WIP: Increasing Engagement with Industrial Advisory Board Members through Asynchronous Assessment of Elevator Pitches

Dr. Walter W Schilling Jr., Milwaukee School of Engineering

Walter Schilling is a Professor in the Software Engineering program and coordinates the Cybersecurity Minor at the Milwaukee School of Engineering in Milwaukee, Wisconsin. He received his B.S.E.E. from Ohio Northern University and M.S. and Ph.D. from the University of Toledo. He worked for Ford Motor Company and Visteon as an Embedded Software Engineer for several years prior to returning for doctoral work. He has spent time at NASA Glenn Research Center in Cleveland, Ohio, and consulted for multiple embedded systems companies in the Midwest. In addition to one U.S. patent, Schilling has numerous publications in refereed international conferences and other journals. He received the Ohio Space Grant Consortium Doctoral Fellowship and has received awards from the IEEE Southeastern Michigan and IEEE Toledo Sections, as well as the ASEE Computers in Education and New Engineering Educators Divisions. He is a member of IEEE, IEEE Computer Society and ASEE. At MSOE, he coordinates courses in software verification, real time systems, DevSecOps, Network Security, and other cybersecurity topics.

Dr. Derek David Riley, Milwaukee School of Engineering

Derek Riley, Ph.D., is a professor and the director of MSOE's Computer Science program, which includes an emphasis in artificial intelligence and deep learning. His teaching and research areas include machine learning, modeling, and mobile computing. Derek got his PhD at Vanderbilt University in 2009 where he developed high performance formal modeling and simulation methods for biochemical and industrial systems. In addition to teaching at MSOE, he provides data, algorithm, and AI consulting services, and is a member of the Association for Computing Machinery.

Work In Progress: Increasing Engagement with Industrial Advisory Board Members through asynchronous assessment of elevator pitches.

Abstract

As the Global Pandemic has continued to resolve, many programs have struggled to maintain active engagement with their industrial advisory boards. While hybrid meetings have helped to retain attendance, it is unclear if attendees are as engaged with the events. At the same time, student needs have increased, making faculty interaction and mentorship more challenging.

ABET Accredited Engineering and Computer Science Programs are required to demonstrate that students have an ability to communicate effectively, with Engineering Programs specifically being required to communicate effectively with a wide variety of audiences. Traditionally, programs assess this using formal oral presentations and written reports in various ways. However, these methods may not be as important for modern students entering industry or research, where the ability to be clear and succinct may be vital.

As part of the capstone sequence at the Milwaukee School of Engineering (MSOE), students in the Computer Science and Software Engineering Programs are required to prepare and deliver an elevator pitch related to their project during the first term once the initial requirements have been established. This pitch helps to solidify the project scope and is used as part of the continuous improvement process for the programs.

To help improve the capstone experience, a subset of elevator pitches for the programs were evaluated by external, industrial advisory board members to provide students with formative feedback from a different audience as a pilot project. This Work In Progress paper will discuss the process used for external evaluation as well as key initial findings from doing this as part of the capstone experience.

Introduction

In 2020, engineering programs were thrust into an era of rapid change brought on by the global pandemic. Programs which relied upon high personal contact were forced to operate in a virtual manner, with little to no personal contact. This impacted everything, from the day-to-day classroom operations to commencements to recruitment. All classes were impacted, but in some regards, the most significant impact was on the capstone projects. Numerous papers have been published describing the approaches used during this timeframe. [1] [2]

This disruption significantly impacted relationships with advisory boards. On many campuses, advisory boards aid capstone design courses. Advisory board members sponsor senior design projects, provide technical assistance to students on projects, and provide input to engineering programs on the larger, strategic directions the programs should be taking. Some advisory board members also help with assessment and continuous improvement in the programs. When the pandemic hit, much of this stopped, as interaction was limited to impersonable virtual meetings. For many campuses, the timing could not have been worse, as it occurred midway into the spring semester, right as many advisory boards were preparing to meet and students were finishing up their projects. Computing projects tended to be easier to work in a remote environment, but other projects requiring hardware proved challenging to complete. Most importantly, the review and critique of projects was significantly more difficult.

Overview of the Milwaukee School of Engineering Relationships with IACS

The Milwaukee School of Engineering (MSOE) has prided itself on maintaining close relationships with its Industrial Advisory Committees. As with many schools, the advisory boards consist of program alumni, employers of graduates, local business leaders, faculty, and selected student representatives. Historically, attendance and engagement has been very strong, with most members reliably attending the meetings. While the specifics vary with the program and department, the IACs within the EECS department tend to meet twice per year, once in the fall and once in the spring. The fall session is scheduled sometime during the fall term and tends to be based more on program development and strategic development. The spring meeting tends to be scheduled in conjunction with the senior design showcase, allowing advisory board members to see the projects in a poster session structure. Advisory board feedback has always been positive, but there has not been any organized attempt to obtain formal feedback.

In 2020, when the pandemic began, all advisory board meetings immediately moved to virtual through the usage of Microsoft Teams, as in person meetings could not be conducted. While this approach worked in that geographically dispersed members could all participate, some level of direct engagement was lost. Additionally, due to limits on public gatherings, senior design showcases were not able to be held in the spring of 2020 or 2021. This meant that IAC members were even more disengaged from the student body.

In 2022, advisory board meetings returned to being in person. However, in person attendance has been greatly diminished, reducing engagement with the advisory board. Select members of the board have routinely asked how they can be of assistance to the program. While for some members there have been opportunities for extra engagement, they often have involved specialized engagement – either technical support related to a given product or specific projects. But overall, there were no general forms of engagement outside of the twice annual meetings.

MSOE SE and CS Continuous Improvement Mechanisms

In tandem with the pandemic, MSOE was undergoing significant changes from an academic standpoint. At the institutional level, the decision had been made to convert the academic calendar from a quarter-based system into a semester-based system. At the same time, the institution was also involved in an HLC improvement project, revising the general education curriculum, known now as the Raider Core. The Raider Core was constructed on top of seven learning outcomes, referred to as the Common Learning Outcomes (CLO's) and shown in Figure 1, which are the 21st century skills which form the foundation for all programs on campus.

- **Collaborate Successfully and Communicate Effectively**
  - Work constructively with others towards a common goal and articulate and explain complex ideas clearly across a range of media and audiences.
- **Demonstrate Ethical Understanding**
  - Engage in independent ethical inquiry on pressing ethical challenges and foster ethical behavior in personal and professional life.
- **Embrace Diversity**
  - Demonstrate inclusivity toward others, pursuing intercultural understanding and exploring ways to address historical or existing barriers to social equity.
- **Exhibit Curiosity**
  - Practice open-minded intellectual inquiry, creative exploration, and engagement with different perspectives.
- **Think Critically**
  - Apply sound principles of critical or analytical reasoning and evaluation of evidence.
- **Integrate Learning**
  - Synthesize and transfer learning across new contexts to address complex problems through program-level courses, Raider Core courses, co-curricular activities and senior/capstone projects.

Figure 1 MSOE Common Learning Outcomes [3]

From the institutional standpoint, CLOs were assessed in two different places. CLOs were assessed in several courses that students were required to take as part of the general education component. This assessment could occur in any year of the student's enrollment or in any one of several elective courses the student would enroll in. Programs themselves were also responsible for designating a location within the curriculum whereby each item would be assessed as well. Program assessments tend to fall toward the end of a student's academic career, and many cases, this assessment was handled in one of the capstone courses.

Computer Science

Graduates of the MSOE Computer Science program will have an ability to:

1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Software Engineering

Upon successful completion of the software engineering program, graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Figure 2 MSOE SE and CS Program Outcomes [4]

At the same time that the changes to the CLOs were occurring, the Software Engineering Program and Computer Science Program were in the process of ensuring that the program was properly assessing the new ABET outcomes for engineering and computer science programs, resulting in the Program Outcomes shown in Figure 2. While the changes from the previous outcomes were relatively small, the opportunity was taken to improve the assessment of all Key Performance Indicators (KPIs). Special attention was also given to the alignment of KPIs to the CLOs, for the program was required to submit assessment data related to CLOs.

CS Outcome 3: Communicate effectively in a variety of professional contexts.

- CSO3P1 A student will write with a level of detail using appropriate terminology and language to communicate with a member of management or research community regarding a challenge with multiple constraints. (Assessed in CSC4902 Computer Science Capstone 2)
- CSO3P2 A student will deliver an elevator pitch for a software project to a non-technical audience. (Also assessing MSOE CLO 1) (Assessed in CSC4901 Computer Science Capstone 1)
- CSO3P3 A student will create an effective visualization intended for a non-technical audience. (Assessed in CSC4801 Data Science Practicum)
- CSO3P4 A student will write meaningful documentation targeted at a technical audience. (Assessed in CSC4631 Artificial Intelligence)

SE Outcome 3: An ability to communicate effectively with a range of audiences.

- SEO3P1 A student will write with a level of detail using appropriate terminology and language to communicate with a member of management or research community regarding a challenge with multiple constraints. (Assessed in SWE4902 Software Engineering Capstone 2)
- SEO3P2 A student will deliver an elevator pitch for a software project to a non-technical audience. (Also assessing MSOE CLO 1) (Assessed in SWE4901 Software Engineering Capstone 1)
- SEO3P3 A student will create an effective visualization intended for a non-technical audience. (Assessed in SWE3411 Software Requirements and Architecture)
- SEO3P4 A student will write meaningful documentation targeted at a technical audience. (Assessed in SWE3720 Software Development Lab 2)

Figure 3 CS and SE KPIs related to ABET Communications Outcome

Figure 3 shows the KPIs selected for the SE and CS Programs in communications. In both cases, two of the four KPIs are measured in the senior design sequence. Of these two KPIs, one that is measured in the capstone course is also used for institutional assessment purposes, namely CSO3P2 and SEO3P2. This assessment requires students to prepare an elevator pitch describing the purpose of their project and plan for developing their project. This then is evaluated by the instructor of the capstone project using the rubric provided in Figure 4.

Rating	Description	Descriptive Text
5	Exemplary	Presentation makes the audience a believer in the product
4	Accomplished	Presentation is understandable and engaging
3	Proficient	Presentation is understandable but not compelling
2	Developing	Presentation is mostly understandable but is missing components
1	Beginning	Presentation is confusion or misleading
0	Missing	Did not submit

Figure 4 CSO3P2 and SEO3P2 assessment rubric.

The assignment varies slightly by instructor and is based on material available from the KEEN Network [5] [6], but a sample assignment prompt is provided in Figure 5.

Elevator Pitch[1]

As a professional in engineering, you will be expected to present solutions to engineering problems and related opportunities. One of the key skills to learn as an engineer is to present these items in a clear, succinct, and time efficient manner. Thus, the concept of an elevator pitch.

"An elevator pitch, elevator speech, or elevator statement is a short description of an idea, product, or company that explains the concept in a way such that any listener can understand it in a short period of time. This description typically explains who the thing is for, what it does, why it is needed, and how it will get done."[2]

One of the goals of senior design is to demonstrate communications skills. At this point in your academic career, you have taken one or more communications related courses, and you have done one or more class presentations. You also have a good idea of the vision and scope for your senior design project.

As an individual, you are to create an elevator pitch for your project. In making this pitch, you should make your pitch as if you were communicating with a potential investor that would sponsor your project. You need to convince the sponsor that your project is viable, serves a need, and should be funded.

A successful elevator pitch requires many things. You need to clearly identify the problem. You need to clearly explain the vision for your solution to the problem. You clearly need to present the value proposition for the project to your stakeholders. You clearly need to convince the stakeholders that you have a plan to deliver on your vision.

In terms of your delivery, you need to be confident, with eye contact, flow, and enthusiasm. You need to connect with the audience, who is a businessman and may not be familiar with technical jargon. And finally, you need to be efficient in doing this, roughly 60 seconds.

Assignment:

Now that you have finished the inception phase and know what your project is all about, you need to figure out how to communicate that to others. By doing this, it will become clear that each one of your fully understands the project that you will be delivering, and that you are on the same page with your teammates on the project.

As an individual, you are to create and deliver an elevator pitch for your project. In creating this pitch, prepare as if you were presenting to an investor. You need to anticipate their questions and present the key info they would need to evaluate your project. Remember, it is entirely up to you and your words. There are no slides or whiteboard behind you to rely upon, and you cannot look at your notes.

Once you have thought through your pitch, practice it one or more times. Practice it in front of a roommate or friend that knows nothing about what you are doing. Give the pitch to a parent or other family member who may not be an engineer, or better yet, may be in management of a company. The key is to build your confidence in your presentation. Then, using your mobile phone or other device, record the pitch and store the pitch to video.

Once you have done this, upload a link to canvas of your video, making sure the permissions are set so that your video can be viewed by one or more persons. You can place your video into vidgrid (https://www.vidgrid.com/) or any other system, again so long as it is readily visible to anyone who has the link.

There are some sample videos in Canvas that you can use as references. These references vary in quality, and the topic is slightly different. But you can use them as a basis for your project. You also may be able to find other examples online.

Your final deliverable will both be referenced by your advisor as well as Industrial Advisory Committee members who will provide constructive feedback on your project.

Figure 5 Sample elevator pitch prompt.

Asking for Outside Help

While this method has worked well for most assessments, there was a desire to try to align our assessment with industry views. The goal was not to replace the assessments being done by the faculty, but to expand the feedback provided to students related to their presentations. To do this, a solicitation was sent to members of the SE and CS IACs requesting their assistance in evaluating elevator pitches. Overall, 11 of the combined total 37 IAC members for the SE and CS committees responded that they would participate.

The submitted elevator pitches for approximately half of the senior design students were divided up amongst the responding members, resulting in each member viewing approximately 5 elevator pitches. Pitches were pseudo randomly assigned to members, and each pitch was theoretically to be reviewed by at least 3 different IAC members. This provided a range of feedback for the students.

Overall, how would you rate the ability of the speaker to convey the important concepts of the project and why the project is being done in this form of an elevator pitch?	Very Strong	Strong	Average	Weak	Very Weak
Overall, how impressed are you with the uniqueness of the project as presented? As an outsider, is the project engaging and interesting, while also being practical?	Very Impressed	Impressed	Neutral	Unimpressed	Very Unimpressed
If you were deciding to fund a project based upon only these presentations and assuming an appropriate budget, is the project described solid enough to be funded and would you fund it?	Absolutely, without a doubt	Strong probability it would be funded	Potentially it might be funded.	The project likely would not be funded.	There is a very strong probability the project would not be funded.
Based upon the presentation given, what are the first two or three follow-up questions you would ask the presenter about the project?					
Based upon your experience, are there any areas of improvement the student should think about if giving a similar pitch in the future?					
A more optional question: Based upon your technical expertise, are there any technical risks that you feel the student(s) should be aware of related to this project? (Given your varied technical areas and the various domains of these projects, this may not be as easy to answer.)					

Figure 6 Elevator pitch assessment rubric and free form questions.

Elevator pitches were evaluated using questions provided in Figure 6. No formal rubric was provided to the IAC members, so variance in answers was expected. The questions also were designed to evaluate the pitches in a slightly different manner than faculty might be using. The faculty rubric of Figure 4 is a broad rubric which does not individually look at independent aspects of the elevator pitch. Rather, it evaluates at a very broad level the effectiveness of the elevator pitch. One of the questions effectively addresses this. However, the other two

evaluated questions look at the innovation in the project and the strength of the overall pitch as to whether the justification is strong enough to fund the project.

The question about follow-up questions was built due to the asynchronous nature of this. Had this presentation been in the form of a poster presentation, then these questions might have been asked in person. This question gave the students an opportunity to see what aspects of their pitch may have been unclear and to try and be better prepared for future poster presentations and other activities. The question about improving their pitch also targeted this growth aspect.

The question about technical concerns allowed the students to again get feedback from professionals outside of academia on their projects from a technical side. Depending on the project, the reviewers may or may not have had technical depth, but in the cases where they did have appropriate background, it is likely that their depth may surpass that of the faculty members advising the projects, as the industry professional is exposed to the technologies daily.

Results

To evaluate the results, several different approaches were taken. Given the variability and lack of depth in the assessment rubric, some approaches would be ineffective. Additionally, given that this was the first time for this proof-of-concept application, the highly reliable results were not expected.

To analyze the results, a cluster analysis technique was applied. The number of responses that were "positive" were binned together, as well as the number of "negative". The neutral responses were then binned into their own category. The difference between the positive and negative values was then calculated and this was divided by the total number of responses. Effectively, this yields a score between 1 and -1, with -1 representing perfect disagreement and 1 representing perfect agreement. Mathematically this is shown in Equation 1.

Equation 1 $$Score = \frac{(N_{Very\,Strong}+N_{Strong})-(N_{Weak}+N_{Very\,Weak})}{\sum N}$$

Overall, students scored well in their ability to communicate the important concepts of their project. IAC members were less impressed with the uniqueness and creativity of their project ideas. However, the weakest aspect clearly was whether the students had a strong enough presentation to fund the project, even in a somewhat loose form.

Questions	Raw Score
Overall, how would you rate the ability of the speaker to convey the important concepts of the project and why the project is being done in this form of an elevator pitch?	**0.564**
Overall, how impressed are you with the uniqueness of the project as presented? As an outsider, is the project engaging and interesting, while also being practical?	**0.364**
If you were deciding to fund a project based upon only these presentations and assuming an appropriate budget, is the project described solid enough to be funded and would you fund it?	**0.000**

Figure 7 Calculated Results

Future Directions

At this point, this approach is still a work in progress. This increased IAC engagement with campus was spoken of favorably during the next advisory board meeting. Overall, the response from the IAC members who participated was quite enthusiastic, and most have committed to repeating the process again.

The technique is being repeated with the next set of students who started one term later. This set is a much smaller set of students, but again can help to refine the process.

Going forward, the intent is to roll the assessment out to all senior design teams and then look closer at how this approach impacts the validity of the internal assessment. There is also consideration of having students complete a follow-up reflection on the IAC feedback.

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