides the departmental assessment plan

Academic Quality Improvement Plan Annual report for AY 2015/16: provides results and any

actions taken.

- How has the unit used these findings to bring about improvements in the programs, effect curricular changes, and/or make decisions about resource allocation?

Based on the annual report and because our curriculum was recently significantly modified, there were not any recommended changes to the curriculum in AY 2016/17. At the faculty retreat on 21 September 2016, the faculty reviewed the end of year report and each SLO in detail. Several SLOs were found to be redundant, did not provide meaningful data, or did not accurately meet ACCE standards. Therefore, the faculty decided to reduce the total number of direct assessment SLOs from 39 to 32. One of the direct assessments for technology was moved from the estimating lab class to the virtual construction class.

Since the data collected was for a “beta year,” and at that point only one year of data has been collected, no specific recommendations were made about achieving student learning performance levels (i.e. 100% of students achieve > 80%). Therefore, whether or not students achieved the required performance level was not considered or acted upon.

In the beta year, we recognized that our data collection system was not very efficient. In response, we developed a system using Google docs. As of AY 2016/17, all instructors are able to directly upload their specific SLO data.

The results were shared with CIAC and the CIAC curriculum committee. CIAC and the CIAC curriculum committee did not have any substantive changes or recommendations. The CIAC committee did meet again to have a deeper understanding of the degree program and ACCE requirements. The CIAC curriculum committee has decided to spend more time on understanding the curriculum. One young member plans to become an ACCE visiting industry member.

- If applicable, note the courses typically taken by undergraduates who will not be majors in any of the unit’s programs. Are there specific learning goals in those courses designed to accommodate such “non-major” students? If so, how is student achievement in reaching these goals assessed?

CM classes are closed to other majors due to capacity issues. We do allow a finite number of Civil Engineering students into our courses. These students are expected to achieve the same learning outcomes as our CM students.

MS Construction Management

- What are the student learning goals (i.e., what students are expected to learn)?

The goals of the master’s program are for students to learn advanced concepts of construction management and provide learning opportunities for career advancement. We want students to

participate in research and learn advanced topics in construction management to help solve some of the most pressing problems that our industry faces. Performing research in a variety of subjects enables students to learn the practice of applied problem solving.

- In what ways does the unit evaluate student learning (e.g., classroom- and/or performance-based assessment, capstone experiences, portfolios, etc.)?

All students must complete a research paper or thesis. The paper involves studying a current issue and earning three credits of CM 600, independent study. The thesis involves writing about an original concept, forming a committee, and earning six credits of CM 700, thesis.

- What methods are used to assess student satisfaction? What efforts are made to gauge the satisfaction of students from under-represented groups?

Individual faculty members meet with graduate students to gauge student satisfaction. A survey of graduate students is needed to further understand graduate student satisfaction. Students evaluate each class for both teaching effectiveness and the course as a whole. The results of each class is reviewed by the department chair. No specific measures are taken to gauge the satisfaction of under-represented groups.

- What are the findings of the assessment of student learning in each program of study?

The graduate program coordinator monitors the academic performance of graduate students. Students with subpar academic performance are mentored and monitored by their advisor. Historically, the department has relied on grades as a measure of whether learning outcomes have been achieved. It is recognized that a formal assessment process for the graduate program would be a better system to gauge student learning.

Other significant findings were that a significant number of students have changed mid-course from a thesis option to a research paper option. Additionally, one course was discontinued due to significant student displeasure with a course.

- How has the unit used these findings to bring about improvements in the programs, effect curricular changes, and/or make decisions about resource allocation?

The department started a one credit seminar in autumn 2016 to introduce the students to the faculty. Each faculty member presents their specialty area to graduate students in hopes of matching students and faculty with common interests. This seminar has been successful in directing students to the right type of research based on collaborations with faculty with similar interests.

- If applicable, note the courses typically taken by graduates who will not be majors in any of the unit's programs. Are there specific learning goals in those courses designed to accommodate such "non-major" students? If so, how is student achievement in reaching these goals assessed?

Graduate students from Civil Engineering, Architecture, Real Estate, and Urban Planning take our graduate classes. These students are expected to achieve the same learning outcomes as CM students.

CM Certificate Program, offered through the Continuum College is a fee based program.

- What are the student learning goals (i.e., what are students expected to learn)?

The certificate program's goals are to provide specialized training in project planning, budgeting, scheduling, quality control, safety, contracts and staff development.

- In what ways does the unit evaluate student learning (e.g., classroom- and/or performance-based assessment, capstone experiences, portfolios, etc.)?

The curriculum follows a project from estimating through project management. Learning outcomes are listed on the syllabus of each class. Student learning is assessed via homework, exams, and in final projects.

- What methods are used to assess student satisfaction? What efforts are made to gauge the satisfaction of students from under-represented groups?

The results of each class are reviewed by the department chair. No specific measures are taken to gauge the satisfaction of under-represented groups.

- What are the findings of the assessment of student learning in each program of study?

Faculty members gauge student learning in each course. Recently in the estimating course, student learning suffered from admitting students that were unprepared for this course.

- How has the unit used these findings to bring about improvements in the programs, effect curricular changes, and/or make decisions about resource allocation?

Changes were made to the acceptance policy to ensure students had the knowledge to successfully complete this course.

- If applicable, note the courses typically taken by undergraduates who will not be majors in any of the unit's programs.

This is not applicable; all of the students in the certificate program are "majors".

Instructional Effectiveness

- Including the use of standardized teaching evaluation forms, describe and discuss the method(s) used within the unit to evaluate quality of instruction.

The department requires that each course must be evaluated by students. This process is completed by using standardized forms developed by the UW. However, faculty have the ability to add questions to these forms. All student evaluations are reviewed by the department chair at

the end of each quarter. Specific quality of instruction issues are discussed with each faculty member.

The department also has a peer teaching evaluation process. Faculty members eligible for promotion and affiliate faculty are peer reviewed each year. Peer reviewers attend a class, write a review of the teaching, and provide feedback both orally and in writing to the faculty member.

As part of the department's merit review process, faculty are asked to write a self-reflective statement on their teaching effectiveness. This statement provides reflection on how to improve future classes.

- Please note all opportunities for training in teaching that are made available to any individuals teaching within the unit (including graduate students). These may be opportunities that support teaching improvement, innovation, and/or best practices, for example.

New faculty to the UW attend a faculty teaching orientation hosted by UW's Center for Teaching and Learning (CTL). Faculty members have also used CTL for additional instructional guidance. Graduate students that will become TAs attend the TA orientation provided by CTL. The department co-hosts an orientation for new affiliate faculty each autumn.

- Describe specific instructional changes you have seen made by instructors in response to evaluation of teaching within the unit.

Our undergraduate curriculum was substantially modified in AY 2014/15 to better incorporate a major modification to our accreditation standards. Based on current trends and industry input, in AY 2015/16 another modification to the undergraduate curriculum was made by adding a requirement for an additional technology class. The graduate curriculum has not significantly changed over the past few years, except for adding in specific courses that pertain to a particular faculty member's interest. Some specific examples of instructional changes are as follows.

In the Estimating lab course, different software has been introduced to the students to alleviate the concern that students were not being introduced to newer estimating software.

Based on student feedback, the scheduling class instructor has introduced MS Project earlier and provided more example schedules.

In a technology class, the professor tried to flip the class by having students view videos on software procedures so more time could be used in class to build 3D models. Students felt unprepared for lecture activities because they either did not do the pre-work or this work was difficult to comprehend. The class now spends significantly more time on how to apply the software before models are attempted.

In the graduate sustainability class, the professor introduced too much analytical material without enough time to cover it properly. This class is offered on Monday nights in winter quarter. This

past year there were three Monday holidays and one snow day on a Monday night. Future class sessions will be scheduled across two days and not on Monday evenings.

Teaching and Mentoring Outside the Classroom

- Describe and discuss how faculty members are involved in undergraduate and graduate student learning and development other than through classroom teaching (i.e., informal learning, independent studies, research involvement, specialized seminars or workshops, etc.).

Undergraduate students participate in the following student competitions: Associated Schools of Construction, Mechanical Contractors Association, National Association of Home Builders, National Electrical Contractors Association, and Design Build Institute of America. Additionally, faculty mentor undergraduates by offering individual studies courses for special projects.

Graduate students are invited to many presentations, talks, and workshops provided by the department and college. In spring of 2017, a workshop on solar energy installation was offered. All graduate students participate in the Construction Education and Research Conference's annual March conference at our facility at Sandpoint.

- Describe how the unit works with undergraduate and graduate students to ensure steady academic progress and overall success in the program, and any additional efforts to support students from under-represented groups.

Undergraduate students are advised by the department's academic advisor until they are accepted into the Construction Management program. Once accepted into the program these students are assigned a faculty member to be their advisor. The department's academic advisor meets regularly with prospective students to monitor progress and provide guidance.

The department has an informal process to guide under-represented groups. The department's academic advisor and department chair monitor all students, particularly students that have enrolled in the Educational Opportunity Program (EOP) administered through Office of Minority Affairs and Diversity (OMAD) program.

Graduate students' academic achievement is monitored through the graduate school and a notice is sent to the graduate program coordinator if a student is struggling academically. As graduate students near the completion of their studies, a degree audit is performed to ensure all degree requirements are met.

- Describe how the unit works with undergraduate and graduate students to prepare them for the next phases of their academic or professional lives.

The department enjoys a close relationship with the construction industry, and we use this relationship to help prepare students for great careers. At various stages in a student's

progression, they are exposed to industry professionals. Our full-time faculty regularly have guest speakers from industry, and many of our part-time faculty work in the industry and teach one class a year. We also sponsor field trips to a wide variety of construction sites. Industry professionals volunteer as mentors in preparing competition teams and during capstone preparation and judging. The department hosts panel sessions for both the junior and senior classes. The panel session for the juniors is focused on preparing students for their internships and how to have a successful internship. The panel session for the seniors is focused on preparing students for their careers and the importance of continuing professional development after graduation.

Section III: Scholarly Impact

- Describe the broad impact of faculty members' research and/or creative work. Feel free to note specific individuals and how their work embodies the unit's mission, or distinguishes the unit from those at peer institutions.

Since the department is relatively small, the interests of the faculty dictate the research interests of the department.

Associate Professor Aziz specializes in project delivery specific to Public-Private Partnerships (PPP), economic and financial modeling, and analysis of project management. His PPP work is significant since the state of Washington has recently begun projects using this method. Dr. Aziz has recently worked with the Capital Project Advisory and Review Board to draft legislation that was sent to the Washington State Legislation for incorporation of PPP into the Revised Code of Washington.

Professor Bender's recent work has been published in areas to support the academic mission of construction management programs. A recent paper to correlate construction management student performance with student entrance criteria provided programs with a perspective on the effectiveness of entrance criteria.

Professor Saeed Daniali is an expert in structural systems.

Professor Carrie Dossick's research is associated with technology, specifically BIM and communications in the built environment. Her work has furthered the knowledge and adaptability of technology used for communications within the Architecture, Engineering, Construction (AEC) community. Dr. Dossick is also the director of our Center for Education and Research in Construction (CERC). This physical center contains lab and classroom space that is located off campus.

Professor Yong-Woo Kim's research emphasizes lean principles focused on the supply chain in construction management. His work in activity-based costing for construction companies has been adopted by industrial partners.

Associate Professor Kamran Nemati's research focus is on structural performance in concrete. Most recently his work is focused on studying the fire resilience of concrete.

Associate Professor Ken-Yu Lin is an expert in construction safety and applying technology to civil engineering. She has recently established a program with another department in the School of Public Health to expand construction safety to individuals studying industrial hygiene.

Associate Professor Giovanni Migliaccio's research has a broad research base that furthers the body of knowledge in project management, transportation, and worker safety. Recently he has finished a guidebook to improve sustainable practices for contractors and engineers in the transportation sector.

Assistant Professor Chris Lee has begun to establish himself as a researcher in sustainable systems and interdisciplinary work. His current work seeks to improve energy efficiency, worker safety, and project delivery using technology.

- For undergraduate and graduate students, describe significant awards, noteworthy presentations, or activities that have had an impact on the field while in the program.

Undergraduate students successfully compete each year in the Associated Schools of Construction (ASC) student competitions. Over the past five years, teams have placed in the categories of Heavy/Civil, Mixed Use, Design Build, Commercial, Sustainability, and Concrete. Teams have also placed in the national competitions for Design-Build, Electrical, and Mechanical. Graduate students have participated the ASC student competition in the Integrated Project Delivery (IPD) category.

- For units in which postdoctoral fellows are appointed, describe their participation in the research and teaching activities of the unit.

The department does not employ postdoctoral fellows.

- Describe how program graduates have had an impact on the field either academically or professionally.

Graduates build infrastructure locally, regionally, nationally, and internationally. Impacts to the field are best expressed by the success of our graduates. Generally graduates go to work for construction contractors. As they progress in their careers they branch out to other areas of the construction industry. Construction management graduates can be found in the corner offices of construction companies in Seattle and across the west coast. Graduates also work for governmental agencies; for example, they are managing the \$54 billion light rail effort with Sound Transit and are managing large projects for the University of Washington and King County. In the Pacific Northwest, graduates have contributed to innovations in the use of software to manage projects (estimating, scheduling, and BIM), structural core concrete techniques for tall buildings, and by serving on a host of professional and community boards,

committees, and task forces.

- In what ways have advances in the field or discipline, changing paradigms, changing funding patterns, new technologies and trends, or other changes influenced research, scholarship, or creative activity in the unit?

The AEC industry has become a much more collaborative work environment. However, owners typically want projects completed faster. Several of our research efforts focus on communications, collaborations, and project delivery. The construction industry has not seen the significant production efficiencies that other service or manufacturing industries have. Our research in lean and applying technology to construction have contributed to areas that seek to boost production efficiencies.

Funding has traditionally been difficult to obtain in the area of construction management research. We have we have sought funding from governmental agencies and industry. Recently we created the Applied Research Consortium (ARC), the intent of which is to generate small amounts of funding from local contractors to solve industry problems with assistance from our graduate students and faculty members.

- List any collaborative and/or interdisciplinary efforts between the unit and other units at the University or at other institutions, and the positive impacts of these efforts.

Our closest partner is the Department of Architecture. We share a dual degree program. We have several classes that include both architecture and construction management students. The shared classes have allowed us to have group projects using a mixture of the students. We believe that it makes a significant impact on student learning to get students start working together early in their careers. This helps students gain an understanding of perspectives for the design or construction point of view. Faculty from both departments collaborate on research projects and work with graduate students.

Another collaboration focus in the college is the Real Estate department. We have teamed with faculty on research projects, participate in the real estate steering committee, and encouraged our students to take each other's classes. This mingling of students and classes allows for a broader education for both groups of students.

Across campus, we have partnered with the School of Public Health to create a specialty area in the master's program that deals with construction safety. This program, called Construction Management Occupational Safety and Health (CMOSH), provides funding for domestic graduate students and joint classes between the department and the Department of Industrial Hygiene.

We have a long-established joint online masters program with the Department of Civil and Environmental Engineering. In this program, students take a mix of classes from each department. This program provides educational access to students across the globe. Faculty in our two departments also work jointly on projects, graduate committees, and combined field

trips.

Most of our faculty collaborate with faculty across the globe; joint projects include work with our sister institution at Washington State University and universities in Italy, Japan, Korea, and Germany. These collaborations have helped to expand body of knowledge in the built environment.

- How does the unit work with junior faculty to maximize their success?

An Assistant Professor's teaching load is only three classes versus the normal four classes. The department chair mentors assistant faculty for teaching, service, and research. Assistant Professors are actively included as collaborators in projects with other faculty members.

- Describe how the unit utilizes institutional resources such as the Office of the Associate Vice Provost for Faculty Advancement to recruit and retain faculty from under-represented minority groups.

The department has a diverse mix of full-time faculty. During our last search, three finalists were brought to campus: a white male, a white women, and an Asian male. Our affiliate faculty mostly work in the industry and generally reflect industry demographics. We have not used this office but in the future we plan to do so to ensure we recruit from underrepresented groups.

- To what extent has the unit been successful in diversifying its faculty ranks?

Our faculty is diverse in several ways: age, ethnicity, gender, and original country of origin.

- What specific strategy has the unit employed to support the career success of, faculty members from under-represented groups?

The department does not have specific program to support faculty from under-represented groups.

Section IV: Future Directions

Rather than simply addressing this section by reiterating previous sections of the self-study thus far, address this in a way that is constructive for the unit as it thinks about its future.

- Where is the unit headed?

The department contains a mature undergraduate construction management program; we recently celebrated our 50th anniversary in 2014. The undergraduate program has recently obtained what is considered capacity at between 60-70 students graduate each spring. No major changes are expected except continuous improvement from our assessment process. We would like to increase our efforts to diversify our student demographics.

The graduate program has recently experienced growth in international students since the program has been declared a STEM field. The graduate program currently graduates about 20

students per year, this number could grow to 30 a year. However, most recently we have experienced another downturn and are only expecting 11 students to enroll in autumn 2017. As a department, we need to set a target for the desired number of students and work toward that goal, especially given how the current political environment can affect international student enrollment.

The certificate program is robust and at a steady state. Currently, the enrollments and revenues are strong. The department does not plan any expansion or curriculum modifications in this area.

The online masters program has suffered from steadily lowering enrollments. This program needs a review/modernization of course work, credit reduction, better marketing, and potentially, a tuition reduction.

The department research center, CERC has recently operated at a higher level and is projected to be self-sustaining. The department needs to continue to nurture this facility's capabilities to ensure financial sustainability.

Research opportunities and collaboration among faculty in the department, college, university, and industry need further development.

- What opportunities does the unit wish to pursue and what goals does it wish to reach?

Undergraduate Program: The undergraduate program has an opportunity to continue strong enrollments and diversify the student population. We also seek to create more awareness about our major in local high schools and admitted UW students.

Graduate Program: The department has an opportunity to improve and grow the size of the graduate program, both online and face to face. We need to modify existing goals, procedures, and student management to accommodate this growth.

Research: The department has unique and diverse faculty expertise in construction management. There are opportunities to collaborate with each other and researchers both inside the UW and externally. We need to expand our funded research opportunities.

Construction Education and Research Center: CERC is a tremendous physical space and virtual depository for the collection and dissemination of research. We need to continue to foster the growth of this resource.

Advancement: The Pacific Northwest construction market is booming. The department has a ripe environment for fundraising. Our fundraising goals are for student scholarships, graduate student fellowships, student support, research opportunities, and faculty professional development.

- How does the unit intend to seize these opportunities and reach these goals?

Undergraduate: This summer, the department hosted a week-long experience for high school students to learn more about construction management in June 2017. We plan to continue this

effort. The department plans to purchase VR equipment and have demonstrations in the Husky Union Building. This is to introduce UW students to the technology side of construction management as part of our recruiting and awareness efforts. We plan to continue additional marketing efforts by attending high school college fairs, by creating articulation agreements with community colleges, and by pursuing similar opportunities.

Graduate: In preparation for this 10-year review, the faculty developed unit defined questions. Most of the questions centered around the graduate program since our undergraduate program is accredited and is reviewed every six years. In order to achieve growth and maintain quality in the graduate program, the faculty have sketched out potential changes to our program. As part of this review, we plan to make modifications to the graduate program in AY 2017/18 to incorporate practices that will help grow this program.

Research: The department has provided limited funds to support graduate students working with faculty as a way to increase research productivity. Our ARC program is another opportunity. As our faculty collaborate with one another and share funding opportunities on projects, this will help to achieve these goals. Additionally, faculty who seek and obtain funds from outside agencies or industry will help achieve these goals.

Advancement: The department has been working with CIAC to develop a fundraising task force. Some marketing materials have been developed. This task force needs to start meeting, develop tasks, and assign duties.

- Describe the unit's current benefit and impact regionally, statewide, nationally, and internationally. Given the unit's envisioned future, describe how reaching this future will augment that benefit and impact.

Regionally and nationally, we produce entry level management professionals from our undergraduate program that builds infrastructure.

Similarly, our graduate program produces well-trained and educated management professionals. Additionally, it educates global citizens steeped in our culture of sustainability, safety, and quality on construction projects. A robust graduate program with domestic students benefits our economy. Educating a large international student body benefits people across the globe by fostering construction practices that are less harmful to people and the environment.

Our faculty disseminate built environment research that has a regional and global impact. Our ARC program focuses mostly on regional issues. Nationally, several faculty are on boards, committees, and task forces that work to solve industry issues. Internationally, our faculty publish at international conferences and with international experts across the globe.

Part B Unit-Defined Questions

Part B contains the unit's core questions it set forth for itself. Since the department's undergraduate program is American Council on Construction Education (ACCE) accredited, we have elected to focus questions on the graduate program, support of research, and resource allocation. These questions ensure that the review is of unique value to the unit and help guide the review committee's work in best assisting the unit to understand its current strengths and challenges, as well as the best path for achieving its future goals. The questions are provided with some context behind each question, followed by our response to the questions.

Questions with context.

Q1 Does the graduate program meet the needs of our students, employers, and faculty?

- 1.1 Should we have two separate MS degrees (one online and one face to face)?
- 1.2 Do both graduate programs need a research component?
- 1.3 Quality expectations held by graduate students?
- 1.4 Should curriculum focus on industry preparation or academic careers?
- 1.5 Are we providing quality instruction to meet industry needs?
- 1.6 Industry reflection on enrollment?
- 1.7 Is the industry receptive to hiring graduate students?
- 1.8 How to attract more domestic students?

Q2 How do we support basic and applied research? Are we providing quality research to contribute to the construction industry and academia?

- 2.1 What synergies in the college and region can our department leverage? and what resources in the Department and College are currently available for research activities?
- 2.2 How do we enhance collaborative research with our industry partners of owners and contractors? Are we producing collaborative research with our industry partners?
- 2.3 Are we producing research output that contributes to advancing industry practices and our academic domain?

Q3 Is the current resource allocation plan in line with the strategic plan? How should future resource allocations be aligned with the strategic plan?

- 3.1 How should our limited resources be prioritized to be in line with the strategic plan?
- 3.2 Do we fund resources enough to meet the needs?
- 3.3 What metrics should be assessed to measure performance? i.e. publications, etc.
- 3.4 How can we best adapt to changes in resources from internal and external systems, particularly by developing additional resources in relation to supporting graduate students?

Questions with answers

1. Does the graduate program meet the needs of our students, employers, and faculty?

This main question provides the framework for the following questions and answers. For students and industry, a survey should be conducted to gauge student and employer satisfaction.

1.1 Should we have two separate MS degrees (one online and one face to face)?

Currently, the master's degree in construction management has two degree paths: one face-to-face and one online. The online masters is jointly offered with the department of Civil and Environmental Engineering (CEE). Applications for both degree paths are managed together using the same admission criteria. Similarly, the graduation requirements are the same.

However, the on-line degree requires specific courses which are not necessarily the same as in the face-to-face degree. On the other hand, students in the face-to-face degree program can take courses from both degree paths. Students in the face-to-face program must take three required courses.

While graduation from both degrees requires 45 credits, the face-to-face degree path allows students to choose between a research thesis option of 9 credits and a research paper option of 3 credits. The 45 credits are established based on 9 credits of 3 core courses, regular CM courses, a maximum of 12 credits of approved non-CM courses, and the credits for the thesis or paper options. The online degree path is designed for working professionals. It also allows students from around the globe to study at their own pace. This program has a fixed curriculum that does not allow students to take non-CM/CEE scheduled courses. It has 41 credits of coursework (14 courses) and a maximum of 4 credits in independent study (CM600) toward the degree requirement of 45 credits. The online degree path from the CEE department requires only 42 credits total (14 courses) without independent study research. The Graduate School requires a minimum of 36 credits for graduation for a master's degree.

We would like to change our online master degree requirements to match those of the CEE master degree (which only requires 42 credits). This could be accomplished by removing the independent research requirement (CM600) and changing CM 590 "Research Methods in Construction" to make it a 3 credit course or by keeping CM 590 at 2 two credits and reducing the research study (CM600) to one credit.

The face-to-face degree should have the same number of credits as the online program, which we would like to change to 42 credits. If we decide on a reduction in credits, we may require the face-to-face option to reduce the number of non-CM credits from 12 to 9. However, we are also considering allowing 15 credits of graduate level Real Estate coursework to allow students to earn a minor in Real Estate. If changes are made in the number of credits required, the Department needs to make decisions on these kinds of details.

1.2 Do both graduate programs need a research component?

The UW is an institution where research plays a significant role in advancing knowledge by addressing and providing solutions for problems in the built environment. Research work plays an intrinsic role in most university units; it can be done at the master's degree level, doctoral degree, or both.

While research work is essential to the function of the university, it is also necessary for faculty professional development and advancement. Without a research component in a degree program, e.g. research paper, thesis work, or both, the ability for faculty to do collaborative research with graduate students would be limited. Graduate students support some of the research work done by the faculty. Graduate students who support faculty research work are also being trained as the next generation of academics. Without a research component, faculty may need to put more effort in basic research endeavors, which could lead to less capacity in teaching and service. Also, without graduate students performing basic research this may impact the ability to attract funded research.

Some university units or programs may provide the most up-to-date knowledge to graduate students without having them do research. This course-only approach to graduate education addresses the needs of professionals who want to learn advanced topics while working. Their work schedule may not allow them the opportunity to conduct research work. Units may choose to have non-research oriented graduate programs (which complement existing research programs) in order to satisfy students' professional needs.

It is more suitable for the online degree program to have a reduced research component or consist of coursework only. This may better suit the working professional and be better for marketing the program among the heavily practice-oriented construction industry.

The face-to-face degree program should continue to have a research-oriented component since there are actively engaged faculty members to work with. The research component is currently supported by the thesis or research paper options. Potentially, a course-only option could also be added. This option may be attractive if we grow the masters program and there is a limitation on the number of students a faculty member can mentor. However, further investigation is required since other university units such as Civil and Environmental Engineering (CEE) were negatively affected by having a course-only option. Given the option to choose, most CEE students chose the coursework-only option. CEE does research work with graduate students by providing

funded fellowships. The CM department has very few funded fellowships.

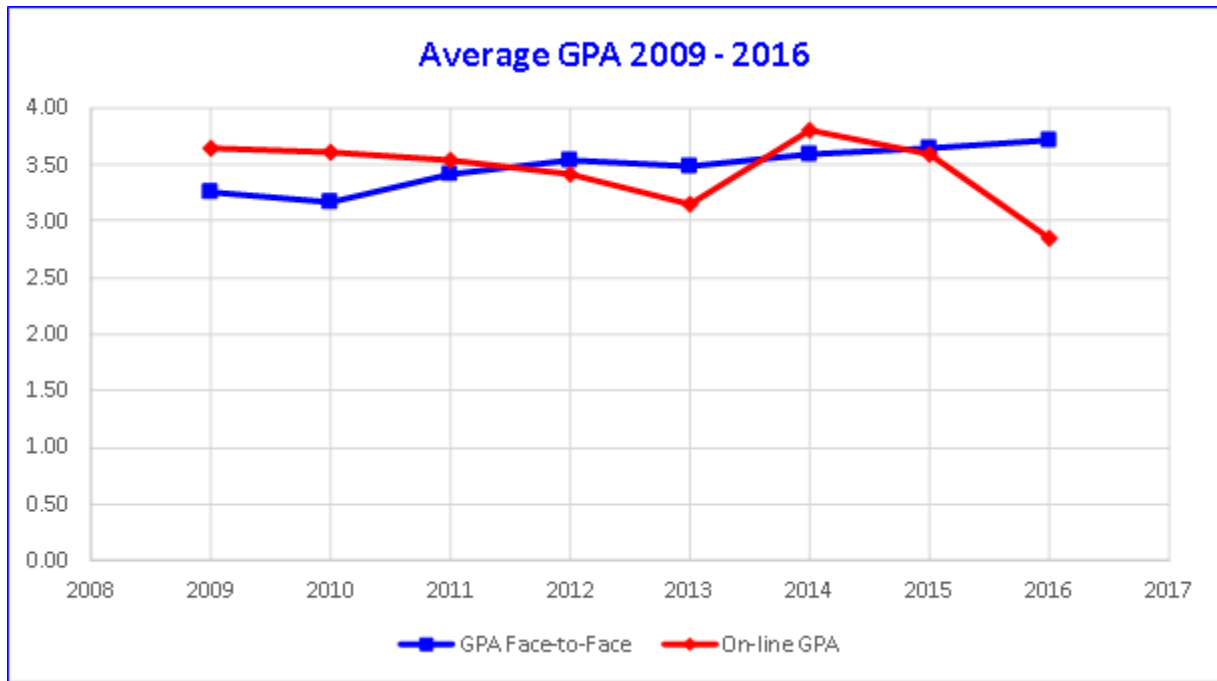
1.3 What are the quality expectations of graduate students?

We have expressed the quality expectations of graduate students in two ways: 1) academic quality achievement and 2) what the graduate students think about the quality of the program. The academic quality achievement of the graduating students is presented and discussed below. An indirect assessment is required to gauge what students think about the quality of the program. This assessment can be accomplished by an annual exit survey.

CM graduate students are expected to achieve a minimum cumulative GPA of 3.0 for graduation. However, during their enrolment, students who obtain GPA less than 3.0 in any course, quarter GPA, or cumulative GPA are warned for substandard performance and given a quarter to improve. The inability of students to achieve such a minimum triggers the probation procedure where students are given two quarters to improve before a final probation period. This procedure is a university requirement and helps to keep track of the academic performance of the students.

Along with the grade requirements, students are warned not to take a satisfactory/not satisfactory (S/NS) grading option without consulting with their advisor or the Graduate Program Coordinator. Following the Graduate School requirements, a minimum of 18 credits need to be taken as graded credits. Having too many credits on a S/NS basis does not provide for adequate judgment of a student's performance.

Historically, in the 2009 – 2016 period, CM Masters program graduates earned a GPA average of 3.48 in the face-to-face program and 3.45 for the online program. The GPA trend has been steady over the same period as shown in the chart below. In terms of earned grades, the chart speaks very well about the academic achievement of graduate students.



1.4 Should curriculum focus on industry preparation or academic careers?

The graduate program curriculum complements the undergraduate program curriculum. The undergraduate degree prepares students for entry level management positions in the construction industry.

The graduate program prepares students for advanced positions in industry or academic careers. The graduate program curriculum provides more advanced topics. The program prepares students to take higher positions in the industry, and at the same time, prepares students who want to pursue academic careers. The mix of graduate courses and graduate research provides for these dual objectives. However, the recent growth in our graduate program is largely from an increased number of international students. These students typically have experience in engineering and/or are unfamiliar with the US methodology of construction management. Many of the basic concepts of estimating, scheduling and project management are unfamiliar to most of our international students. Additionally, most of the international students would like to gain US industry experience through Curricular Practical Training (CPT) or Optional Practical Training (OPT). The department does offer a 400 level course in the summer that has learning objectives of estimating and scheduling. However, since international students do not arrive until fall this class is out of sequence. This course should be offered in the fall and the degree program could allow for a 400 level course to count toward a student's 45 required total.

1.5 Are we providing quality instruction to meet industry needs? And, are we providing material or courses to meet industry needs? What else is needed?

The CM Department provides quality instruction through several dimensions. One of these dimensions is the graduate curriculum. The curriculum includes courses that cover most of the management aspects of the construction industry. These courses deal with: business operations of a construction company, cost and procurement systems, company and facility management, sustainability, innovations in the built environment, construction project management, and research methods. The wide spectrum of courses available to graduate students include the following list:

Contractual and Procurement Systems

CM 500 Design and Construction Law

CM 520 Construction Procurement Systems

CM 527 Management of Scope and Risks for Construction Projects

CM 530 Project Economics and Risk Analysis

CM 560 Design-Build Project Management

Company and Facility Management

CM 575 Leadership in Construction

CM 570 Facilities Management

CM 565 Managing International Projects

CM 545 Real Estate Development

CM 550 Residential Project Development

CM 555 Construction Firm Management

Construction Project Management

CM 510 Advanced Construction Techniques

CM 512 Preconstruction Facilitation

CM 525 Cost Analysis and Management

CM 528 Advanced Cost Management in Construction

CM 580 Temporary Structures

CM 582 Heavy Construction Estimating

CM 586 Utility Systems Construction

CM 588 Construction Operations and Productivity

CM 584 Marine Construction

Safety, Sustainability and Innovations in the Built Environment

CM 598 Special Topics – Data Driven Construction Health and Safety

CM 540 Sustainable Construction

CM 518 Lean Construction

CM 515 Innovative Project Management Concepts

Research Methods

CM 535 Research Methods in Construction

CM 590 Research Methods in Construction Engineering

CM 598 Special Topics

CM 600 Independent Study/Research

CM 700 Research Thesis

The department periodically reviews the curriculum with our industry partners (CIAC). The curriculum is periodically updated to provide new courses to satisfy particular needs.

Another dimension in the quality of instruction is the quality and qualifications of the CM faculty members. The faculty have significant experience in construction management. All the full time tenured or tenure track faculty members of the CM Departments hold Doctor of Philosophy in Civil Engineering degrees. The Department also employs around 18 affiliate instructors due to their practical knowledge in their respective fields.

A third dimension in the quality of instruction is related to the funded research managed by the graduate faculty. Research work not directly performed by faculty is conducted by graduate students to increase their knowledge. Faculty also share this research output with students in the graduate courses.

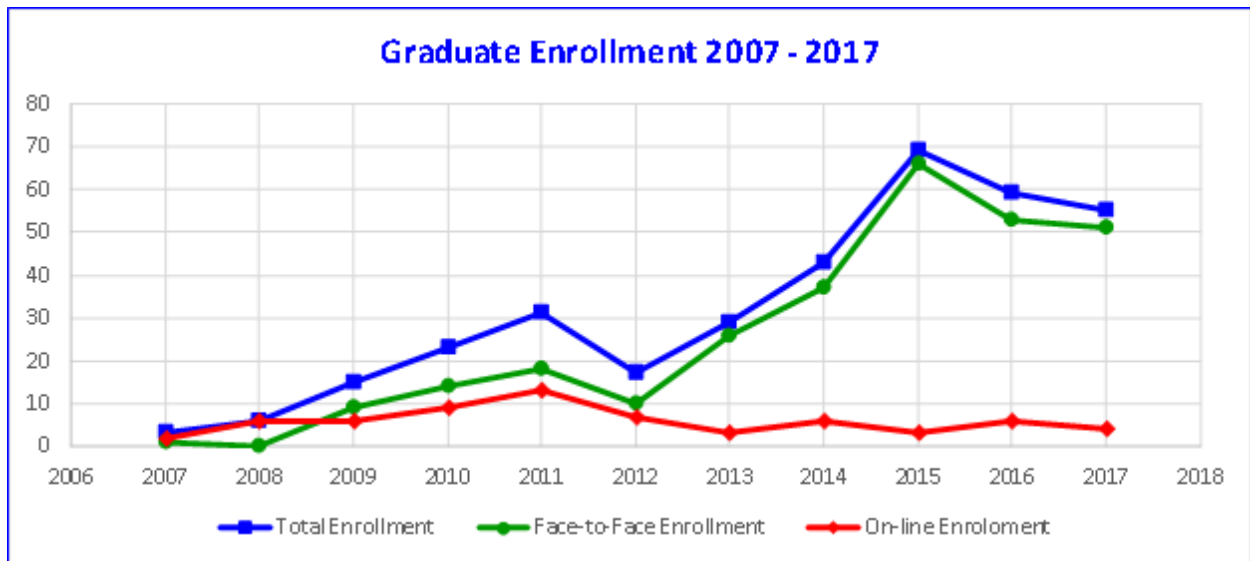
A fourth dimension is the continuous evaluation of the courses taught by the faculty members. Evaluation is done by students using course evaluation and by fellow faculty using peer-review sessions. This provides for continuous review of the quality of faculty instruction and provides for feedback on further improvement for future offerings.

As a final dimension, the CM department should gauge how employers in the construction

industry perceive the quality of our graduate program. This could be obtained through a structured survey of construction employers that hire our graduate students.

1.6 Enrollment figures and industry reflection on enrollment?

Graduate enrollment in the CM Department has been increasing over the 2007-2017 period with a positive trend of increase as shown on the chart below. Total enrollment between 2007 and 2017 is 350 students, of which 285 (81%) were in the face-to-face program and 65 (19%) were in the online program. For the same period, the average enrollment was 32 students per year of which 26 students per year were in the face-to-face program and 6 students per year in the online program.



Over the recent three-year period of 2014 to 2016, the average number of graduate students increased to 57 per year, however, a number of these students are progressing very slowly through the program. For those three years, the face-to-face program accounted for an average for 52 students per year (91%) and the online program accounted for 5 students per year (9%). In 2017, the expected enrollment is 55 with 51 students (93%) in the face-to-face program and 4 students (7%) in the online program.

Graduate enrollment is made up of international and domestic students, with international enrollment recently increasing. Graduate enrollment for the face-to-face program has been mainly dominated by international students. Over the 2007-2017, out of 285 (81%) students, 196 students (69%) were international students and 89 students (31%) were domestic students. For the same program and over the recent three-year 2014-2016, international students accounted for 78% (41 students per year) while domestic students accounted for 22% (11 students per year).

In contrast, graduate enrollment for the online program has been generally dominated by domestic students. Over the 2007-2017, out of 65 students (19%), 63 students were domestic, and 2 students were international. For the same program and over the recent three-year 2014-2016, domestic students accounted for almost 100%.of enrollment.

With the above enrollment figures and historical trends, it is expected that the enrollment per year would remain around 50 students per year and that the international students will continue to dominate the graduate enrollment in the CM master program. We have recently experienced a larger number of applicants for the master' program, however for AY 2017/18 enrollments are down. The department needs to decide if we want to expand enrollment.

1.7 Is the industry receptive to hiring graduate students?

The local construction industry is not very receptive to hiring international graduate students, however most students find work if not locally then elsewhere in the U.S. This difficulty is for several reasons.

International students who dominate the graduate enrollment cannot be relied upon for long term employment since they are constrained by their visa status. This situation has improved since the CM program became STEM-approved in 2015. STEM allows international students to stay for 29 months instead of the original 12 months of training. However, only a small number of international graduate students find a local internship. This is because local employers are often not familiar with the Optional Practical Training option which allows international graduate students to work in the U.S. for up to 29 months without visa sponsorship.

However, in order to get a full picture on how the industry employers perceive hiring our graduate students, a survey needs to be conducted.

1.8 How to attract more domestic students?

To counteract low enrolment of local and national students, the program should consider several strategies:

1. Running a marketing campaign for the master program to explain the program benefits, content, and how long it takes to earn a degree.
2. Discuss with our industry partners in CIAC on how to promote the graduate program with their staff/employees in a way that would benefit the members from the extra knowledge the employees would bring to the company.
3. Provide more graduate certificates that address the needs of the industry and working professionals, e.g. certificate in facility management, certificate in construction safety, etc.
4. Diversify the program options into new tracks, e.g. master degree in facility management.
5. Establish an executive degree designed for companies' senior managers.

6. Provide a full or partial scholarship covering resident tuition to the applicant with best qualifications.
7. Waive the GRE requirement for domestic students for both pathways, i.e. the online and the face-to-face programs.
8. Investigate the possibility of getting the graduate program accredited.
9. Reduce the number of credits to make the cost and time to completion more attractive.
10. Provide a graduate minor in Construction Management for graduate students.

Q2. How do we support basic and applied research? Are we providing quality research to contribute to the construction industry and academia?

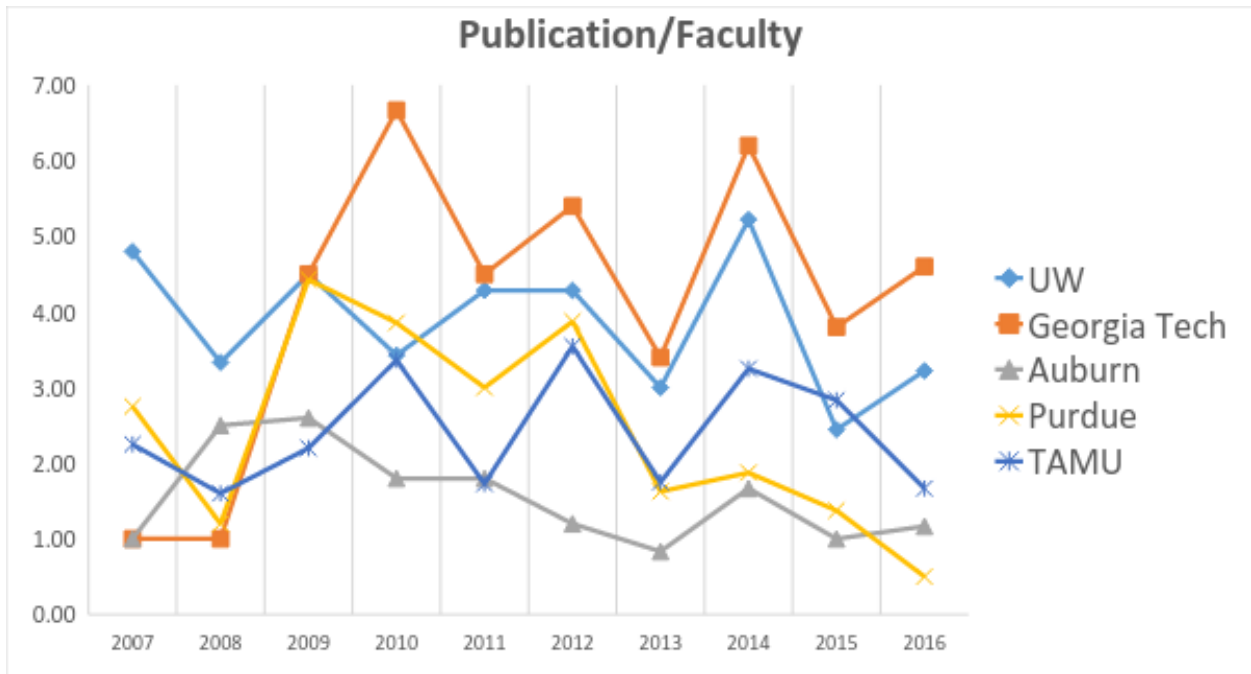
As a measure of how we support research, data was collected from peer institutions and compared to the department's faculty production. Additionally, what is being researched was investigated and is presented below.

Georgia Tech, Auburn, Purdue, and Texas A&M were selected based on the following criteria:

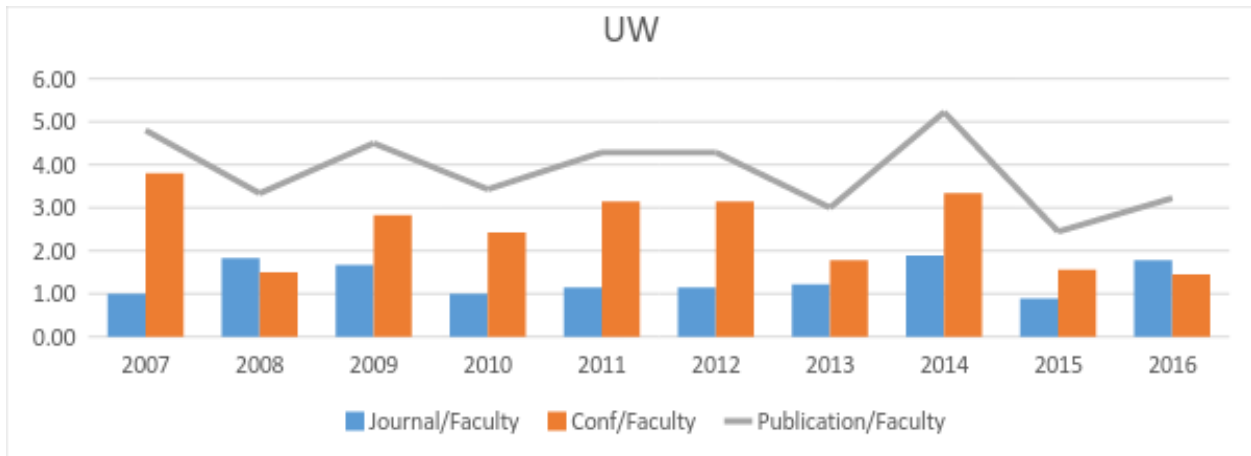
- Non-engineering school
- Offers PhD program
- Active research agenda

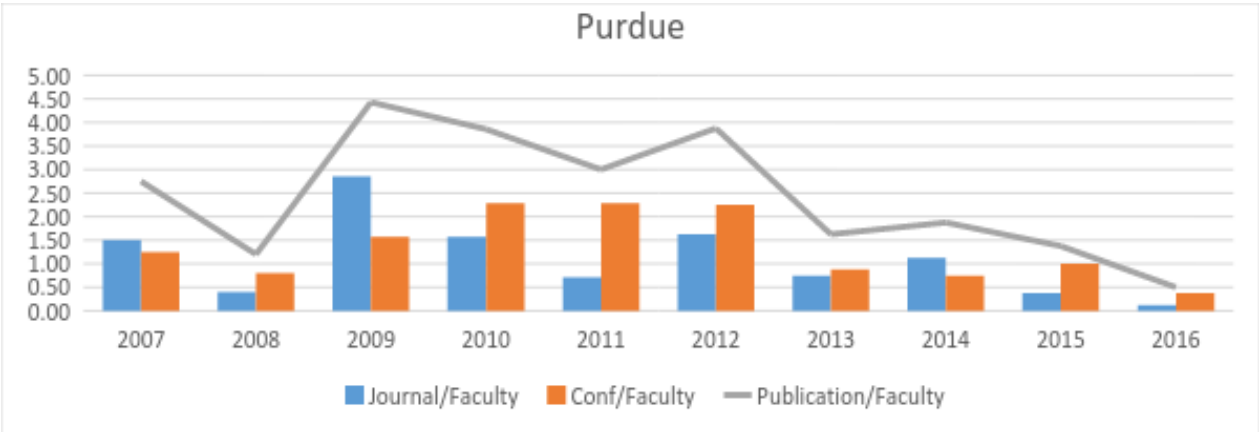
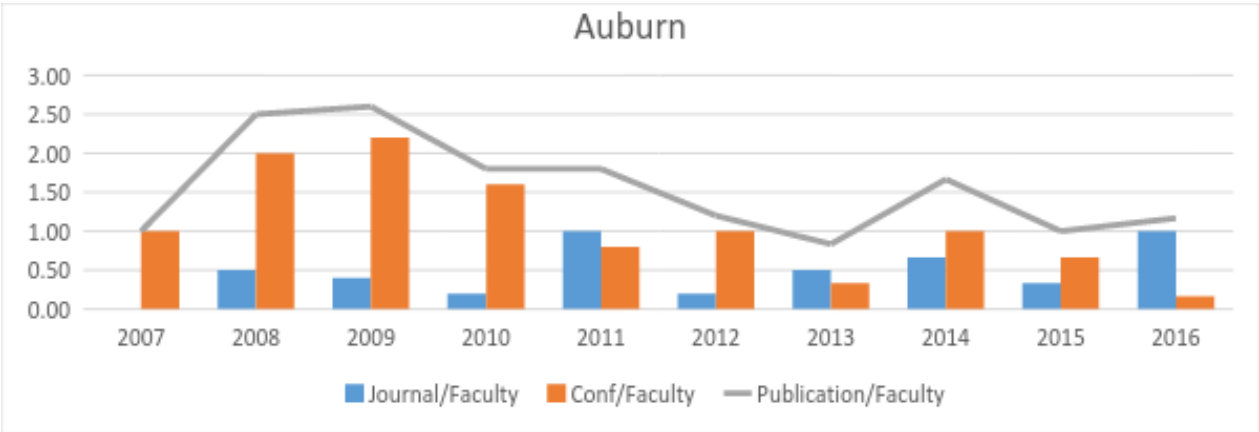
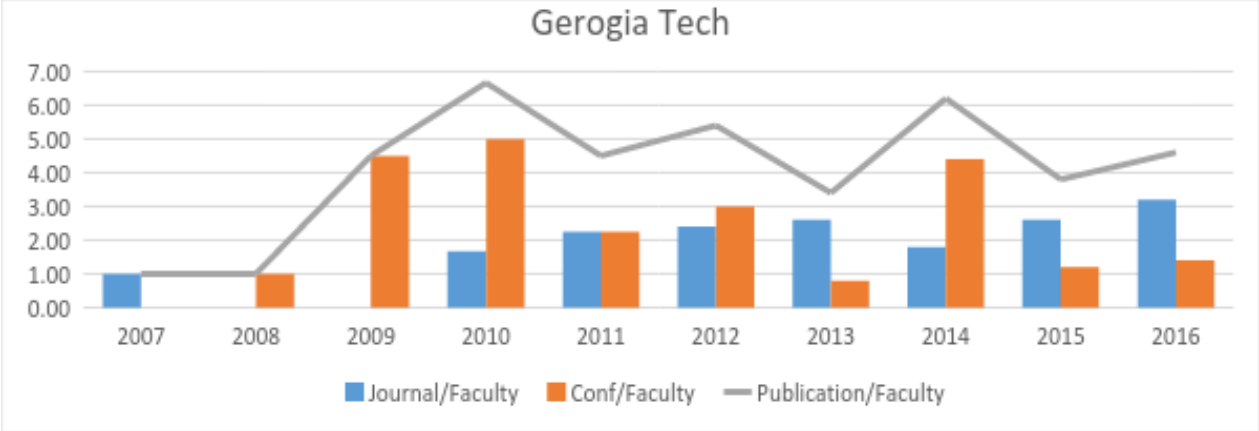
The data collection targeted journal publications and conference papers. The chart below summarizes the numbers of total publications (journal + conference papers) per faculty for each school over the last ten years (2007 through 2016). The chart indicates that in general, UW CM published more papers than other peer schools, except for Georgia Tech.

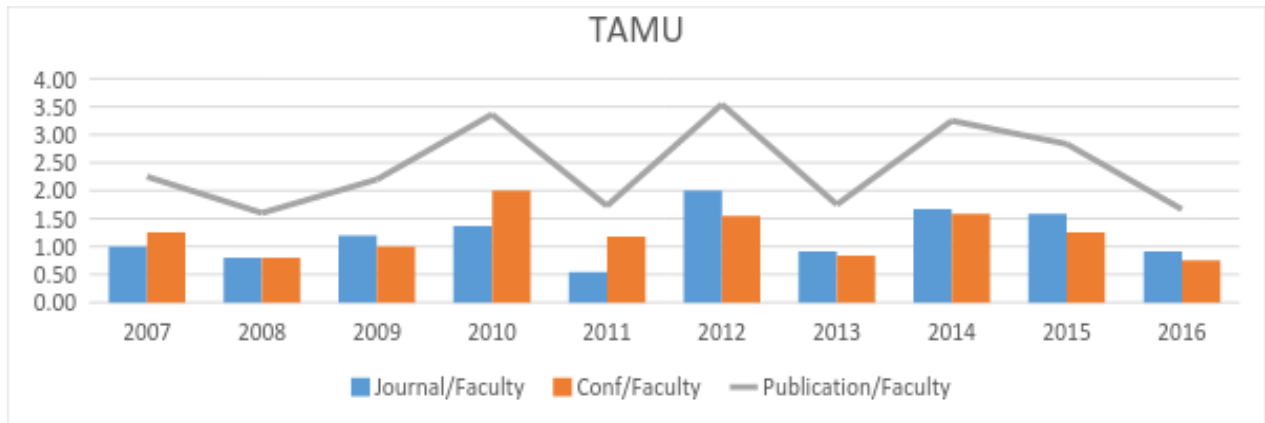
Therefore, we conclude that the research production of UW CM in terms of publication has been relatively strong for the last ten years. It should be noted that Georgia Tech recently cancelled their undergraduate program and three new assistant professors were hired solely for the graduate program. We attribute their strong publication performance to such major changes.



The detailed data for each school is given in the following five charts.







In addition to the number of publications, we also examined the target areas of each publication as a way to determine the core expertise and research interests of UW CM. Out of the 17 target areas identified, the following top five areas account for 82% of the total publications.

- Sustainability
- Project Delivery
- Safety
- BIM
- Lean

We also found that the current research lines of UW CM emphasize subjects related to pre-construction such as:

- BIM
- Design Management
- Collaboration

These three areas account for 31% of the total publications for the department. If the subject area of “sustainability” is included, the share increases to 49%. This result indicates that a significant share of the existing research and expertise is focused on pre-construction activities (such as planning, designing, and feasibility study), which matches up with the recent CM research trends focused more on pre-construction. It should be also noted that a significant amount of research has been conducted on not only construction management but also project management.

Q2.1 What synergies in the college and region can our department leverage and what resources in the Department and College are currently available for research activities?

At the Department level, the following resources are currently available for research:

1. Applied Research Consortium (ARC)
2. Center for Education and Research in Construction (CERC)
3. Departmental PhD Teaching Assistantships
4. Research labs at CERC
5. Professional staff for research administrative support
6. Research scientist for qualitative research and IRB (Human Subjects Approval)

preparation support

7. Construction Industry Advisory Council (CIAC)
8. Tuition matching funds from the department for funding research assistantships
9. Reduced teaching load to four classes from the college norm or five classes to conduct research

At the College level, the following resources are currently available for research;

1. Associate Dean for Research to support college-wide collaborative and interdisciplinary research beyond departmental boundaries
2. Professional staff for grant and budget preparation support
3. Interdisciplinary research opportunities with college faculty

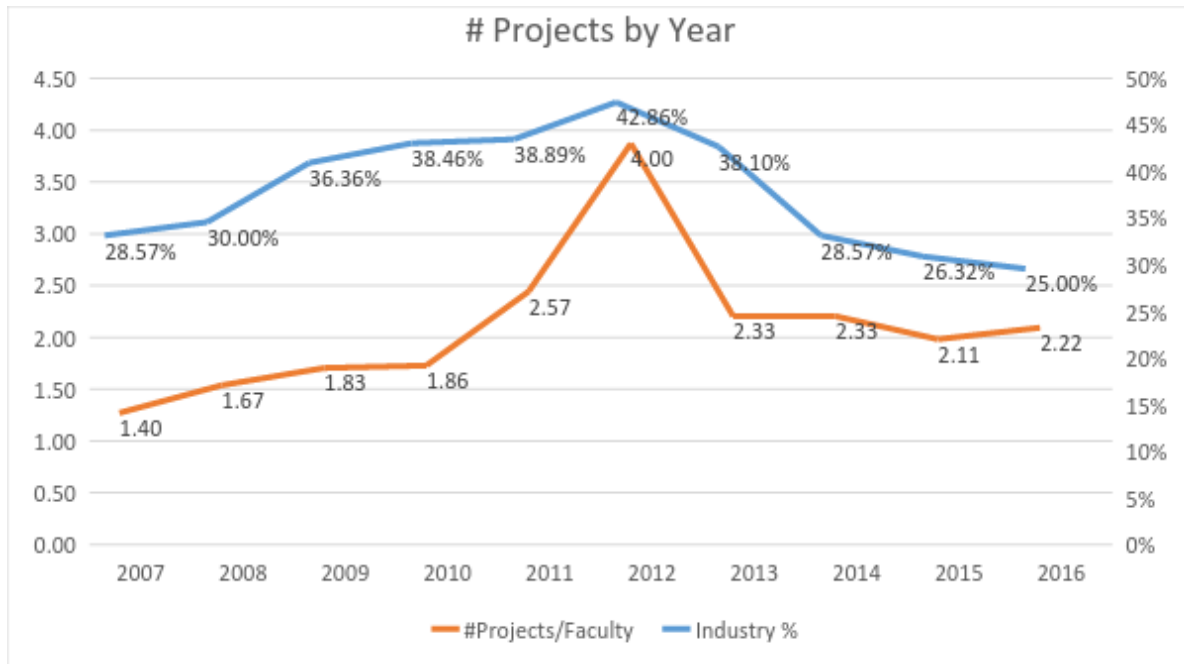
Although there are numerous sources of funding available from the Department and College, overall, they do not provide a high level of funding. Typically large funded research projects need to be funded from outside the University.

2.2 How do we enhance collaborative research with our industry partners of owners and contractors? Are we producing collaborative research with our industry partners?

To better answer this sub-question, we decided to collect the data for the number of funded projects each faculty member performed over the last ten years. The data was analyzed based on the number and type (industry-funded vs. government funded) of each project each year. It should be noted that multi-year projects were counted multiple times. For example, for a project spanning from 2012 to 2014, it was counted three times, that is one for each year. Also, the size of the project (such as \$ value) was not targeted for the analysis.

The chart below presents the summary of the analysis. It shows that the number of projects per faculty gradually increased from 2007 to 2011, and there was a sudden increase at 2012. After that, the number of projects per faculty has been steady hovering between 2.1 and 2.3. Therefore, we concluded that UW CM has a sustainable and steady stream of funded projects in recent years.

Industry-funded projects accounted for between 25% and 43%, indicating a healthy share of industry-oriented research projects. It was difficult to determine the type of some projects e.g. government vs. industry. For example, projects funded by the UW Capital Planning and Development (CPD) were regarded as government-funded since UW CPD is a state government organization; yet the nature of those projects were industry-oriented. If these projects were included, the percentage for industry-funded projects would increase significantly.



Recently UW CM launched the Applied Research Consortium (ARC), a research program that promotes academic-industry collaboration. With ARC in place, we expect that the share of industry-funded projects will increase in the near future.

Q2.3 Are we producing research output that contributes to advancing industry practices and our academic domain?

Based on the publication production and focus areas that UW CM indicated for the last ten years, we conclude that our current lines of research effectively contribute to advancing industry practices and our academic domain.

Department faculty plan to expand and promote ARC for broader collaboration with more industry partners. It is critical that the faculty seek more collaborative research with our industry partners since we focus on applied research. With the recent development of ARC, we expect this will lead to more applied research with our industry partners.

Departmental faculty contribute to research leadership with collaboration and through research dissemination in academic publications. Most departmental interdisciplinary research activities have been limited to individual faculty’s personal relationship with outside departments (e.g., DOT). To increase opportunities for large-size interdisciplinary research in the future, more strategic research planning and execution is needed by departmental and college faculty.

Q3 Is the current resource allocation plan in line with the strategic plan/ How should future resource allocations be aligned with the strategic plan?

The department operates on limited funding. The UW operates fiscally on a resource-centered management model called activity-based budgeting. Funding is based on student credit hours. Current five year projections show the department does not receive enough funding from the UW to cover all salaries. Therefore, enrollment management, growth, class size, and recruitment must all be carefully managed. The shortfall in salary funding is made up from our continuing education programs, principally the CM certificate. Additional sources of soft funding are endowments, donations, and minor revenue programs. The department's strategic plan was updated in the fall of 2015 and serves as our long term guide.

3.1 How should our limited resources be prioritized to be in line with the strategic plan?

Our resource allocation seems to be in line with the strategic plan. In recent years, the graduate program needed staffing support for prospective student advising, program communications, and coordination. New staff members have developed in their roles and created some graduate program support. The department supports faculty research by having a teaching load of four classes per academic year compared to the college norm of five courses. The department also provides some matching funds to support research assistantships. Some teaching assistantships support faculty teaching efforts and graders are provided for all undergraduate classes with enrolment over 30 students. Several faculty (5/10) have endowment support of up to \$9,000/year and every faculty member is awarded up to \$3,000/year for professional development.

3.2 Do we fund resources enough to meet the needs?

Research: Recent bridge funding from the department for CERC staff has been a significant investment that has paid off in CERC becoming a viable and self-sustaining center. This has also allowed the formation of a new program called the Applied Research Consortium (ARC). ARC has evolved to the point that it can provide ARC Graduate Fellowships that include an applied research internship with a partner firm.

Where we do not feel supported enough to meet our needs is in grant budget and finance management. Many of these functions are managed from the Dean's office. The resources at the College level seem overwhelmed which creates inefficiencies through rework and tracking budget requests that are not fulfilled. It appears that the Dean's office does not have the financial staff support required to manage these budgets. Consequently, our requests for changes, corrections, and allocations often take several requests.

Teaching: We have welcomed two new staff members to our department, and their roles are still emerging. Teaching is supported by the department, and both undergraduate and graduate students are well-served. The online course management tools meet our needs and Information Technology is well supported at the department, college, and university levels. We are lucky to have a great Director of Computing in our college who exceeds our expectations for IT support. The Chair of the department is also supportive of the instructional resources that we need for our classes. For example, the department purchased Personal Protective Equipment for in-class demonstrations, document cameras for Gould classrooms, and provides graders and teaching assistants. The department is also seeking to acquire Virtual Reality technology to get

prospective students excited about the discipline. The department also has a very strong relationship with industry, and many of our classes, graduate student papers and theses benefit from interaction with industry professionals.

3.3 What metrics should be assessed to measure performance? I.e. publications, etc.

We need to develop metrics to measure performance. The metrics could include: faculty graduate student advising loads, job placement, time to graduation, number of masters student thesis or projects, number of applications, number of offers and number of accepted offers for admissions.

Other qualitative and quantitative metrics should be identified within the strategic plan. In addition, other metrics may be found in the department's Promotion and Tenure guidelines that includes some qualitative metrics for research, teaching, and service activities. These metrics could be extracted annually based on merit review documents.

The department and the college should seek to streamline some of the administrative systems (such as budget management) to eliminate waste currently in the system. This would free up staff and faculty time to address some of the resource limitations mentioned earlier.

3.4 How can we best adapt to changes in resources from internal and external systems, particularly by developing additional resources in relation to supporting graduate students

Research: There may be opportunities to adapt to reduction in funding by pursuing funding for research or teaching initiatives. Through recent investments in the graduate program, the department now supports graduate students through 10 quarters of tuition matching. This means that if the faculty receive a grant or contract that will cover a student's stipend, the department can match that stipend with tuition for a full Research Assistantship. The department also offers Teaching Assistantships for a graduate student to teach a basic level class.

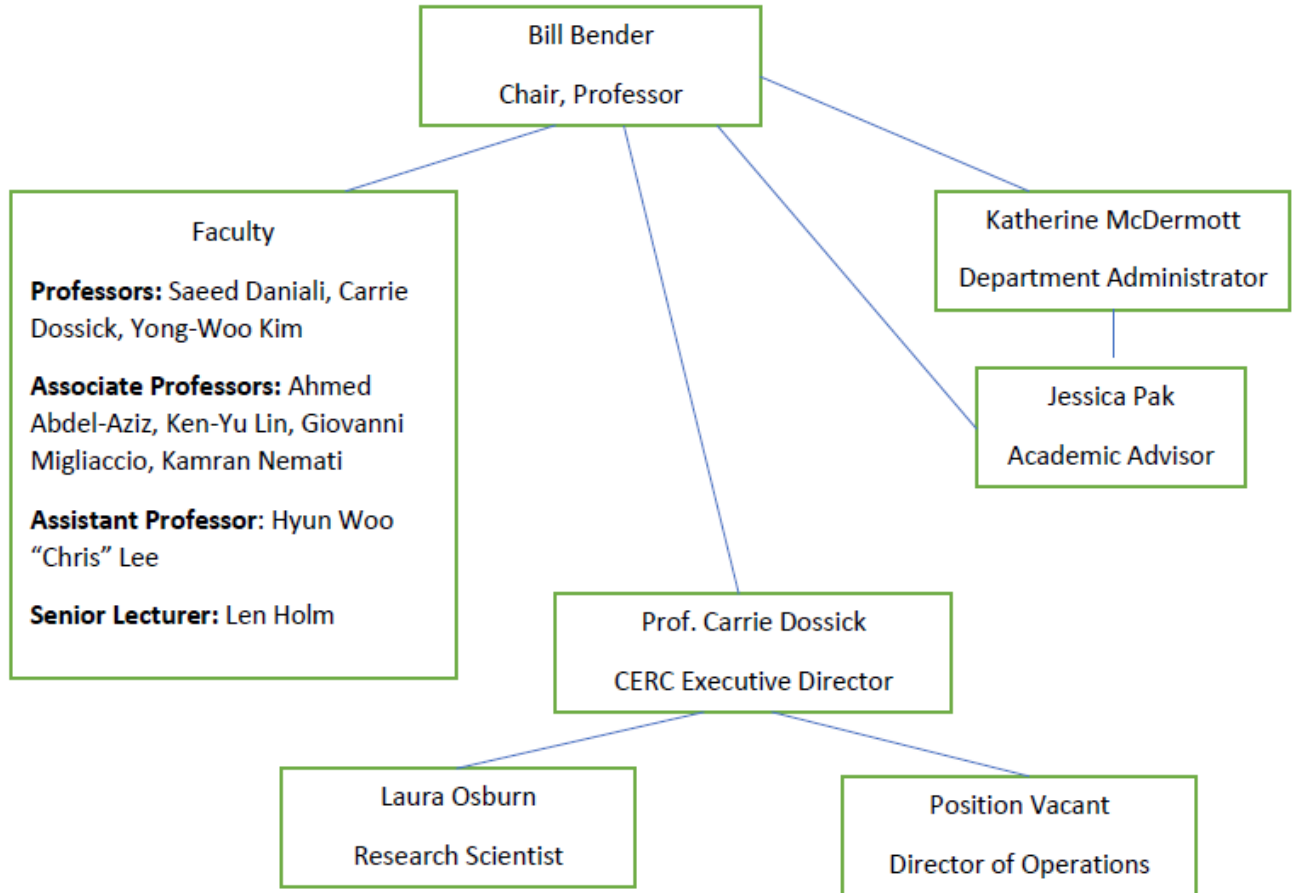
CERC can also support external funding development through its research and training programs. Investments in pursuing research grant is a strategic method for departmental and center operations support. When grants are awarded to faculty using CERC, we benefit through direct administration cost recovery and indirect fees.

Teaching: We can consider restructuring classes to combine larger lecture sections with smaller lab sections to provide greater student access to classes, while supporting smaller class sizes in lab sections. The department may also need to consider raising the cohort class size, and restructuring thesis and paper requirements to manage faculty instructional loads. The department should develop a CM class for the existing prerequisite for AutoCAD/Solidworks. This 200 level course could be offered every quarter and cover topics such as AutoCAD, BIM, and Excel.

Part C Appendices

Appendix A: Organization Chart

Provide a list (or develop a chart) that depicts the unit's organizational structure, including titles of those in leadership positions, names of departments/centers/units, and so on.



Appendix B: Budget Summary

Provide a summary of the unit's three most recent biennia. Feel free to prepare this summary in any way that makes most sense for your unit, providing a comprehensive overview for the review committee.

We feel a more instructive view of our fiscal health would be our budget projections for the next five years. The following table is based on past expenses and anticipated future revenues and expenses.

		5 year projections					
		2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
		actual	projected	projected	projected	projected	projected
faculty	ANNUAL TTL	1,159,209	1,278,266	1,303,832	1,329,908	1,356,506	1,383,637
staff + front desk	ANNUAL TTL	93,663	105,203	107,307	109,453	111,642	113,875
affiliates	ANNUAL TTL	206,369	210,496	214,706	219,001	223,381	227,848
est. office expen	ANNUAL TTL	50,000	51,000	52,020	53,060	54,122	55,204
	GRAND TOTALS	1,509,242	1,644,965	1,677,865	1,711,422	1,745,650	1,780,563
	undergrad revenue	763,000	757,000	818,000	834,000	851,000	868,000
	graduate revenue	637,000	597,000	669,000	682,380	682,000	682,000
State funding	deficit/balance	(109,242)	(290,965)	(190,865)	(195,042)	(212,650)	(230,563)
Revenue	Cert + MS Online	135,000	137,700	140,454	143,263	146,128	149,051
Total +/-		25,758	(153,265)	(50,411)	(51,779)	(66,522)	(81,512)

Total department expenses are well-above the revenues received from state funding (ABB budgeting). ABB budgeting means that our budget is based on student credit hours. Up until 2016-17, we have been able to cover all costs because of the revenue that is generated from our Certificate and on-line Masters program. Starting in 2017-18, we will no longer be able to cover our costs from the combined state and fee-based funding. We have some reserves that we will be able to draw down on for the next few years but sooner rather than later we must find a new way to cover the teaching costs of the department.

Appendix C: Information about Faculty

Professors

Bill Bender <http://cm.be.washington.edu/people/bill-bender/>

Saeed Daniali <http://cm.be.washington.edu/people/saeed-daniali/>

Carrie Dossick <http://cm.be.washington.edu/people/carrie-dossick/>

Yong-Woo Kim <http://cm.be.washington.edu/people/yong-woo-kim/>

Associate Professors

Ahmed Abdel-Aziz <http://cm.be.washington.edu/people/ahmed-abdel-aziz/>

Ken-Yu Lin <http://cm.be.washington.edu/people/ken-yu-lin/>

Kamran Nemati <http://cm.be.washington.edu/people/kamran-m-nemati/>

Giovanni Migliaccio <http://cm.be.washington.edu/people/giovanni-migliaccio/>

Assistant Professor and Senior Lecturer

Chris Lee <http://cm.be.washington.edu/people/hyun-woo-chris-lee/>

Len Holm <http://cm.be.washington.edu/people/len-holm/>