Echo Service Overview

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Neil Bantoc, Michael James, Vanessa Kalu, Chaoya Li, Sara Stalla, Min Zhou

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EXECUTIVE SUMMARY

We undertook a two month project to research and design a potential on-campus solution for the Simon Initiative. To understand the problem space of communication skill development on-campus, we interviewed students and faculty in the College of Engineering and staff and faculty from the Global Communication Center (GCC), Intercultural Communication Center (ICC), Career and Professional Development Center (CPDC), and the Eberly Center for Teaching Excellence. We also conducted a competitive analysis of peer universities and a literature review. We decided to focus our project on Engineering undergraduate students who do not have opportunities to practice or evaluate their presentation skills. After going through a human-centered design process, including storyboarding, needs validation, and user enactments, we settled on a two part solution that offers multiple layers of feedback for practice and in-class presentations. The service would be administered by the GCC and include at times automated, peer, expert, and faculty feedback for practice and in-class presentations. In addition to the automated coordination and delivery of this feedback, the linchpin of the service is a practice environment that simulates a live audience and gives immediate feedback, allowing students to make adjustments either in real-time or soon after the completion of their presentations.

PROCESSES

Phase 1: Defining the Problem

Exploring the Problem Space

Interviews

During our exploratory phase, we were able to conduct interviews from members of major stakeholder groups: alumni, faculty and staff. We interviewed staff from CMU's Global Communications Center (GCC), Career and Professional Development Center (CPDC), a retired English professor, and alumni from various backgrounds. We learned from our interviews with the faculty and staff that students are naturally better at linear thinking. So when it comes to writing, they are mostly advised to use frameworks or simple formulas to structure their composition, which matches the way they already think. Unfortunately, this can lead to dry, boring writing. As for their verbal communication, students have problems developing comfort in speaking with others, an essential skill for networking and job search that is often brushed off by students in technical fields.

CMU's GCC and CPDC are support organizations available to students that offer services geared towards improving their communication skills. These services are positive forces on-campus but a few challenges remain. These organizations find it difficult to make students aware of the resources they offer, and are understaffed during peak times, leading to appointments getting cut short. Apart from this, students found their needs unmet when using a GCC appointment to seek advice when starting brainstorming, finding this resource more useful for getting feedback on already completed material that needs polishing.

Former students shared the same sentiment that it is difficult to learn about the events and resources available to them. Alumni also commented that it would have been good to have more than one required English class, and that communication classes like this should have been spread out more during their program to have at most one per semester. According to alumni, extracurricular activities such as student organizations and training videos from Lynda.com are what they have utilized the most whenever they found gaps in their skills. Alumni were also frustrated whenever they had to work in group projects that had members with poor people skills, tangible evidence that student communication skills are indeed underdeveloped.

Competitive Analysis & Literature Review

According to literature we have found online, researchers found that employers look for people who make clear presentations, work well in teams, listen properly, and solve problems collaboratively. Exercises such as presentations, group discussions, and having to instruct each other to complete a task helped students to practice these skills. In one paper, we found that participating in activities such as group sharing with other students, one-on-one counseling with professors, and training in group discussions and public speaking help students build the communication skills that they need. In a different paper, we've found that timely and useful feedback is important so that students know what the results of their work are. However, generating this feedback manually is laborious, so the paper suggests using computer-generated feedback.

As for offerings by other universities in support of writing and communication building, we've found that all six peer institutions we studied have writing centers that can provide regular services like one-to-one tutoring and writing workshops, but only three out of six universities have a peer review process for course assignments or theses. Lastly, all universities have career center offerings that share basic functionalities such as job opportunities, career counseling, review of job application materials and career planning. All six universities also include required English classes in their curriculums.

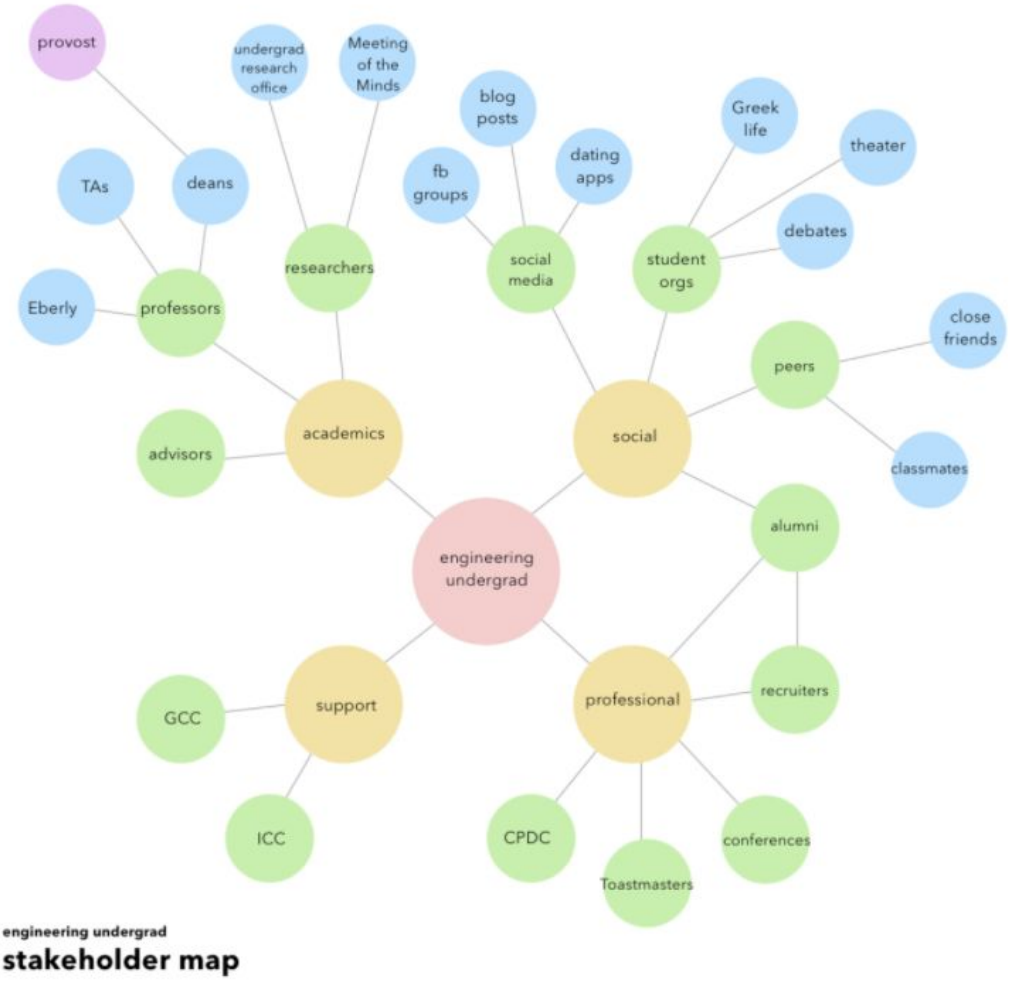
Moving Forward

We decided to focus our efforts on presentation skills because we found that there was a lack of opportunities for development of this skill. It ties in strongly with the verbal communication and self-presentation needs of job interviews and on the job presentations. We focused on Engineering undergraduate students because the department gets less attention than Computer Science but still displays a great need.

Current State Models

Stakeholder Map

After interviewing stakeholders, we identified parties that might be affected by a communication skill building service. The stakeholders are divided into four groups: academics, social, support and professional. Academic stakeholders are involved in students' academic activities, including research, class, and academic advice. Social stakeholders are related to students' social life, like student organizations, social media, and peers. We believe that social life is an essential opportunity for students to practice and learn soft skills. Support stakeholders are on-campus organizations, like the GCC and ICC, who provide workshops, lectures, and one-on-one tutoring to improve student communication skills. Professional stakeholders are interacted with as a student looks past graduation and are strong motivators.



Stakeholder map.

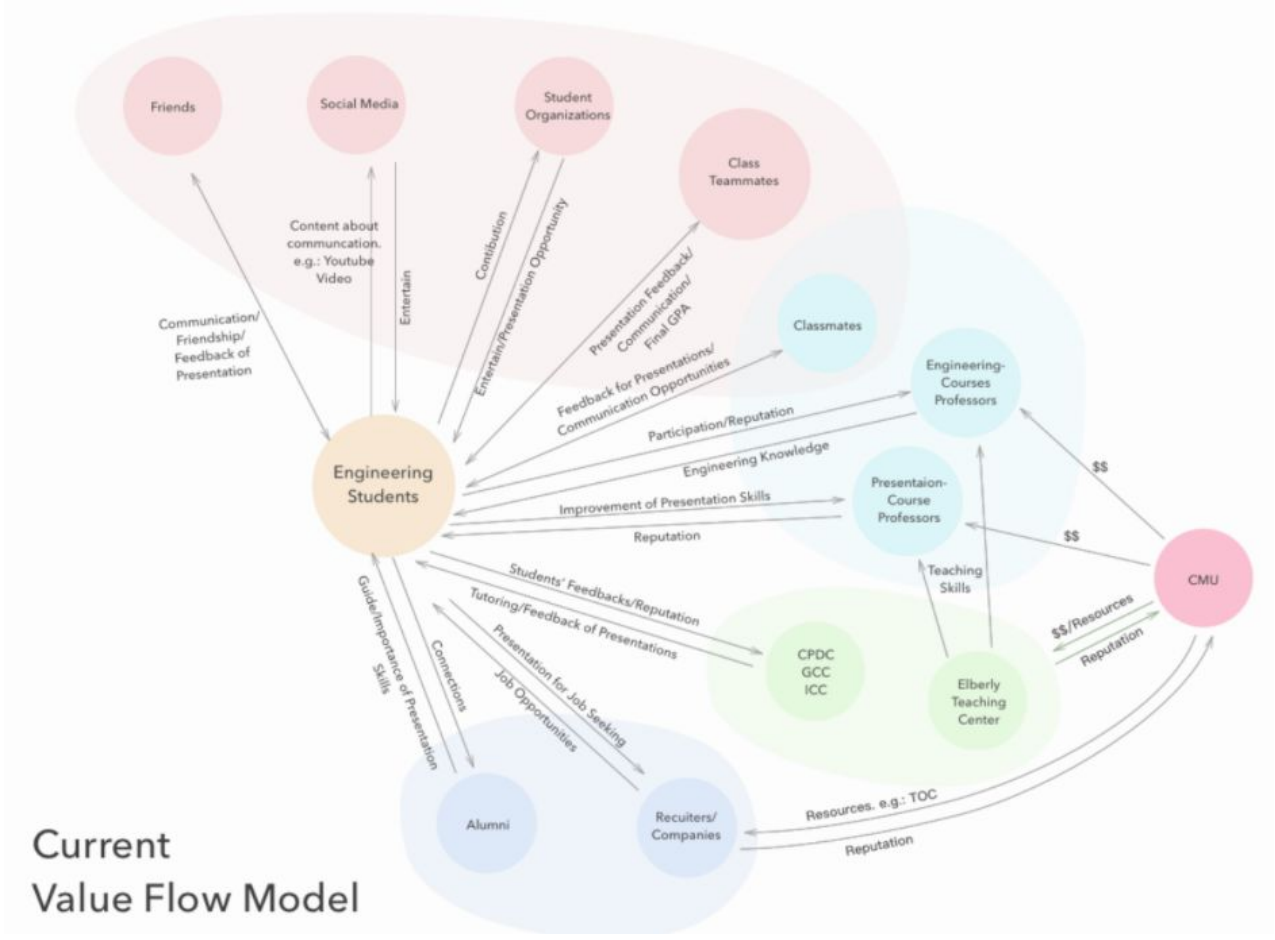
Value Flow Model

We analyzed the value flow between different parties to identify opportunities for intervention.

1) The value exchange between Engineering professors and Engineering students is low. Professors mainly provide engineering knowledge, hesitating to take the risk to investigate their time and energies to improve students' presentation skill.

2) The value flow between peers (classmates) is useful for developing presentation skills. However, this value exchange rarely happens and there are still opportunities to catalyze this process.

3) GCC/ICC/CPDC provide expert support to Engineering students. We wanted to accentuate these unique services by making them more accessible.



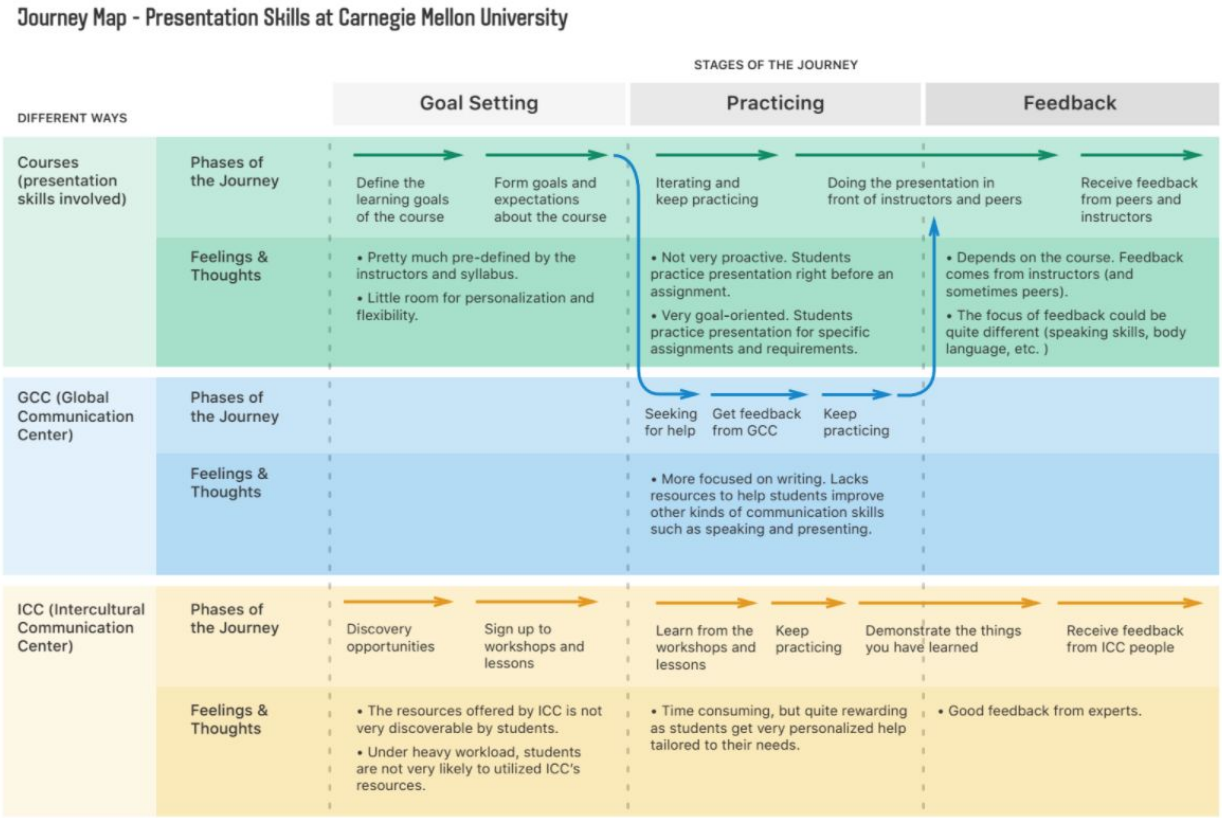
Value Flow Model

Journey Map

We present the journey Engineering students take to complete a class presentation in three dimensions: in-class, GCC support and ICC support.

In courses, students are assigned goals, practice presentations by themselves, and get content feedback from instructors. They have to self-drive practice, setting their own goals, and receive only surface level feedback about the format of their presentations. Students can seek help practicing from the GCC, even though it is focused on writing, lacking expert resources to help improve other kinds of communication skills such as speaking and presenting. At the ICC, international students can learn and demonstrate presentation skills during workshops, and receive feedback from ICC tutors. The feedback from experts is quite valuable, but the learning process is time-consuming.

We observed that the current process of preparing a presentation has room for improvement. It could include feedback mechanisms, expert support, incentives, and opportunities for practice.



Journey Map.

Learning More about Our Selected Problem

Interviews

In order to gain more information about our selected problem, we conducted several interviews amongst Engineering students, faculty, and supporting organizations, such as the Eberly center. One of the main takeaways we received from engineering students is they do not see value in improving their presentation skills because they believe the technical skills they learn in their curriculum will suffice to get them an internship or full-time job offer. For a majority of engineering students, employment is their main concern. Through student interviews, we also learned that although Engineering students give several presentations throughout their curriculum at Carnegie Mellon, their feedback is mostly focused on content rather than delivery. Many professors believe they lack the expertise to give high-level feedback. As a result many students do not take presentations seriously, often waiting until the last minute or not at all to practice giving the presentation. To combat this problem, the Eberly Center emphasized the importance of milestones for large projects, such as practicing in a group. From their observation, they have seen that when students are left to their own devices, they get behind on their work. In response, faculty did not want to “spoon feed” students. However, the Eberly Center did not see this as spoon feeding. They believe that professors over-estimate student communication skills and what the students are able to do on their own without training. The representative of the Eberly Center also encouraged the use of rubrics for presentations, as they would help students know what the learning goals are and allow the GCC staff to be "part of" the teaching team for an assignment. It was also suggested that presentation delivery be given a greater weight in the course grade because this is how students determine the value and importance of building a skill. By conducting several interviews, we were able to determine the pain points that many students, faculty, and supporting organizations experience in relation to student course presentations and developing presentation skills.

Phase 2: Designing the Right Thing

Needs Validation (Storyboards/Speed Dating)

We looked at ways for students to practice presentation skills formally and informally. To do this, we developed eight ideas we made into storyboards: a presentation hackathon, in class role playing, campfire stories, presentation practice in simulated environments, and automated feedback in class presentations. After showing our storyboards to several students, incentive and motivation was a major recurring issue. Students place a high emphasis on getting value out of their time, and because they don't feel their communication skills need improvement or are of great value, they are generally unwilling to dedicate class or extracurricular time to improving presentation skills. Students and educators wanted in-class work to be relevant to their coursework and not take away from "real learning" in the classroom. They favored ideas that were self-service because students could choose when and how much time they wanted to spend, making low attendance a non-issue. The two practice-based ideas, the video-based live stream and the simulated practice environment, both benefited from this feature, offering a high level of user control and flexibility.

Phase 3: Designing the Thing Right

User Enactments

Echo is a service that provides opportunities for engineering students to get feedback on presentations, including both presentations in practice rooms and in-class presentations. The service combines automatic evaluation of presentation mechanics, peer feedback on general comprehension, and expert feedback on structural concerns and areas for improvement.

In order to further validate our idea and collect user's first-hand inputs to better design and flesh out the service, we created two user enactments for participants to try. The first enactment is in an Echo Chamber (presentation practice room), and the second enactment is about simulating the setting for an in-class presentation. We have invited 6 engineering students (3 students in each enactment) at Carnegie Mellon University to experience our proposed service.

Practice Room

One day before the enactment, we sent out emails to participants and asked them to think about what they want to present with a list of recommended topics. In the Echo Chamber, the participants stood in front of a large projected image of a simulated audience. This simulation software prototype (http://michael-james.github.io/echo-practice) we put together seemingly tracks participant's presentation mechanics and provides real-time feedback. Once a participant starts their presentation, the timer on the large screen starts. We were in the room as wizards tracking presenter's filler words, speaking volume, speed, and eye-contact. Whenever we saw or heard things from the participant's presentation that could be improved, we triggered a corresponding notification to pop up in the simulated screen, such as "louder", "slower", or "try to say less 'uh'".

While the participant was presenting, there are two peers sitting in the room filling out a simple Google form to provide feedback on the current presentation, evaluating how well the presenter communicates their message to the audience.

Image 1: Simulated screen with audience and real-time feedback

Image 2: Participant practicing presentation in the Echo Chamber

In-Class Presentation

To test the in-class portion of our service, we asked participants to give a presentation on a project they have worked on in class, as if they were presenting to their classmates and professor. Peers sitting in the room filled out simple Google forms during each presentation. We again recorded statistics about the presentation's mechanics, but did not display them live.



Image 1, 2 & 3: Engineering students delivering class presentation

Feedback Report

In both cases, we put together a feedback report with evaluation of presentation mechanics, peer feedback on general comprehension, and expert feedback that we prepared beforehand and tweaked to each presentation. We showed the report to each presenter afterwards and collected their thoughts and suggestions after experiencing the whole service.

Feedback

When reviewing feedback gathered after our user enactment, we identified three factors that students found most rewarding about Echo:

- **Perspective.** Students needed some perspective about what success looks like. Although many can recognize a good presentation, students often have trouble understanding what exactly makes it good. Echo helps users parse and understand the factors that manage effective communication with an audience.
- **Layers.** Students appreciated the "layered" nature of evaluation, especially the meticulous reports that allow them to quantify their performance and track it over longer periods of time as well as minute-by-minute. Additionally, Echo empowers students to draw upon two types of support: peer feedback that captures a real audience's response and expert feedback for communication strategy and guidance.

- **Speed.** Students also appreciated the automated nature of the service, which allowed them to identify and correct their behavior in real-time. Instant feedback promotes the development of good habits, enabling students to recognize patterns in their problem areas and nip them in the bud.

SOLUTION

Overview

Echo is a two part service that combines machine-learning solutions with peer and expert feedback, available for both practice sessions and in-class use. For more information, please refer to our introductory video:

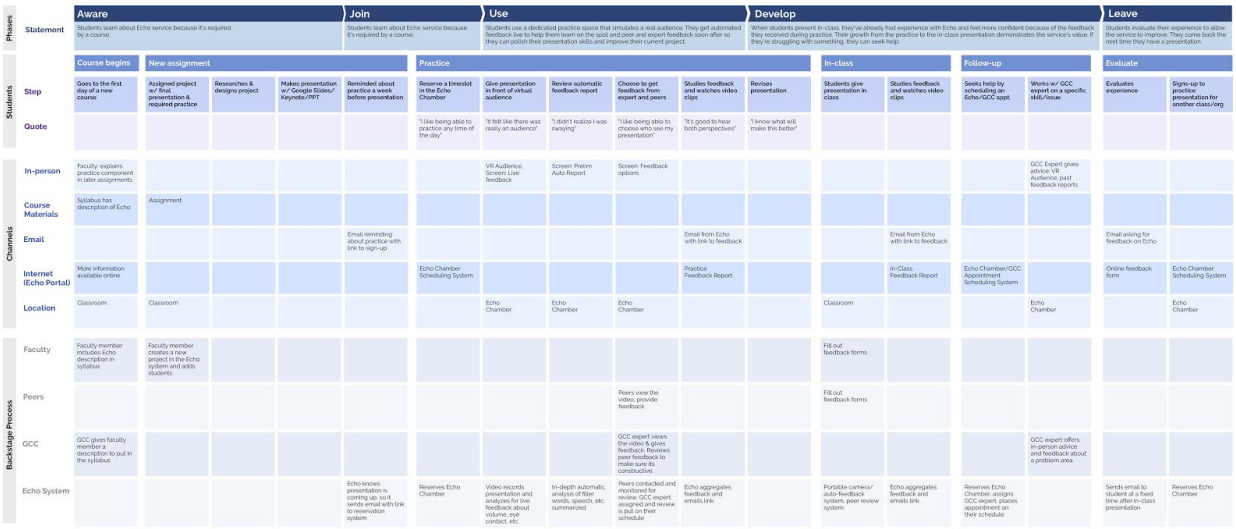
https://vimeo.com/194274155

Service Blueprint

Because the service is delivered across a variety of channels and relies on a number of different backstage roles, we organized our service blueprint to clearly outline where each touchpoint and process falls in the puzzle. Students are introduced to the service primarily through classes that require presentation practice, giving students concrete motivation to use the service.

Students can schedule a practice timeslot in the Echo Chamber day and night, since presentations are often made at the last minute. After they sign-up through an online reservation system, students are granted key card access at their timeslot. In the practice room, they give the presentation to a simulated audience as the system analyzes live video and audio, giving immediate feedback about issues they can fix on the spot. Afterwards, they can see a report with more detailed feedback, such as filler words, swaying, etc. Students have the option to send the report for more feedback. If they request peer feedback, a few students would be prompted to watch the video and answer a few simple questions about what they got from the presentation. If they request expert feedback, a GCC consultant who specializes in presentations would give them specific and strategic feedback. The expert would briefly review the peer feedback to make sure it's constructive and then the platform would send the report to the student. The student would revise the presentation and give it in-class.

The in-class presentations could support similar feedback through a portable presentation-analysis suite similar to the one in the practice room. During the in-class presentation, students would answer a few simple questions about each presentation and the faculty member would replace the GCC expert in this case. The student would similarly receive a report afterwards and they would have the option to schedule a GCC appointment in the practice room if there issues with the presentation they wanted to work on further.



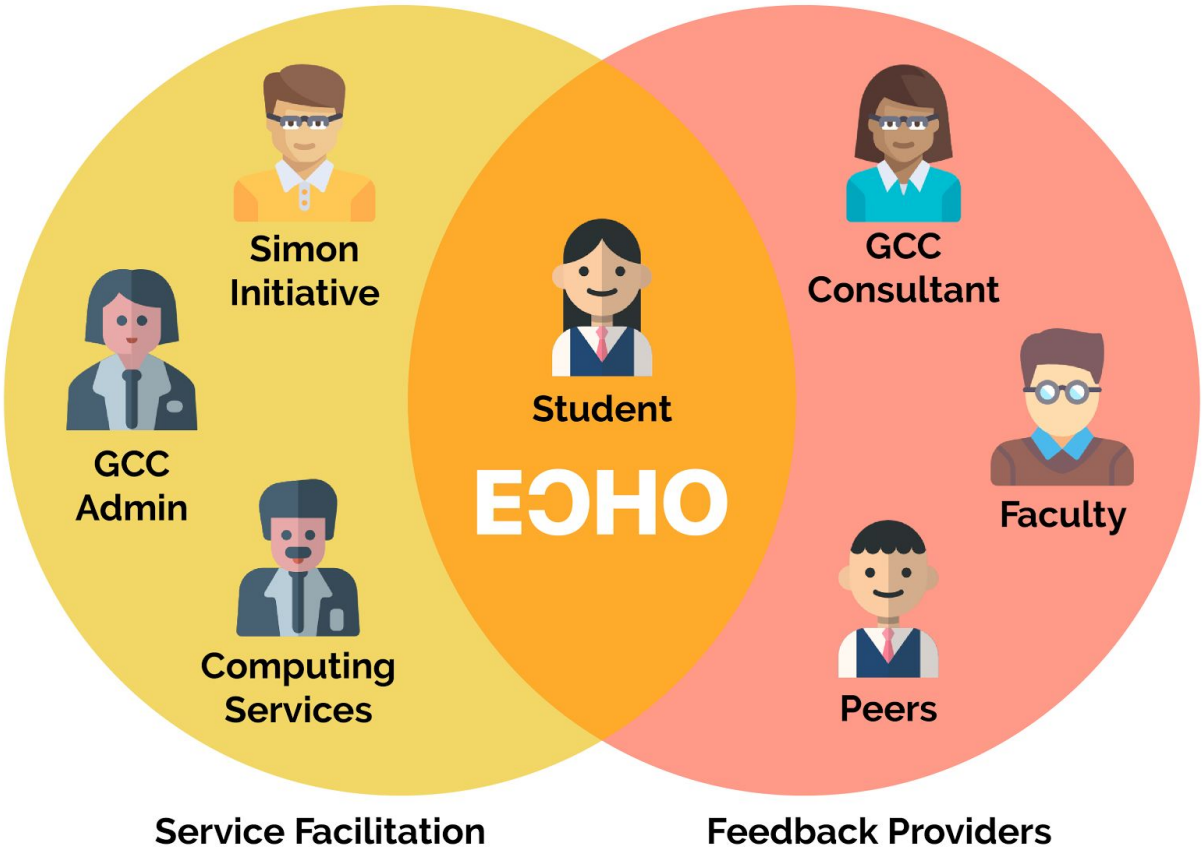
Service Blueprint. A PDF is available in our final deliverables folder.

Stakeholder Model

Service facilitators work to operate and manage the Echo system. The Simon Initiative provides financial support and vision to the service. The GCC leadership provides administrative support by managing the scheduling system, tutor assignment, and quality assurance. Computing Services provides IT support for the Echo system.

Feedback providers generate the feedback content, which is the core of the service. Peers provide feedback on recorded practice videos and in-class presentations. Faculty also provide feedback on in-class presentations. Whereas the first two stakeholders contribute at no cost because they mutually benefit, expert GCC consultants are included in the practice phase to provide systematic and credible feedback.

These two groups of stakeholders works as a whole to enable the Echo system to consistently provide useful feedback to our students.



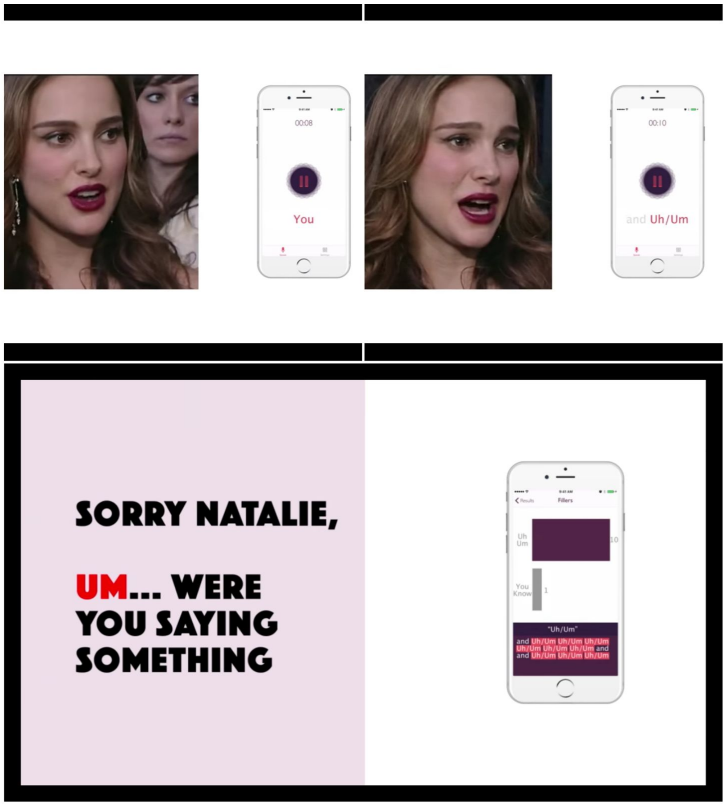
Stakeholder Model

Technical overview

To be able to provide meaningful feedback to the users, we are looking to track certain aspects of their presentation such as the words that they use, the quality of their voice, their body posture, their gaze, and the audience's reaction to the presentation. Some observable aspects such as dynamics and pacing can be given as real time feedback so that they can make adjustments on the fly, while others such as frequency of filler words and dead silences can be provided after the presentation to serve as metrics that the presenters can reflect on.

Speech

To assess the quality of their speech, we will be tracking the volume of their voice (dynamics), the pacing of their words and the frequency of their filler words as well as any prolonged silences. The technology for this already exists, and one such product of this technology is the Ummo speech coaching app:



Ummo provides the user a transcript of words as well as a summary of frequent filler words and volume over time.

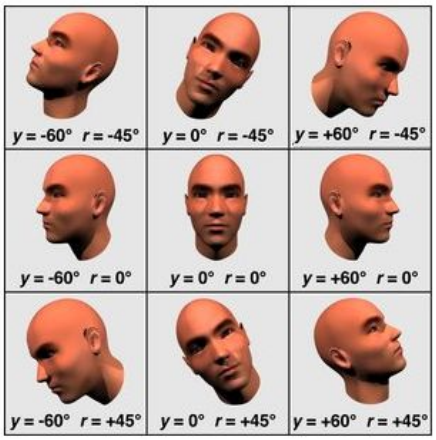
Speech recognition toolkits such as CMU Sphinx and the SpeechRecognizer class for Android are also available for building speech recognizers from scratch.

Audience Participation and Presenter Posture

To assess the general body language of the presenter, we will be tracking how much they slouch as well as how much they use their arms to express what they're saying during their speech. We will also track how much they wander on the stage, and if they eyes are focusing too much on a particular section of the audience. We will use the same eye and face tracking on the audience to determine their engagement level.

To track how much the presenter is slouching, consumer products such as the LumoLift posture coach can be used. In conjunction with this, a Microsoft Kinect can be used to track not only the posture but the aforementioned hand gestures and stage wandering as well.

Eye and face position tracking toolkits also exist, such as the one found on Google's Play Services SDK for Android. The presence of these technologies on mobile platforms such as Android showcase just how accessible this technology has become.



Feasibility

We recommend that our proposed solution is managed through the Global Communications Center (GCC). The GCC is Carnegie Mellon's resource for students in improving all forms of communication skills. In order to implement our solution, we propose the GCC hire a new staff member or delegate the role of managing the Echo platform to an existing staff member. Responsibilities will include managing scheduled appointments for the Echo Chamber as well as managing presentation feedback between GCC experts and students through the Echo system. In addition, Computing Services will provide IT support for the online Echo portal as well as any technical support for Echo systems that are located in classrooms and Echo Chambers.

We recommend that for in class presentations, the Echo system is placed in classrooms that are frequently occupied by engineers, so that it is available to them when giving presentations. Another option would be to delegate a few classrooms that will contain the Echo system and professors can reserve these classrooms on days their students need to give presentations. In addition, we recommend that the Eco Chambers should be placed inside of Hunt Library. The library is currently where the GCC is located. The 3 study rooms in the basement of the library could be converted into Echo Chambers, or the Simon Initiative could look into developing Echo Chambers in other areas of campus such as the University Center, Doherty Hall, Wean Hall, or Roberts Engineering Hall. These are locations that engineering students frequently attend.

The hardware required to run this setup doesn't come at great cost, although the expense of developing an integrated Echo platform would have to be further considered.
Hardware: Kinect ($99.99) and adapter ($39.99), Lumo Lift ($99.99)
Software: Ummoapp ($1.99), CMU Sphinx (Free), Android Face Detection (Free)

CONCLUSION

Over the course of the past two months, our team immersed itself in the challenges facing CMU students as they prepare for life post-graduation, particularly the workplace challenges they may be unprepared to face as a result of a honed focus on technical skill development in their undergraduate curricula. The Simon Initiative has identified that students don't share the same proficiencies in communication skills as they do in their technical skills, and seeks to close that gap by exploring on-campus opportunities to enhance speaking, writing, and listening. In partnership with this organization, our team surveyed the campus offerings, conducted a competitive analysis, engaged in user research, and formulated a variety of potential solutions that we then winnowed into one comprehensive communication aid.

The result of our work is Echo: a two part service that incorporates practice simulation and real-time presentation feedback. Echo leverages the strengths of both peers and experts, delivering to students the best value from their contributions and evaluations. The system also relies on sophisticated technology powered by machine-learning algorithms that can detect and surface some of the most common obstacles to effective performances, and delivers them both in real-time prompts and cumulative data visualizations. By combining solutions that are both human and machine supported, the student is presented with a plenitude of factors that cover a spectrum of feedback and convenience: both qualitative and quantitative, available for use by oneself or with peers/experts.

The Simon Initiative strives to improve CMU's current offerings by strengthening what may be perceived as a shortcoming in the university's focus. Our solution aims to address this need in a way that pays respect to the enormous value CMU already brings its students. By presenting a design that is heavily supported by technical prowess, we hope to introduce a solution that complements and fits seamlessly into the suite of offerings at CMU, and pays homage to the institutions values and strengths. With Echo, we hope to inspire our students as we guide them towards greater successes in their futures.