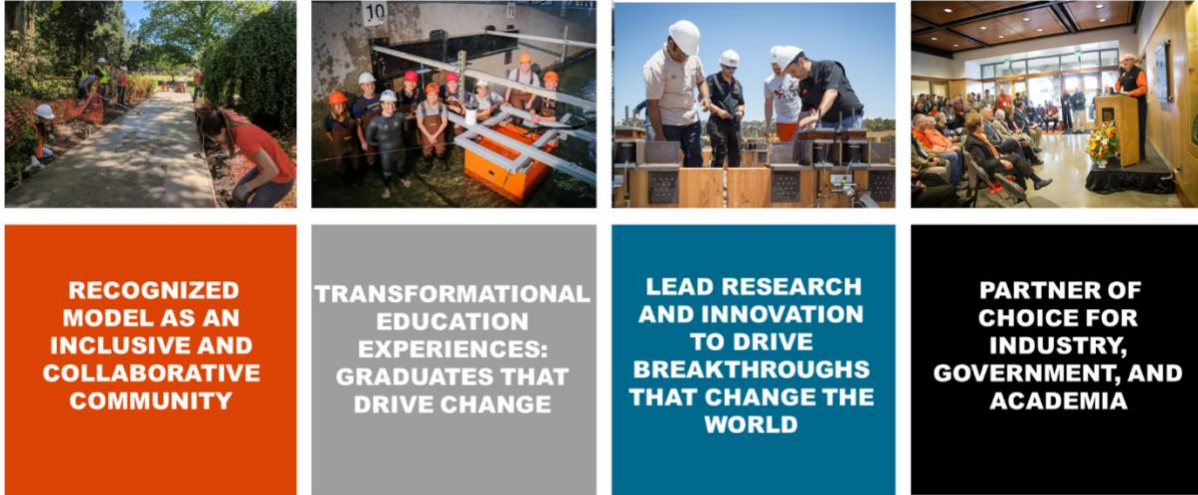


Civil and Construction Engineering Strategy Report – AY 2019



Prepared by Jason Weiss

Head of the School of Civil and Construction Engineering

The Miles Lowell and Margaret Watt Edwards Distinguished Chair in Engineering

Director of the Kiewit Center for Infrastructure and Transportation Research

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Report Scope

This report was developed in response to the request for strategy plan on March 13, 2018 to outline opportunities, threats, strategic actions, and plans to be implemented in the 2019 academic year and beyond. This report will be used in the determination of the budget distribution model as well is to brief the Dean and associate deans on the activities in Civil and Construction Engineering (CCE).

Executive Summary

This report was developed using situational analysis, examining external and internal factors in the data as it relates to CCE, from which a 5C, PEST, or SWOT analysis can be performed. The report begins by examining national trends in higher education and trends in civil and construction engineering. The report then discusses steps that CCE will take as it continues to implement the COE Strategic Plan 2015-2020 (and its updated version). For each of the strategic thrust areas, a change plan is suggested that identifies the state of change by estimating the current state of change using the Proschaka States of Change process.

Background – Review of National Higher Education Trends

This report begins with a summary of several national trends taking place in higher education. The organization “Educational Drive” has identified nontraditional students as the top fixation in higher education for 2018. It identifies that nontraditional students crave flexibility in scheduling, engagement in institutional culture, the availability of online classes, as well as alternative credentialing. They also identified that over 70 percent of students attending community college are part-time students. Clearly, these key issues should be considered by the OSU COE team with an increase in community college students in the student body as well as the implementation of a “Portland strategy”.

The Chronicle of Higher Education has identified a major emphasis area in 2018 as being focused in the area of inclusive teaching. Inclusive teaching consists of providing a welcoming and supportive environment that strives for equity while achieving successful and meaningful learning. This approach requires that course design emphasizes student values and discernment. It also focuses on courses that value the community that emphasizes the feeling of belonging.

Educational Drive has also published articles on projected trends of 2018. Of these trends, the following appear to be most important for COE:

- **A blurred line between nonprofit and profit educational providers.** Purdue University’s acquisition of Kaplan University is a key indicator of what can be considered to be a move toward vertical integration.
- **US education as an international export.** The US should be anticipating further declines in international enrollments during the coming years.
- **Reimagining physical campus space.** Campuses will need to utilize space more efficiently. Building projects that have been developed in the past will be re-imagined to be more flexible spaces.
- **Unbundling and micro credentials.** The purchase of “the whole college experience” will be decreasing as “customers (i.e., students)” will purchase only specific aspects of education that they require.
- **Accelerating mobile applications.** College’s will increasingly develop apps and new technology that will be able to re-create the college experience. This will be both from an educational perspective as well as a social network perspective.
- **Students in charge.** Student voices will be increasingly heard and will have a greater impact on administrative actions. This includes campus climate issues and how student success will be defined.
- **Rebranding the PhD.** The graduate experience will be re-examined through changes related to thesis format, internships, development of management skills, and broadening of overall skills.
- **Data science and honesty in numbers.** In the face of overwhelming information, an additional emphasis will be placed on honesty and the representation of data.
- **Changing populations.** The Northeastern and Midwestern regions of the US will experience a population decline with respect to high school students while the Western and Southern regions of the US will see a population increase in high school students. This is an important trend note that schools in the Northeast and Midwestern regions will become more aggressive as it relates to recruiting. It was

also noted that there will be an increase in Hispanic students pursuing degrees in higher education.

- **States with donor populations of college students.** Several states have an exodus of students who are pursuing college degrees. The most notable states where this occurs are Florida, Texas, the mid-Atlantic region, Illinois and California.

Background – Review of National Civil and Construction Engineering Trends

This report begins with a summary of several national and regional trends taking place in civil and construction engineering.

- **CE heads meeting.** During the most recent meeting of the heads of the CE programs throughout the US, organized by ASCE, attendees discussed a common theme of a perceived “lack of innovation” being emphasized by ASCE and its annual activities. This issue drew a high level of participation due to concerns over dwindling enrollments in the profession as well as a perceived lack of directional change coming from ASCE. It is rapidly becoming apparent that there are disagreements in direction taking place between the ASCE education committee and the department heads in the schools of civil engineering.
- **Masters is the first professional degree.** It should be noted that there has been a substantial push towards the masters as the first professional degree. While this would create an uptick in students pursuing masters degrees, there is a concern from many that this would decrease the overall enrollment in civil engineering programs nationally. In discussing this concern with the IAB, they were adamant that the bachelors degree should remain as the first professional degree. If some subdisciplines require additional education, that should be carefully considered.
- **Powerful subdisciplines.** Civil and construction engineering has several subdisciplines that can dominate the overall curricular discussions as well as the direction of the field. OSU needs to carefully consider how we will respond to national trends as it relates to subdiscipline activity.
- **ASCE’s dominant issues.** ASCE has identified several issues as being dominant in the coming years. This includes:
 - Creating Sustainable Communities that Address the Environment, Economy, and Society
 - Reinforcing and Rebuilding Americas Failing Infrastructure
 - Changing Business Mindset: Include Sustainability & Profit
 - Redefining Mobility for a Growing Population Safety, Connectivity, Autonomous
 - Building Platforms for Renewable Energy Exploration and Reducing the Footprint of Current Energy Practices
- **Hiring trends.** There will be an increase in heavy and highway spending during the coming years. As discussed in 2015, the US Department of Labor has estimated that in engineering there only four subdisciplines which are scheduled to experience double-digit growth by 2025. These include surveying with the 10 percent increase, environmental engineering with a 15 percent increase, construction engineering and management with a 16 percent increase, and of civil engineering with a 20 percent increase. It is of particular interest that the region of

the country with the highest projected growth and construction is the Pacific Northwest.

- **Training students for professional behavior.** CCE has taken steps to introduce students to alcohol awareness training as it will impact their professional career development. Additionally, sexual harassment training has been introduced at the junior level.
- **Making a university great.** As presented in August at the COE retreat, CCE is working in three main areas to pursue greatness.
 - The first is talented teachers, researchers, and students.
 - The second is a sufficient budget to enable those talented students, researchers, and teachers to thrive. This is specifically important to the land-grant University, that is responsible for producing future leaders who will make the world a better place as well as producing research products that will have a meaningful impact on society.
 - The third area is freedom, autonomy, and leadership and is focused on preparing members who are sufficiently willing and prepared to question assumptions and to move OSU forward.

Background – Review of Civil and Construction Engineering Data

This report examines data that has been gathered as it relates to changes in CCE from the baseline year of 2013.

Figure 1a provides data regarding the number of students admitted to professional school, while figure 1b provides data of degrees awarded by the CCE program. The number of students admitted to civil engineering has remained relatively flat with a slight increase in the number of degrees being earned. The greatest area of growth occurring in the programs is in the construction engineering management student population, which has nearly doubled in terms of students admitted with similar impact on the number of students obtaining degrees.

Figure 2 provides historical trends on the number of full-time tenure and tenure track professors as well as the student credit hours per full-time instructor per course assignment. Since the baseline year of 2013, CCE increased the number of faculty by approximately 10 percent and had a slight downturn in the number of instructors. The student credit hours (after normalizing per faculty member and per assigned course is taught) has been relatively stable throughout the last five years.

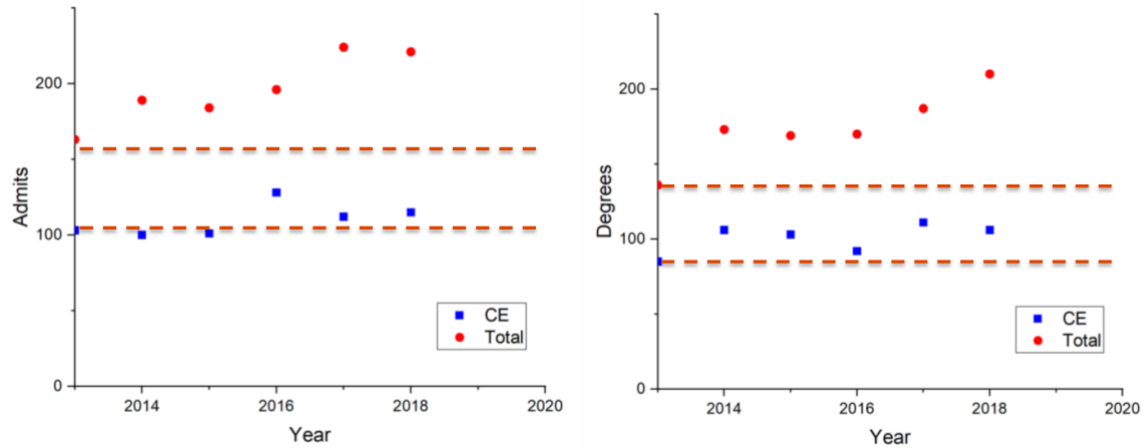


Figure 1: a) students admitted to CCE professional school, and b) students earning degrees in civil and construction engineering

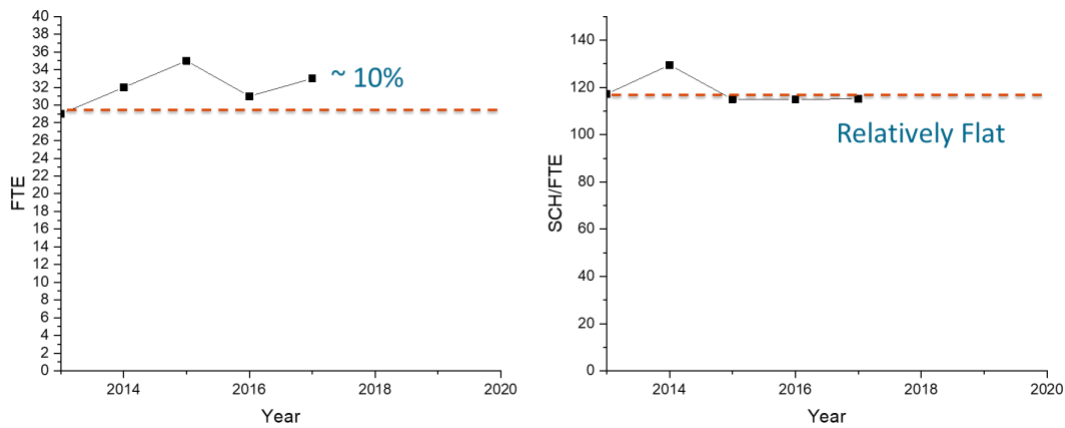


Figure 2: a) full-time tenure and tenure track employees as a function of year, and b) student credit hours, per full-time tenure/tenure track employee, per assigned course

Figure 3 illustrates that the number of PhD students per faculty member has increased from approximately 1.7 at the baseline year of 2013 to approximately 2.6 at the current time. During this time, the masters degrees earned has been relatively flat while the masters of engineering degrees has decreased. It is believed that the current state of the economy is responsible for fewer students staying to earn a masters of engineering degree because the job prospects are high. Figure 3b illustrates the number of drivable peer-reviewed journal articles that have been published by faculty over the course of the last five years. It can be seen that the number of publications has nearly doubled over this time.

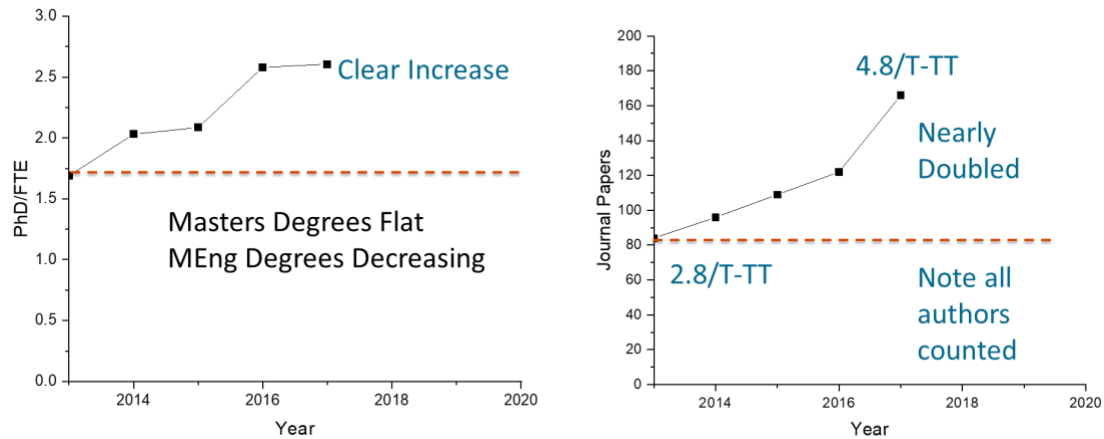


Figure 3: a) PhD students per tenure tenure-track faculty and b) journal papers published as a function of time.

Figure 4 provides a snapshot of external funding for CCE. Figure 4a shows that expended funds (shown in black) have increased from the baseline value of approximately \$6 million to approximately \$8 million. During that same time, the incoming grants and contracts have remained relatively stable although there has been a sharp upturn in 2017. It is believed that this is due to some anomalies in the year of reporting for 2016, primarily associated with the timing of contracts being processed by OSRAA. As such, while it is expected that 2018 will be higher than the \$7 million running baseline, it is not anticipated that will be as high as it was in 2017. Figure 4b shows the level of gifts received by the foundation.

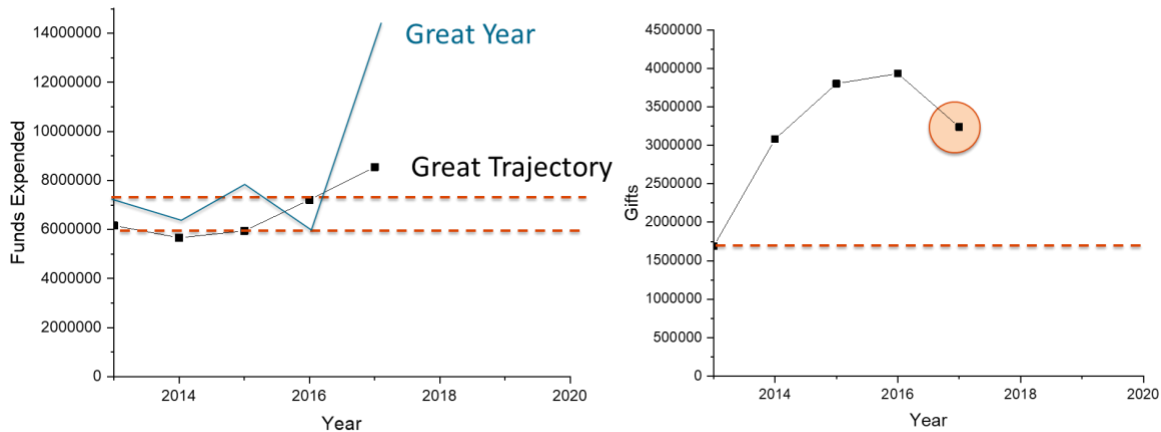


Figure 4: a) funds expended (black line) and funds received (blue line), and b) gifts reported by the foundation (note that at the time of the report preparation, the exact amount for the gifts of 2017 were still unknown).

Finally, it should be noted that in 2006 CCE was ranked 60th nationally out of 80 ranked programs. In the most recent rankings, CCE was tied for 40th among 156 ranked programs. Further, the reputation ranking for CCE is higher than it is been historically for the first time breaking into the level of 3.0. It should be noted that movement by 0.1 and reputation would have increased the ranking to 35th and increasing reputation to a value of 3.5 would place CCE within the top 20 programs.

CCE is facing several challenges which include but are not limited to:

- Several facility concerns associated with the inability to provide sufficient heating, cooling, and electrical service which has resulted in ruined research, as well as lost productivity the faculty,
- Lack of sufficient space to conduct research and to store research and teaching materials,
- Operating over the last three years without increasing spending significantly or providing substantial investments in the program, while working to better understand the budget and bring it in line, and
- Several challenges with obtaining contracts, procuring services, and billing in a timely fashion.

The bulleted items will not be addressed in any of the planned activities for the school as these are items that need to be negotiated at the COE level.

The remainder of this report will identify five main areas in which strategic plans related to change are being initiated. The change areas have been identified using Proschaka's Six Stage Process, which is defined for below.

Proschaka's Six Stage Process

This report utilizes theories of readiness for change that is based on a six step process. The first step, precontemplation, is the stage in which a person or organization is unaware that change is needed. The second step, contemplation, is when a person or organization are struggling with whether change may or may not be necessary. The third step, preparation, involves gathering information as well as aligning resources and options necessary to implement the change. The fourth stage, action, is when a person or organization is actually trying new things and taking action. The fifth stage, maintenance, is implementing the new action for a long enough time that it becomes routine. The final stage, termination, is a term that is used to define when the key action items have become successfully ingrained in practice.

Strategic Goal 1: Become a recognized model as an inclusive and collaborative community.

CCE has worked actively in changing the hiring process through the Search Advocate program and by requesting leadership to participate in the ADVANCE program. In 2013, CCE had less than 5 percent female faculty, but is now approaching nearly 30 percent.

CCE has been working actively to establish an awards committee whereas senior faculty members are actively seeking to nominate more junior faculty members for national awards. It is anticipated that during 2019 this will continue and become part of the ingrained CCE culture.

CCE has set out to alter the mentoring programs that are taking place for incoming and junior level faculty. Programs that were initiated in 2015 have become part of the boot camp series for incoming faculty and as such, these are no longer being pursued in CCE. Mentoring programs have been off to a very slow start as we tried to transition from an assigned mentor who typically follows the “ask the Sage” model to a model that consists of mentoring cohorts.

With respect to working toward increasing student success and a feeling of belonging in the program, in 2019 CCE will launch the first-year beaver cohort programs. These programs have been outlined with input from the faculty and the formation of a faculty committee during 2018. The program will consist of faculty and staff members meeting with small cohorts of students over coffee or lunch at which time they will begin to work on building the fabric of a full rich community in into which the students can be more rapidly absorbed. Literature suggests that students who are actively engaged in community are more likely to be retained and to be successful. We believe that this is particularly important with an increase in underrepresented students as well as the high proportion of first generation students in the COE at OSU.

Finally, CCE started to host professional development seminars, which are focused on communication skills. It is anticipated that in 2019 they will include mentoring and project management.

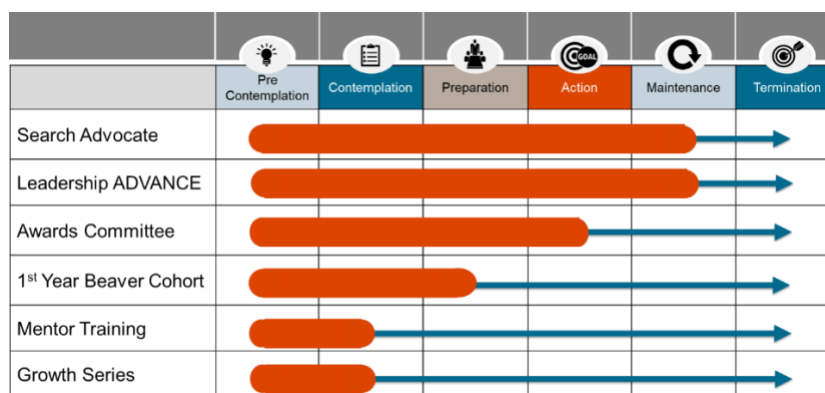


Figure 5: Strategic Goal 1: Areas of Change that Promote an Inclusive and Collaborative Community.

Strategic Goal 2: Provide a transformational educational experience that produces graduates who drive change throughout their lives.

CCE has implemented the teaching evaluation committee (TEC) that consists of seven professors with strong track records in teaching who observe the classroom and provide feedback to instructors and assistant and associate professors. The TEC provides annual feedback for assistant professors while the feedback for associate professors is every other year.

CCE has a strong record of students participating in experiential learning. In both CE and CEM, students average more than two internships before graduation. Further, strong participation exists for both the ASCE Student Chapter and the steel bridge, geotechnical, and concrete canoe competitions. Transportation students actively participate in the ITE Student Chapter. CEM students actively participate in both the AGC Student Chapter and the “Reno” competition. Additionally, during the coming summer, CCE will host a research experience for undergraduate program for the third year in a row, which is also being adapted as part of the clean water engineering initiative.

CCE has worked over the last three years to develop a new degree granting discipline, architectural engineering. In AY 2016 the committee was formed that presented the proposed degree program to the faculty which received unanimous support. This committee then drafted a CAT I proposal that has been working its way through the University system over the last two years. In addition, the committee has worked to develop six CAT II proposals for new courses that will be offered. Two searches have been conducted for faculty lead this new program. In April 2018, the faculty Senate voted to approve the cat one proposal 72/1/5 yes/no/abstain. As such, CCE fully anticipates that this proposal will continue to proceed to the Provost, Academic Affairs, Academic Programs, Catalog Coordinator, and the Board of Trustees and will be approved such that this program can be advertised and we can begin to recruit students.

CCE it is working in four main areas as it relates to the undergraduate curriculum.

- First, CCE added a seminar series course for the CE degree option. During the last year this is been taught in coordination with the CEM seminar series course and it is anticipated that these will be merged during the coming year.
- Second, CEM has taken an active role in pursuing an update of the safety-related course and will work on providing students with the ability to receive OSHA 30 training at the completion of the course. CCE will also be working to provide student interns with the opportunity to achieve OSHA 10 training, either through an online program or in conjunction with the carpenters union of Portland.
- Third, CCE has been reviewing required courses and is examining the possibility of replacing one core course with a technical elective. It is anticipated that a motion will be put forward regarding this during AY 2019.
- Fourth, CCE will be working to re-envision a sophomore-level class series and will be working to weave leadership training throughout the curriculum. CCE has been working with the IAB to determine the skills they would most like to see brought to this course and will be implementing a new strategy as it relates to course design and improvement that incorporates a committee of industrial representatives,

faculty who teach the course, and faculty that teach courses in which these courses are prerequisite.

- Finally, CCE will work with the COE on revising the technical writing course.

CCE will create a video studio where students or staff can interview practicing professionals. Faculty will then be able to use the videos as motivation in class. A studio is in the process of being established in either Covell or Owen hall to make this a reality.

CCE will work to improve our graduate curricula offerings. Currently, several CCE graduate areas offer a listing of courses, however this may not be a complete curriculum. Further, CCE will work to provide more cross-cutting courses at the graduate level.

Finally, CCE is actively pursuing online instruction through the PACE program is actively engaging with the IAB and Construction Education Foundation as well as professional organizations as we work toward developing the online curricula. We think these courses will not target undergraduate or graduate students but rather practicing professionals. We anticipate the initial courses will be online by the end of AY 2018 and these courses will be more fully developed as we work throughout the course of AY 2019.

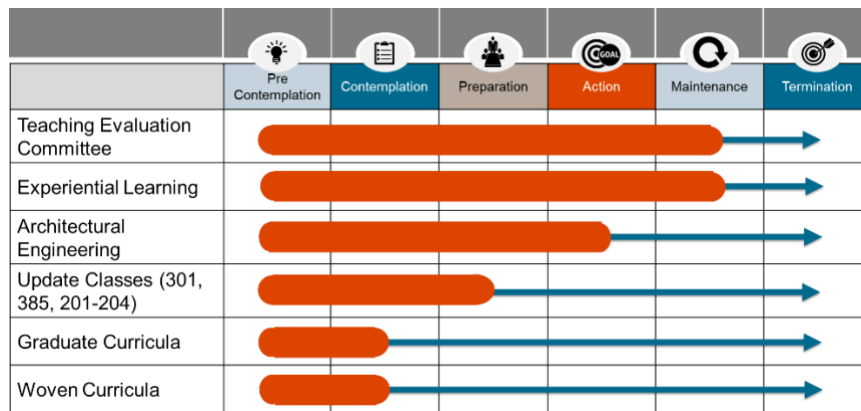


Figure 5: Strategic Goal 2: Areas of Change that Promote Transformational Education

Strategic Goal 3: Lead research and innovation to drive breakthroughs that change the world.

Over the last three years, CCE has worked to focus its research into three main areas: safety, resilience, and infrastructure renewal as shown in Figure 6. Supporting these areas are skills around the area of computation, communication, and management. Research in these areas will be facilitated through strong data analytics, the use of smart sensors, as well as virtual immersive individualization environments.

As illustrated earlier in the report, CCE is experiencing an increase in research expenditures as well as published research and citations of research. As a result, we feel that the areas of expenditures and publications are in the maintenance area of change.

CCE is actively working to fully flush out the research thrust areas shown in Figure 6. CCE needs to begin to develop a strategy around the area of structured research, marketing, and recruitment efforts in these three main areas. As the school has grown, we have moved from the system which relies simply on single PI's to be gathering resources to a more integrated and strategic approach toward systematic research in these areas.



Figure 6: Research Theme areas for CCE

It is our fundamental position that faculty in CCE are able to transition from chasing posted RFPs to working on the development of RFPs that can be targeted for future use. CCE has not actively pursued research and program support from either state or national legislatures. There are strong areas in CCE where local and national efforts could be helpful for the future the program.

CCE has been actively involved with the University Transportation Consortium program; however, as the existing program is entering year three of five, it is time to begin positioning the program for future success. We have been performing grassroots efforts with groups like the US Department of Transportation, state and regional highway

associations, and the Federal Highway Administration, however efforts by the University could help make and establish new and meaningful connections.

As previously mentioned, an awards committee has been established to help promote the careers of early-career faculty.

One of the most pressing needs of CCE's development is to create a world-class space that is fully equipped to do the research necessary to propel CCE on its journey to being one of the most recognized programs in the country. CCE has been actively working on the development of a facility called the Complex for Resilient Infrastructure and Safety (CRIS). This facility is scheduled to be constructed near the O.H. Hinsdale Wave Research Laboratory. During the course of the last three years, CCE has pursued the planning phase of the project. Currently, the budget for the 40,000 square-foot facility is higher than the original estimate. CCE would like to establish a timeline that clearly states how the building process will proceed. This would help identify fundraising opportunities. It is proposed that CCE will pursue funding in phases, with an option for the continuing to the next phase should funds become available.

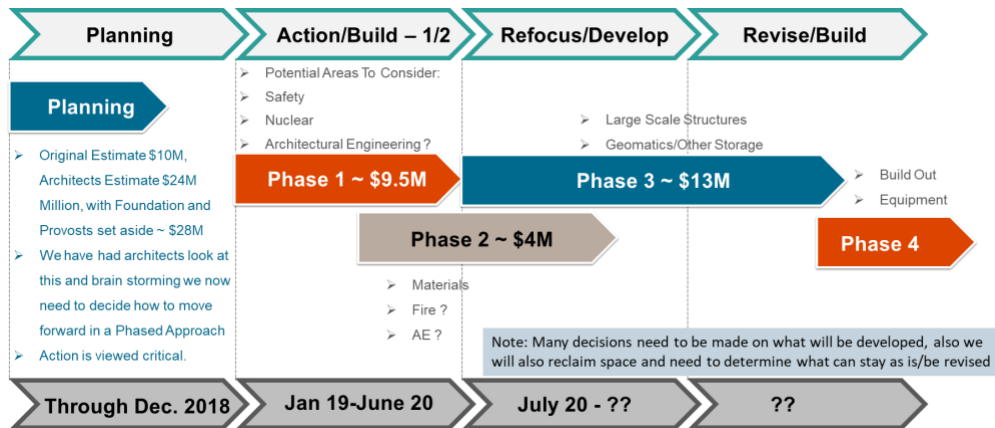


Figure 7: Proposed CRIS Strategy

During the coming year I would like to better understand the process that is used for garnering university level support. CCE has also been position for equipment upgrades for equipment in line with the COE and university plan but has been unsuccessful in gaining traction through the university process. Further, CCE has not been able to garner directed strategic suggestions or aide from local or national university affairs coordinators to help promote interests of CCE on the local or national agenda. Further we will be working to determine whether we can obtain a standing memorandum that would permit OSU to bid state highway agency work at overhead rates that would make us competitive with the 'land grant' university in the region. Without this we are not in a position to compete on equal footing and are leaving substantial research opportunities unfulfilled. Fortunately however, we have been competitive in open calls for proposals.

Finally, is proposed that CCE needs to begin to change its mindset from a small regional school, to a large school seeking to garner national reputation.

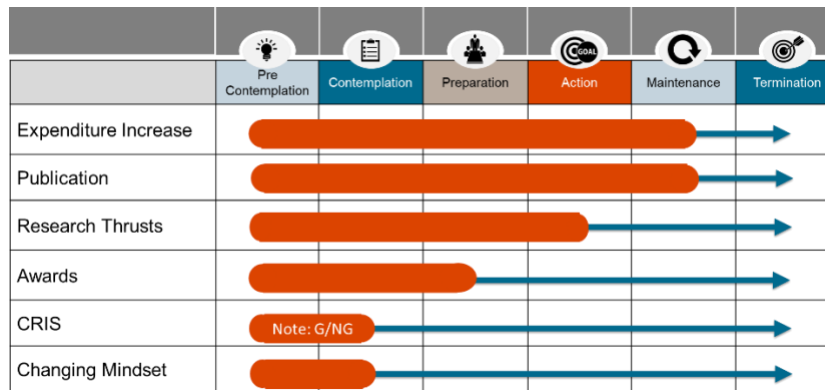


Figure 8: Strategic Goal 3: Lead research and innovation to drive breakthroughs that change the world.

Strategic Goal 4: Establish the College of Engineering as the partner of choice for industry, government, and academia.

During AY 2017 CCE launched a new industrial partner program. Current staffing is stretched thin with respect to maintaining the industrial relations. We are seeking to better utilize faculty to aide in the partner program outreach with course release and to add staffing positions through a new industrial liaison that will be housed in CCE. Between AY 18 and 19 CCE will be working to improve the outdated database as this is currently hampering our ability to advance industrial relationships. CCE has been actively working on recruiting members to the CEF (Construction Education Foundation) and IAB (industry advisory board).

CCE will be actively seeking to develop an e-campus program in the area of PACE (Professional and Continuing Education) and will be working with IAB, CEF and other industrial trade organizations to build a market for these courses. We feel that this is vital to establishing a community of life-long learners and better building an outlet for the great research being conducted through the program. This is fully consistent with ideas proposed by the provost regarding the strategic plan 4.0 during the April meeting with the heads.

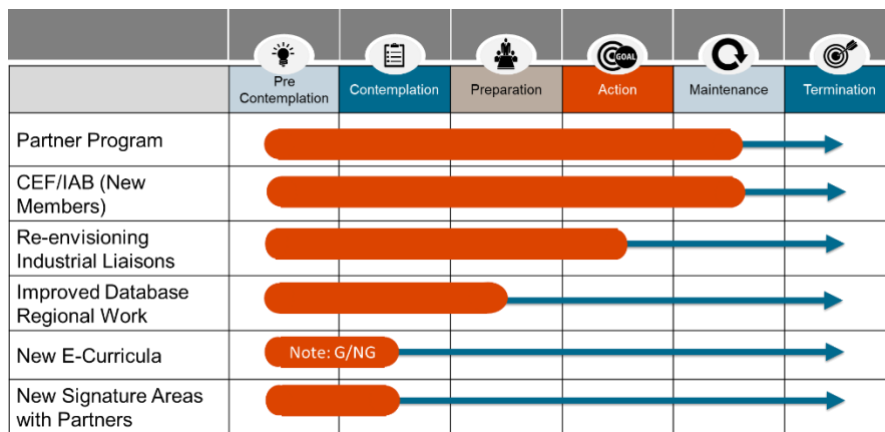


Figure 9: Strategic Goal 4: Establish the College of Engineering as the partner of choice for industry, government, and academia.

Faculty Hiring

CCE proposes hiring in several unique areas. However, unlike growth in the past which has been primarily in the traditional areas of civil and construction engineering, we need to begin hiring in cross-cutting and emerging areas.

- CCE will be well-positioned to potentially hire an industry liaison who could provide assistance for the ongoing programs, aid in expanding the outreach to construction companies, while launching new initiatives toward civil engineering companies. Ideally, this role will be well-positioned to assist with the IAB.
- CCE will be well-positioned to hire in the area of risk assessment and analysis. This person would possess the skills to cross-cut through both civil and construction engineering as well as in all the major areas of emphasis. This could have significant benefits and may be particularly well-suited for a senior-level hire.
- CCE will be well-positioned to hire in the area of advanced infrastructure processing techniques. This could be a cross-cutting position that could combine areas of civil and construction engineering with advanced robotics, automation, the 3D printing.
- CCE will be well-positioned to hire in the area of clean water technology with the specific goal of a person focused on water infrastructure. This could be particularly timely with the launch of the clean water initiative as well as potential upcoming retirements.
- CCE will be well-positioned to hire in the area of geotechnical engineering with an emphasis on seismic hazard reduction.

Additional Areas of Emphasis

In addition to activities directly related to the four goals of the COE Strategic Plan, CCE is developing an integrated communications plan that can further lead to the advancement of the educational, research, teaching, recruitment, reputation, and fundraising goals of the program. Specifically, CCE has identified messages, that will be more fully articulated and advanced throughout the coming year. This would include both communications with alumni, stakeholders, in groups advocating on behalf of the school in the arenas of research and education. Toward this effort, working groups have been established in CCE to better articulate ongoing activities as well as stories that can be developed during the coming year. Information from these working groups will be gathered by the school head, who will work with the CCE Public Information Representative Johanna Carson, to develop an integrated communications plan for AY 2019.



Figure 10: Development of A Strategic Advancement Plan for Integrated Communications that Advance CCE

Currently, CCE is recruiting the most students from Oregon, Washington, and California. Upon graduation, the most students are frequently being placed in these same states. To further increase the size of the program, it will be important to increase recruiting efforts in specific regions such as Alaska, Hawaii, and California as well as regions of the country which are comprised of higher education donors such as Texas, Illinois, and the mid-Atlantic region. Members of the CEF and IAB are nearly unanimous in their support for this expansion program. Many companies represented on these boards operate in these regions and find it difficult to attract students after graduation from Oregon State University to go to and remain in these regions. By initially recruiting students from these regions, it could strengthen our brand in those locations and enhance the impact of CCE.

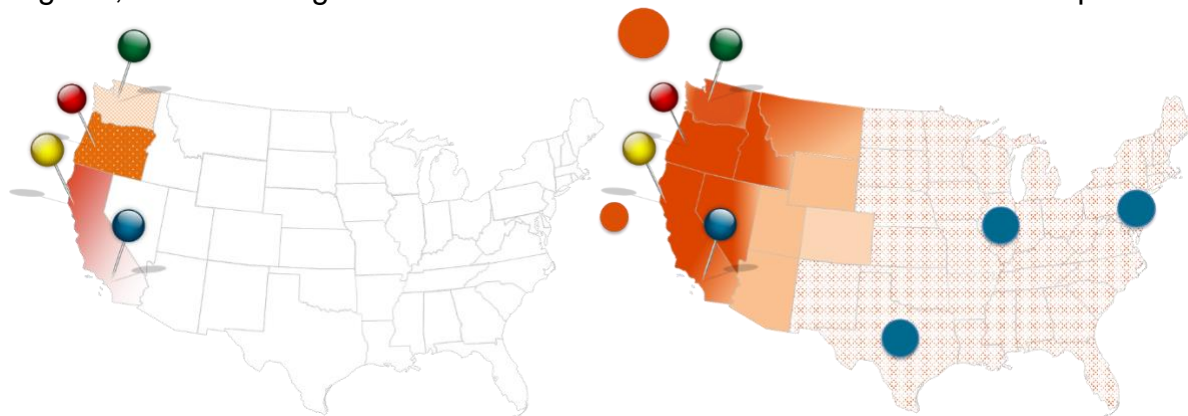


Figure 11: Regional Recruitment Proposal for CCE

CCE initiated a more comprehensive annual review appraisal for instructors as well as tenured and tenure-track faculty members. In addition to being more forward-looking, the appraisal process emphasized areas in which faculty and instructors wished to excel in the current year and a 12-point review process that addresses the majority of items seen in Figure 9.







Figure 12: an illustration of the annual assessment process

Additionally, CCE began to change its mindset from being in a constant spending mode of incoming gifts toward a mode where we begin investing and utilizing endowments for the long-term health of the program. Oregon State has the lowest endowment in the Pac 12 and this is substantially lower than aspirational peers throughout the nation. After substantial discussions with the CEF, we have begun the process of endowing a scholarship through funds raised at the annual CEF Golf Tournament. We have also created an industry partner support program that is generating more income for the school.

Table 1 outlines the primary areas for budget investment during the coming year. CCE fully anticipates working with the Foundation to develop support for facilities such as CRIS, scientific equipment associated with mechanical testing, fire testing, driving simulation, and an immersive virtual environment for construction research. CCE also anticipates support for the development of student competition and learning lab spaces. CCE will continue to work on support for issues around student success, which should be related to scholarships, providing support for faculty fellows and professorships that will enable faculty to have the most impact with students. CCE will also seek support for student competitions and student travel, weaving leadership, communication, and program manager visits throughout the curriculum. After several years of maintaining status quo, CCE is in dire need of investment in the program to move it forward.

Table 1: Budget Requests by Area

| |  Inclusive Community |  Transformational Teaching |  Research that Changes World |  Partner of Choice |
|----------------------------|---|---|--|---|
| Student Scholarships | Impactful Across All Areas | | | |
| Professorships for Faculty | Impactful Across All Areas | | | |
| Facilities | | Competition Space Learning Labs | CRIS | |
| Equipment | | | MTS/Fire/MSI Driving/Construct. | Fire |
| Travel Grants | | Competition Leadership Weave | Student Training | PM Visits |