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Date: April 23, 2019

To: Dr. Susamma Barua, Dean
       College of Engineering and Computer Science (ECS)

From: Chang-Hyun Jo, Coordinator
         Master of Science in Software Engineering (MSE) Program (Online)

Subject: MSE Program's Response to the Review Team's Report

This report is in response to the review team's report. It addresses the strengths of the program, the areas that need improvement, and the actions that would enhance the program, based on perusal of the review team's report.

The Strengths of the Program

The review team noticed that the MSE program has gained remarkable national recognition. In 2019, the US News and World Report nationally ranked the ECS online program, which includes the MSE program, at the 1st among non-granting universities, the 3rd in California, and the 26th overall. Many other survey organizations ranked the MSE program at $5^{th} - 10^{th}$ as well.

The review team also mentioned many significant strengths of the program:
- A group of dedicated full-time faculty members in the program
- Curriculum that address needs of the students who are typically working professionals
- Responsiveness of faculty members, mentioned by alumni and current students
- Hundreds of alumni who contribute to the U.S. economy
- Great value to students, industry, and the University

We will continue efforts to maintain such high rankings and strengths.

The Areas that Need Improvement

Here we address three areas for improvement that were suggested by the review team, and the corresponding program's response: curriculum, competing in recruitment, job placement support.

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Curriculum Update

Suggestion from Review Team

- One of the main basis on which the MSE program competes against larger institutions for students and for corporate-sponsored students is the relevance of its curriculum. An outdated curriculum is a competitive disadvantage.
- There is need to update and integrate foundational topics like security, cloud-based systems, scalable systems, and AI/machine learning into the curriculum or existing courses.
- There is need to update the adoption and use of open source software, component-based systems, documentation-light systems, and accommodating and migrating legacy systems within the current course offerings.
- There is need to produce high definition versions of online course materials when course material has become dated and revised with new materials.
- There is need to consider how to utilize supplementary media including short-form video (e.g., move to multiple 7-10 audio/video lectures followed by short quizzes versus current 75 minute long form lectures that record in-class lectures).
- Faculty have very modest resources to use for professional development or to attend major conferences and workshops where they can interact with colleagues to acquire up-to-date subject matter expertise, which provides the basis for updating the MSE curriculum.

Program's Response

The review team recognizes that the MSE program competes against larger institutions (Ph.D. granting universities that provide online courses). To compete with them, the review team suggested that we update our curriculum to incorporate items such as security, cloud-based systems, scalable systems, and AI/machine learning. We have in fact incorporated such topics in various courses. However, it is not possible entirely to replace the curriculum with those topics, because we would have to sacrifice the more important topics. For example, AI/machine learning is actually beyond software engineering, and it is an entirely separate topic, one that could be part of another program's contents. Instead, for the sake of educating our students, we may provide extra contents that introduce such topics. Note, however, that to design and create such extra curriculum would involve financial burden.

We started this program with advanced topics, such as heavy processes, such as CMMI; which covers the needs of major industrial and government organizations, including DoD companies who were targeting major groups of students. We have continually updated with current topics, such as agile methods that have been recently used in many organizations. Based on surveys we have performed for last 15 years, we see that the majority of students are satisfied with our curriculum (shown in Appendix VII in the PPR Self-Study Report).

Building online materials requires a lot of time and human resources; more than on-campus course materials require. Construction of multiple forms of lecture materials requires a lot of time and financial resources for designing, building, editing and verifying contents before releases. It is hard to replace online materials all at once. That said, we will try to find resources to accommodate it. We will also try to find enough funds to participate in various trainings and conferences, to update curriculum.

Competing in Recruitment

Suggestion from Review Team

- There are growing numbers of regional, national, and international institutions offering online MSE programs. A commitment to status quo will increase likelihood of declines in the program and student enrollment.

- More competition will drive up costs of student recruitment. If these costs cannot be addressed, then declining enrollment and national ranking may be expected.
- Available resources for MSE student recruitment are very limited and have decreased over time.
- But CSUF may provide lower cost tuition for MSE degrees of comparable market value to graduates and industry versus Ph.D. granting institutions.

Program's Response

The review team recognizes that there are growing numbers of institutions that offer an online MSE program.

As we see from the survey and ranking results, we have done well so far. One of the main reasons for our success is that we were the pioneer in the field, and our curriculum well served the major industrial and government organizations who needed capable project leaders (the target of this program). However, nowadays almost all universities have online programs, including Ivy leagues that have larger funding and human resources than we have. We must figure out how to survive in competition with those big leagues.

We have spent around 20% of the funds for advertisement (e.g., $7,000 of $45,000 total annual funding). It is not easy to maintain this program on the 1st or 2nd search result in Google, because there are so many online programs that advertise a lot. We were often shown up in the 1st page, not because of a lot of advertisement, but because our high ranking was searched by many people. We may need more funding in advertisement even to maintain the current recruitment level.

As the review team points out, one of the merits of this program is a relatively lower cost to get the MSE degree as compared to programs in the big leagues. We will continuously advertise this.

Support for Job Placement

Suggestion from Review Team
- Many but not all MSE students are fully employed. So there is need to look for ways to improve job outreach and social networking with companies looking to hire MSE graduates who are not already fully employed, and who cannot attend on-campus job fairs.

Program's Response

The review team suggested that we provide more support for the job placement of students.

Most of our students already have full-time jobs. However, there are some students who do not have full-time jobs or who want to change jobs. We have introduced job placement functions on campus. We let students know whenever we have on-campus or online events for job recruitment activities. We have also performed many activities in social networking, such as on LinkedIn and Facebook. Some alumni or students might not be aware of these activities. We will let them know, and we will keep up with this to help them with job replacement.

The Actions That Would Help Enhance the Effectiveness of the Program

Here we address the actions to enhance the effectiveness of the program that were suggested by the review team; and our response to their suggestions.

Suggestion from Review Team
- Use current fee allocations ($33) to cover existing expense priorities. Then use additional fee allocation ($17) to cover costs of:

- o Faculty development of new expertise of subjects to be integrated into the updated MSE curriculum (security, cloud services, AI/machine learning, open source software, etc.), where such development is facilitated by engagement on-site external expert/consultant brought in for engage, inform, and discuss MSE faculty and curriculum topics.
  - o Faculty travel to corporate partners and potential partners sites that hire/promote MSE graduates, to develop and sustain MSE corporate social networks.

- Revamp MSE Capstone course structure and results.
  - o Provide an online repository that can showcase MSE student capstone and course projects, in ways that may also promoted online to MSE program social media networks.
  - o Recruit alumni mentors to advise capstone projects.

- Encourage MSE faculty to engage in comparative study of Top 25 MSE programs to identify potential areas for improvement in curriculum, student development, corporate relations, course fees, degree/course tuition, etc.

- MSE faculty should consider how best to coordinate projects across courses, where each course addresses course topics arising in the course projects (software requirements, design and architecture, testing, maintenance, etc.).

- Offer additional elective courses not only for enrolled students but also for alumni.
  - o New elective courses may cover trending technologies such as AI/ML.
  - o Alumni may take them as discretionary fee-based "lifelong learning" courses, mini-courses, or invited lecture series, that might also generate extra revenue for the program. Costs for such curriculum supplement preparation and online production may be covered by proposed course fee update. Current MSE students might also be allowed to take such discretionary and complementary online course materials.
  - o Such alternative courses may then be appropriate as a way to engage either adjunct faculty/lecturers, or alumni who have since acquired advanced professional level mastery of subjects that can provide more depth, or take more time to integrate into the existing course offerings.

- Collect alumni success stories for advertisement and recruitment, especially those hosted and shared via online social media networks for MSE alumni, corporate partners, and friends.

- Look for new ways for MSE faculty to utilize University-wide resources such as:
  - o Instructional Designer for online curriculum development.
  - o Engineering's Corporate Partners Program for capstone and internship opportunities.

Program's Response

The review team suggests how to make funds to implement their suggestions.

Increasing students' fees cannot be decided solely by the program level. We will find how to incorporate the review team's suggestion on additional fee allocation.

Showcase seems to be a good idea. It can be used to advertise this program. By advertising students' work in this program, it may have a positive impact on recruitment. We may be able to implement this idea immediately without too much cost.

Our curriculum was actually devised to enable students to practice what they learn in a certain course in a subsequent course. If students learn a topic from a course, such a topic can be immediately used in the next. Students might not well recognize this. We will find out how to explicitly show such coordination to them.

Offering electives has been discussed in the program. The major problem was not having enough resources to offer many courses, without having enough enrollment guarantees for every course. Without guarantee of successive course offerings, it is not easy to spend a lot of effort and resources to build online course materials for only a one-time use. However, we may consider some short contents that are not included in the regular curriculum, if the content is a good topic for current students and alumni. It may still require additional resources to develop online contents for extra or complementary courses.

We have successful alumni in major companies such as Raytheon and IBM. They have been already helpful in many activities of this program, CS Department, and ECS college. Actually we already used one success story with the student's consent in social media. We will continue to maintain such relationships and, with their consent, we will use their success stories in advertisement.

We will find out what resources are available to implement all suggested ideas.

Ending Remarks
We are happy to hear that the review team expressed overall their good impression of the quality of faculty, students, national rankings, and accomplishment of the MSE program. We will continue putting our best effort to maintain the quality and fame of the program.