Redesign of the University of Cincinnati's School of Information Technology's Senior Capstone Courses

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The Bachelor of Science in Information Technology (BSIT) program at the University of Cincinnati has a senior capstone requirement which is two semesters long. There are two co-requisite courses (3 credits each) that all students must successfully complete: a project management class and a technical advising class. When the university was on the quarter system the technical advising class was not started until the Winter quarter and continued through the Spring quarter while the project management class lasted all three quarters. The technical advising at that time was more ad hoc and fluid with most of the faculty participating as advisors, creating a lower student-faculty ratio. Since going to semesters, it was decided that the technical advising would be part of the process beginning in the Fall semester. That and the decision to have only one Software track technical advisor and one Networking track technical advisor has created a different set of challenges. Today, a new model needs to be developed. The paper will look at the challenges faced and how the faculty members involved have begun to address these issues including the future of the technical advisors role in our students' capstone experience.

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Introduction

The BSIT program requires a two-course two semester senior capstone requirement of all our graduates which is one academic year. These two courses are co-requisite that all students must successfully complete. One course is a project management class and the other is technical advising class. During the time when the university was on the quarter system (before Fall 2013) the technical advising class was not started until the Winter quarter and continued through the Spring quarter while the project management class was all three quarters. At the end of the Fall quarter, faculty advisors picked their advisees and a normal load was between 5-15 students with at the most 7-8 projects in all to manage. Since going to semesters, it was decided that the technical advising would be part of the process from the beginning. That and the decision to have only one Software technical advisor and one Networking technical advisor has created a set of different challenges. Last school year the Networking technical advisor had a total of 42 advisees and 28 projects to manage and this school year the Software technical advisor has 37 students and 21 projects with one of these projects includes two students from the Computer Science department. Back during the quarter system with much smaller numbers of students, the advising was more simplistic and subjective. Today, it has become more rigid and objective. The faculty members involved knew that the senior capstone process would have to evolve when the university converted to semesters and they have begun to address these issues and the future of the both the project management advisor and the technical advisor roles in our students' senior design experience.

In the beginning

The BSIT program has its beginnings in the Information Engineering Technology degree (IET) which was a 2+2 BS program housed in the College of Applied Science. It ran from 1998-2004 and students entered as juniors in the program. Senior design technical advising was a not a formal course, but was an assignment in which most faculty members participated. The courses were called Senior Design I, II, and III. During that time there was a separate Senior Design course for our day and evening students and they ran in different quarters such that faculty members were advising both Senior Design II & III students in the same quarter. One quarter the author advised 8 Senior Design II students and 7 Senior Design III students.

In the first quarter students would meet with several faculty members to discuss their project proposal.

Faculty members were not formally involved in the process until after first quarter of Senior Design. After Senior Design I presentations, faculty would meet and as pick those students they wanted to advise during the next two quarters. Advising was more on an ad hoc basis as technical advisors did not actually assign a grade as there was no formal class. Advisors gave input to the Senior Design instructor in terms of work the students did. There was series of checks (faculty signoffs) that occurred where students were responsible for documenting their meetings with their technical advisor and then turning this into their Senior Design instructor. Almost all faculty members were involved in the technical advising of our seniors.

2004-2012 BSIT Quarter System

In the 2004 the BS in Information Technology degree was created[1,2]. This degree was created from the former IET program as well as a few other IT-related programs that existed at the university. This was a four year program with specific tracks or areas of concentrations that students would select (networking or software development).

Both day and evening majors were put into the same cycle of senior design which began in the Fall Quarter and ended in the Spring Quarter. Senior Design was the name of the Fall quarter course. In the Winter and Spring quarters students took Senior Design Project Management I & II and Senior Design Technical Practicum I & II.

A course for Senior Design Technical Practicum advising was created thus formalizing the fact that faculty members were actively involved in our students' senior capstone process. This course title indicated that there was more to our senior capstone process and as before most of the faculty were involved in this advising. However, the faculty did not enter in the picture in a formal way until the second quarter. In the first quarter it was still informal and ad hoc where students talked to any number of the faculty for guidance on their potential project. Members of the faculty picked the students they wanted to advise at the end of the first quarter and the number of advisees was somewhere between 7-12. With the exception of 2011-12 school year (last year of quarters) the corresponding author's advising load had been less than 10. As a faculty advisor, the faculty members were also the subject matter expert. In general most of our students did an individual project with the occasional group of 2-3 students working together.

Grading

Students did receive a formal grade in their technical practicum course which was separate from the senior design general courses. However there was no formal rubric in place for how students would be graded. Each professor tended to give a grade based upon how well the students did on their end of the term presentation and paper as well as the end of the school year TechExpo where all students from the college displayed their senior projects and industry persons served as judges. Still, the grading tended to be more subjective with the bottom-line being "did the student(s) deliver" on what that said they would produce at the end of the first quarter.

2012-2013 First School Year on Semesters

With the restructuring of the academic calendar, it was decided that the technical advising would begin on the very first day of the senior capstone process. This meant that the technical advisor would be working with students who had not yet identified their project or scope. Instead of having a general technical advising course, it was further decided to have a specific one for our networking track students and another one for our software development students.

Instead of most of the faculty being involved in the technical advising only two faculty members would now be involved. One for the networking track students and one for the software development track students. Due to a scheduling problem technical advising faculty members had to be shifted around and as a result the normal networking advisor was no longer available and one of the software track professors was asked to serve as the technical advisor for the networking students. Besides not being a networking instructor, there were about four times as many students to advise as had been normal in that single networking technical practicum section. This would have made it nearly impossible for any faculty technical practicum advisor to be the technical expert in all related areas as the IT field is as wide as it is deep. All senior design faculty advisors teach two additional courses each semester as part of their normal load.

A longtime member of the IT faculty was asked to teach the project management portion of senior design. This was a new assignment for him and also his first real dealings with working directly with the seniors. Prior to taking over this course, he had been an associate dean and our first department head so the administration part of this task was not new to him and he had participated in the presentations that our students gave at the end of each class session.

With so many students in the Networking track additional problems arose. In the old days of technical advising, most of us could meet with our advisees face-to-face once a week for 30-60 minutes each. That was no longer possible. It turned out to be about every three weeks to cycle to get through all the Networking projects so reliance upon email and other forms of communication became the norm.

Not only did was it challenge to manage those numbers, but a couple of teams had substantial problems with one member. In the past, only a few students formed teams, but in most cases, we only had to manage one or two of them and no real problems had occurred between members of the teams. Now there were ten teams in the in the Networking technical track alone and group dynamics came into play. Even in the Software Development technical track one of the teams had some problems. None of the faculty has any formal training in group dynamics and we all realized this was an area that needed to be addressed.

The design of our capstone courses has some similarity to others such as University of Western Florida where students worked with at least two faculty members, were allowed to choose their own project or an industry-based project, and could work alone or with a team.[3] Our Senior Deisgn Project Management course incorporates a "process-oriented" vision where students carry out risk assessment, design specifications, team building, and other project related activities which is similar to how the School of Informatics at Indiana University implemented their course.[4] In the past we did not allow research related projects, but have begun to do so as we feel that research into an IT area just as important as the practical projects and is the next step to developing graduate level courses.[8]

2013-2014 School Year

For the 2013-14 Senior Design process there were several goal established. They were:
1. To teach students who form teams how to work with one another and how to deal with team conflicts.
2. To make the technical advising more formal by creating a rubric of scored activities.
3. To have students find their own outside technical experts who could handle some of their specific technology questions.

The first goal was handled in a rather unique manner. Our department had hired a former CIO of local business in the Cincinnati area to help us development a outreach to the local IT business community. He had already established a number of business relations before joining us and was serving on our program's advisory board. He was asked to work with the Senior Design Project Management professor to make the course more formal with how things are done in the business world insight. They taught a lesson on team-building for our students. As a part of the class each team wrote up a contract that all members signed thus making each member accountable for their individual contribution. Team members would also evaluate one another on their effectiveness and contributions to the project. Not all students work well in teams so it is not a requirement, but we do feel teaching "teamsmanship" skills is very important no matter what the makeup of a project. Team related topics covered were conflict management, meetings, contributions, obligations, and effective communication.[5]

The set goal of developing a rubric for the Technical Practicum class was handled by the author as this was his second year working in the new format. The rubric covered the following seven areas: attendance at required group meetings, communication, working with an outside expert, regular reports and reflection, elevator speech, final presentation, and semester paper. The last two areas carried the most weight as they established the contract between the faculty and student as to what they would produce at the end of the second semester.

Each of Technical Practicum meet periodically with all of their advisees in a classroom setting right before their regular meeting with for the Project Management class. These meetings are mandatory. Students are also expected to meet with their technical advisor on a regular basis. This meeting can be done in several ways including using phone or Skype. While it may seem easy, there have been times when students seemingly "fall off the face of the earth" and the faculty members end up sending them several emails before any communication is re-established. The regular reports are typically done when there is no face-to-face type of meeting so as to have at least some form of reporting done on a regular basis.

The elevator speech is a lightning talk of five minutes or less talk that the students give at the midterm where they describe their proposal. This is also a time for them to get back feedback on what other students and faculty think of their potential project. It also helps students identify potential pitfalls of their projects as it is better to identify these early in the process and not at the end of the semester.

The final presentation and paper are the most important part of the first semester as this is where students present their final set of deliverables and document this along with a needs assessment,

technologies used, use case diagrams, and several others components. Students are also videotaped and their presentations are made available for review.

Finally, the third goal of having students find an outside technical expert was worked on by all faculty members. Most students were able to find at least one outside expert. We got help from a couple of local companies and some of the local IT-related Users Group amongst others. The Android Users Group has been particularly helpful for the Software Development students and members of the group have also attended the end of the semester presentations. We are hoping to expand this professional mentoring in the coming years.

Conclusion

The School of Information Technology's senior capstone process is ever evolving. We went from small numbers of project with informal technical advising to three to four times as many projects and a more formal methodology for evaluating the technical component of our seniors' work. Converting from a quarter system to a semester system changed the way the technical advising component of this capstone process was done. The technical advisor becomes involved from the very start as opposed to the second quarter (or 10-weeks later).

Another new dynamic that has occurred this year is cross college collaboration. One of IT students has teamed up with two Computer Science students from the College of Engineering and Applied Science. This presents a new dynamic as the capstone process in Computer Science is done differently from us. However, we feel that this type of collaboration far exceeds the differences and will help both of our programs as a whole. It should be noted that last year the Computer Science students exhibited their projects and competed against our students in our annual IT TechExpo so this in some way is the next step.

Our IT TechExpo is always held the third week of April and is the culmination of all the hard work that our students put into their projects. Student projects are grouped into similar areas for judging. All of the judges are from the outside which adds to the intensity of judging as our students know they must impress IT experts who work in the "real" world.

Finally, our Senior Design Project Management course has also evolved as we are looking for more industry involvement and probably more team development as we continue to grow. The challenges are plenty and the faculty are examining new ideas to improve upon what we have and help our students create more innovative projects.

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