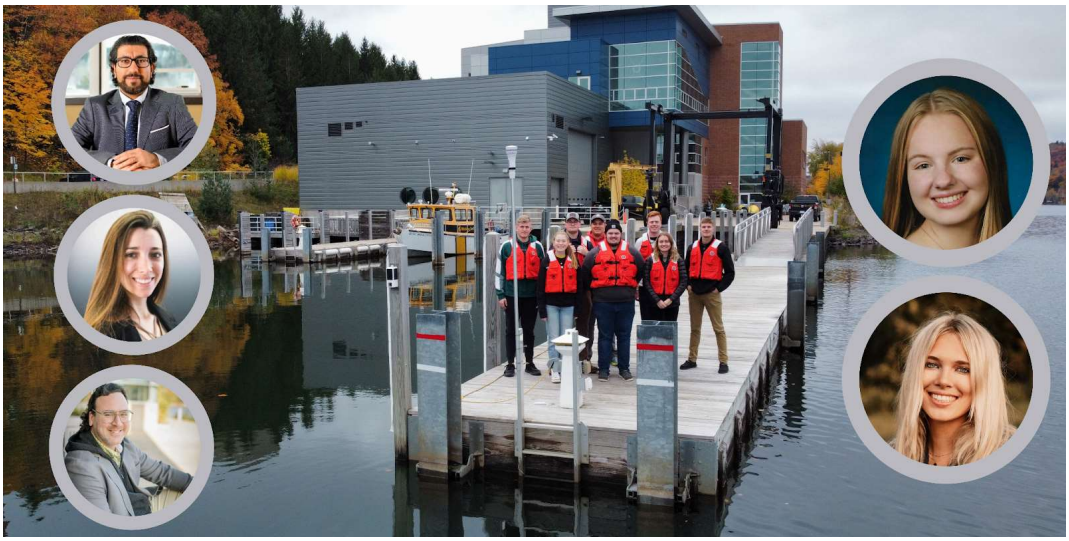
Community Connections Metrics Report
Michigan Technological University

Date: 5/13/2024



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1.0 After Action Report

Following the midyear, the SENSE team became extremely busy bringing to life the tangible point absorber concept, an operation of ordering and assembling that lasted until April. However, we still wanted to demonstrate our concept to a broader community.

We planned to demonstrate our design and overall project at Michigan Tech's Senior Design Expo, in which all senior capstone projects are generally displayed during the day-long public event. The event took place on April 16, 2024. The event is four hours in duration, in which company reps from various industries throughout the nation tour the event and discuss projects with each table. The event is open to the entire public as well, including the MTU student body and faculty. It is generally a very high-volume event each year with both great professional and public attendance.

While actually displaying the point absorber in its environmental action was impossible for this event, the WEC was fully assembled and all related components were on display. Therefore, all passing individuals interested in the project were given a description on the competition, the fundamentals of the SENSE design, and were shown the device's functionality by causing the buoy to oscillate vertically by hand. A team member would physically showcase how the device functions, while another would explain the concept, illustrating important device components such as the voice coil motor, the buoy/shaft guide system, the spar, and the drag plate, while simultaneously explaining the functionality and purpose of each of these components. We would then explain how wave energy converters - such as ours - are generally deployed and what power markets they service. Emphasis was placed on Blue Economy applications, such as AUV charging, aquaculture farming, powering offshore data centers, and providing power for emergency relief systems.

The biggest challenge faced by the team this semester, in terms of Community Connections, was truthfully conceiving a logistically possible event that would actually showcase our device's functionality. Our topic to address in the midyear was the lack of technology demonstrations in the industry - however, the only available location for the SENSE team to actually display their technology in its true operational nature was the MEEM wave tank facility - a facility far too small to host any sort of broad event. Thus, we settled on the Design Expo. By choosing to host an event in the wave tank, we are able to demonstrate the technology in a way that is most informative, however we risk low attendance/interest and are critically spatially constricted. By choosing to display the project at Design Expo, we are unable to demonstrate the technology in its true nature; however, we are still able to oscillate the motor by hand, display images, and explain to individuals exactly how the device operates while someone operates the buoy, offering as comprehensive of an explanation as possible. Additionally, we are guaranteed incredible viewer traffic throughout the day from industry representatives, students, university faculty, and even the general local public, as many Houghton citizens tend to visit the Design Expo each year.

The change to this year's community connections challenge proved interesting for the SENSE MECC team, however the idea to have each team "focus" on an issue allowed us to swiftly engage in productive conversation with every professional we interviewed. Side-tangents, awkward silences, and general

themeless conversations were effectively eliminated by centering the conversation around a specific issue. Additionally, it challenged us to think as not just engineers, but as advocates of engineers, a thought-process that is lacking in not just marine energy, but nearly every technical discipline to some degree. The deliverable of specifically addressing the chosen issue in actual outreach events proved more challenging. For the middle-school event in the fall, we chose to have each student construct their own craft WEC in order to demonstrate the technological concept. Figure 1 depicts a few students engaging in the creation of the craft prototype, and Figure 2 is an image of the SENSE display at MTU Design Expo.

Figure 1

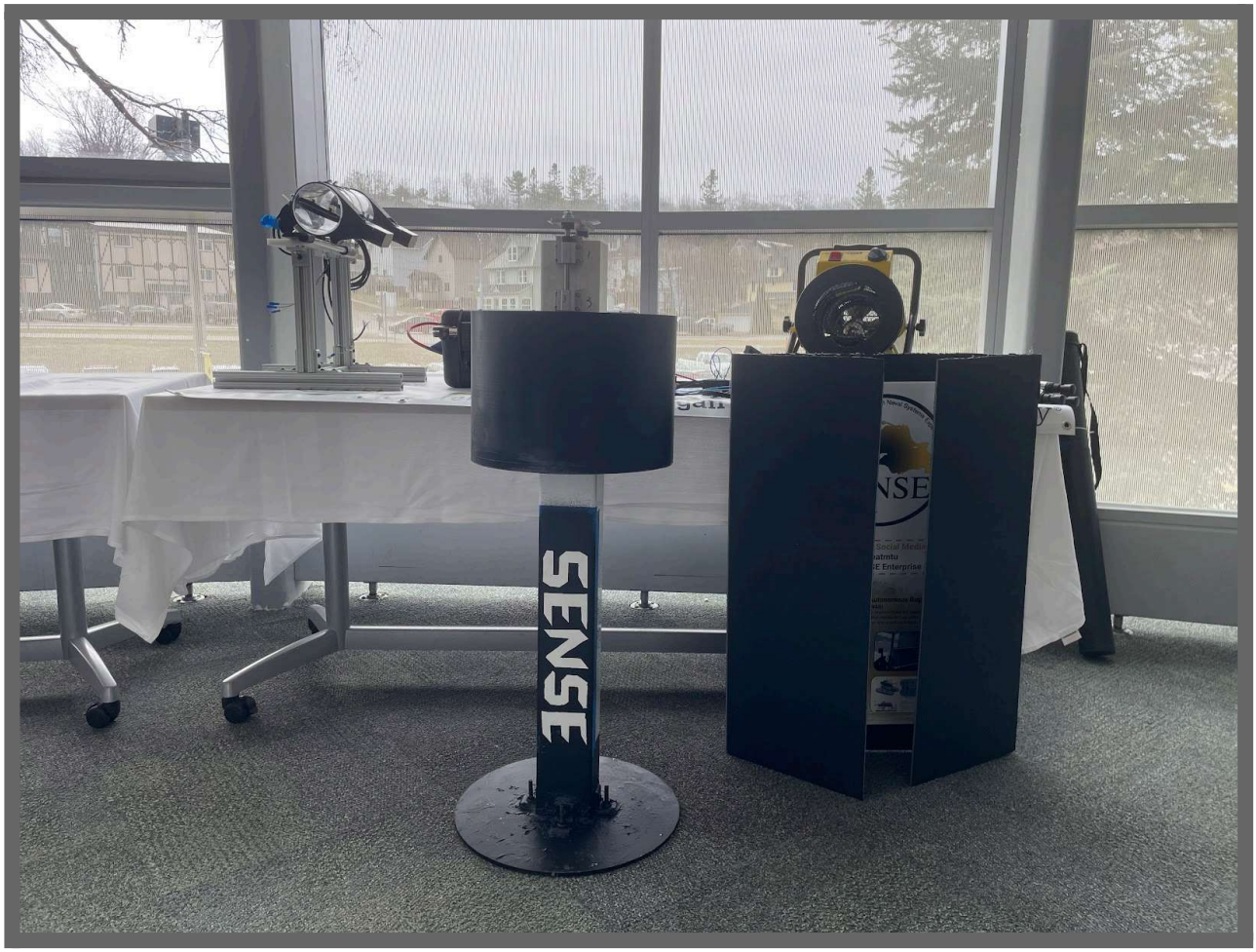

Figure 2

2.0 Metrics Report

Interview 1: Dr. John Ringwood (john.ringwood@mu.ie)
Affiliation: Professor of Electronic Engineering at University of Ireland, Maynooth
Present: Dr. Ringwood, Mason Mariuzza, RJ Slater, Tania Demonte Gonzalez, Dr. Shangyan Zou
Location: Mechanical Engineering - Engineering Mechanics (MEEM) Building at Michigan Tech
Format: Q&A centered around public pushback regarding marine energy, the importance of developer and stakeholder communication regarding functionality, and achieving optimal functionality opposed to simply baseline functionality.
Sector: Research and Development
Future Involvement: Dr. Ringwood commented he'd be happy to answer any team questions following the interview via email.

Origin: Dr. Ringwood attended MTU to give a seminar on control systems design and we were able to meet with him privately earlier in the day.

Interview 2: Andy Jenkins (andy.jenkins@bigmoonpower.com)
Affiliation: President and CEO of Big Moon Power
Present: Andy Jenkins, Mason Mariuzza, Tania Demonte Gonzalez, Jamie MacNeil (affiliated with company)
Location: Remote
Format: Q&A centered around the importance of stakeholder trust, community engagement, risk management, and not solely relying on functional technology to assert a place in the renewable energy market.
Sector: Private Development
Future Involvement: Andy and Jamie both agreed that they would be happy to assist the team and stay updated in project progress, and provide guidance on our business plan if we ever requested.
Origin: Found their website on a MECC resource listing various wave energy developers, reached out via their website portal, and set up an interview.

Interview 3: Allison Johnson (allison.johnson@ee.doe.gov)
Affiliation: VP of Engagement and Outreach for Water Power Technologies Office, DOE
Present: Allison Johnson, Mason Mariuzza, Grace Garnett
Location: Remote
Format: Q&A centered around technological demonstrations, their current lack of funding, and the importance of establishing trust with stakeholders
Sector: Government and Outreach
Future Involvement: Allison is currently one of MECC's most involved faculty, and is one of the four initial creators of the competition.
Origin: LinkedIn

Interview 4: Dr. Ana Dyreson (adyreson@mtu.edu)
Affiliation: Leader of Great Lakes Energies Group, Assistant Professor of Mechanical Engineering at MTU
Present: Dr. Dyreson, Mason Mariuzza, Kevin Hoefer
Location: Mechanical Engineering - Engineering Mechanics (MEEM) Building at Michigan Tech
Format: Q&A centered around the Great Lakes Energies Group's advancements in the local area, key tips to engage stakeholders and arouse their insight, and the importance of showcasing renewable energy technology
Sector: Research and Academia
Future Involvement: Ana stated she really enjoys speaking with our team, as this was her second consecutive interview and would be happy to continue in the future.
Origin: University faculty

Interview 5: Dr. Ryan Coe (rcoe@sandia.gov)
Affiliation: Wave Energy and Fluid Dynamics Modeling Specialist at Sandia National Laboratories

Present: Dr. Coe, Mason Mariuzza, Max Beard, Braeden Colberg
Location: Remote
Format: Q&A centered around Dr. Coe's developments in marine energy, how they are tested and how this is logistically accomplished, as well as other technical concepts.
Sector: Research and Development
Future Involvement: Ryan actually continued to assist via email, there were a few technical questions we had related to some of his work of which he happily answered.
Origin: LinkedIn

3.0 Action Outcomes

The middle school outreach event comprised a class of 17 students interested in STEM. All were able to participate and listen to the team's presentation, and all participated in creating their own mini oscillating water columns to display how water and pressure can be used to spin a motor. The craft was created with a plastic water bottle and a cardstock turbine, and a bucket of water served as the marine environment test bed.

The Design Expo featured representatives from several companies, university faculty, event judges, the President of MTU, hundreds of students, and several everyday citizens of the public simply interested in this year's expo. Being that industry reps arrived from various places in the country, and students at MTU come from all over the world, the SENSE team's reach with the design expo display covered a very significant amount of geographical territory. The project display was featured on SENSE's Instagram page to attract any followers to come learn more about marine energy.

4.0 Outreach Strategy Outcomes

LinkedIn, phone calls, and faculty relations were SENSE's chief tools in obtaining Community Connections interviews, as well as stakeholder interviews for the business plan. Dr. Ryan Coe, Dr. Andy Gish and Allison Johnson were all reached out via LinkedIn and subsequently interviewed. To obtain interviews regarding environmental compliance, the EGLE Water Resources District Office was initially called, and we set up an interview thereafter with Ryan McCone. He then referred us to Kerrie Kuhne of the US Army Corps of Engineers, in which we obtained a second interview regarding environmental compliance. In all, various methods were employed to achieve interviews and we saw a high success rate.

To set up the middle school outreach event, we reached out via email to Copper Island Academy, who gladly set up an hour for us to present. To attract individuals to our design expo table, we posted our display on the SENSE Instagram page. The design expo had a very high volume of diversified traffic interested in our project.