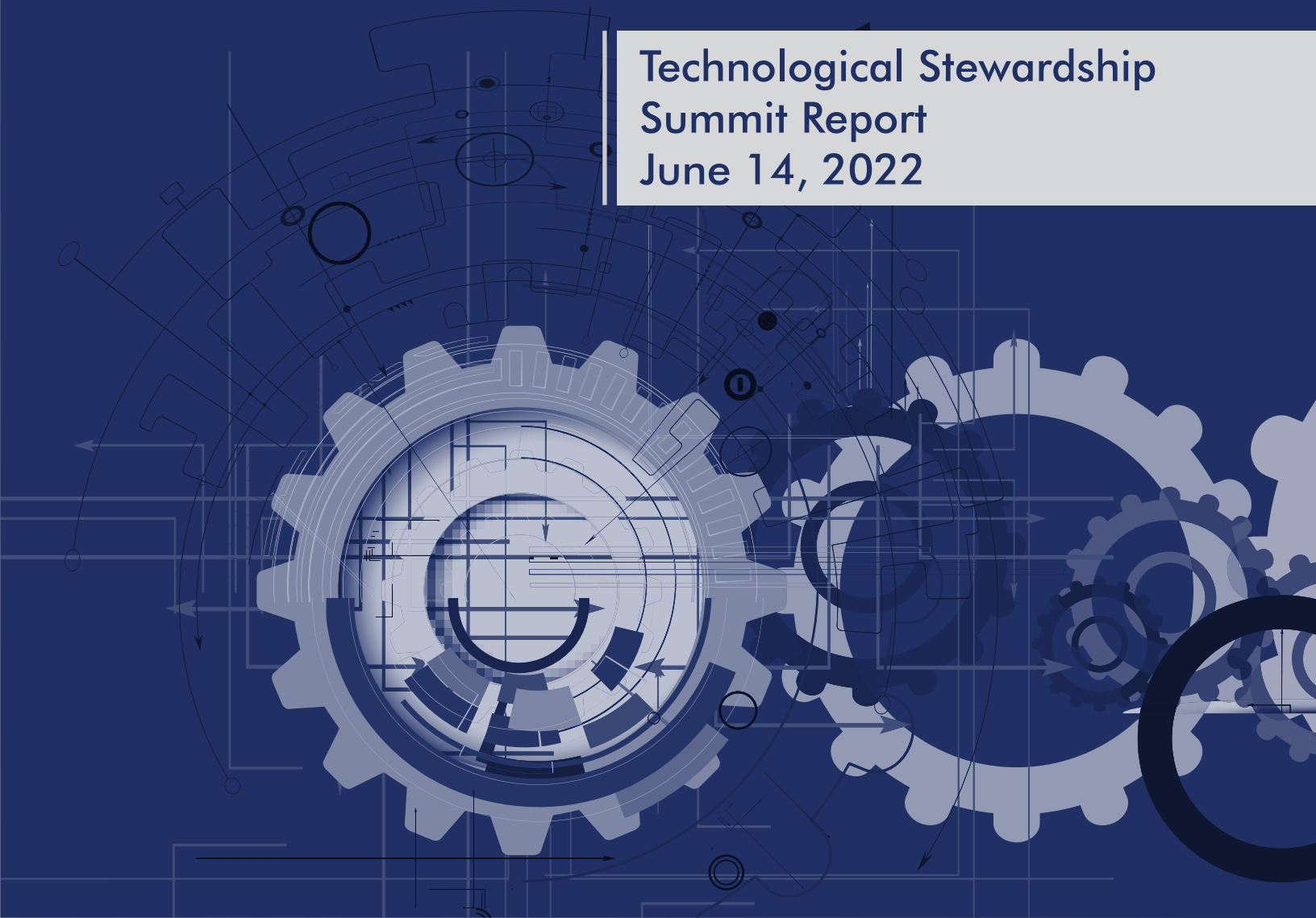
ENGINEERING CHANGE LAB USA

For more information on Engineering Change Lab-USA, contact Executive Director Mike McMeekin at mikemc@ecl-usa.com and visit our website www.ecl-usa.org

TECHNOLOGICAL STEWARDSHIP

AN ENGINEERING CHANGE LAB – USA SUMMIT PRESENTED IN COLLABORATION WITH ENGINEERING CHANGE LAB - CANADA

Technological Stewardship Summit Report
June 14, 2022



Technological Stewardship

Since the dawn of humanity, our technologies have transformed the world around us, adapting our environment to meet our needs and wants. Over the last 150 years, the Engineering Community has played a primary role in the creation and application of physical, digital, and biological technologies, from infrastructure and energy systems to digital twins and artificial intelligence to gene splicing and bio-printing.

In today's world, the power and reach of new technologies is ever-expanding, and the pace of technological change is accelerating. Now more than ever, it is imperative that those of us involved in the creation and application of all types of technology consider the social, environmental, and ethical impacts of our work. Engineering Change Lab – USA's (ECL) June 14, 2022, summit introduced the **Technological Stewardship** (TS) initiative that has been developed by the Engineering Change Lab – Canada. **Technological Stewardship** (TS) offers a professional identity, orientation, and set of practices that can support members of the Engineering Community in navigating the complex tensions inherent in our work, broadening our perspective about the potential impacts of our efforts, and bending the arc of technology towards greater good.

The program for the summit was designed around the Tech Stewardship Practice Program (TSPP) currently being offered in both academic and practice settings by Engineering Change Lab – Canada. The TSPP program is framed around "technology" rather than "engineering," encompassing an aspiration to help the Engineering Community break out of its silo and connect with the knowledge, wisdom, and expertise of related social scientists, professionals, and businesspeople who are also vital players shaping the complex relationship between technology and society. Our overarching goal for this summit was to inspire the Engineering Community to take on a more inclusive and responsible leadership role in shaping the world through the development and stewardship of technology that is beneficial for all. See this link for a quick overview **(TS Overview).**

Click to view

Provocation

THE ECL-CANADA TO TECH STEWARDSHIP STORY

MARK ABBOTT
ECL - CANADA

BIO: Mark currently serves as the Director of the Engineering Change Lab (ECL) and the Director of Tech Stewardship at MaRS Discovery District. Tech Stewardship is a professional identity, orientation and practice. As tech stewards, we continuously discuss, refine, and imagine new ways to shape technology for the benefit of all. The ECL is a catalyst for evolving the engineering community to reach its full potential as stewards of technology for the benefit of all. Over the past years, over 150 organizations and 350+ individual leaders (CEOs, VPs, Deans, Directors) have collaborated using the Lab's platform, advancing understanding and action to evolve engineering. Previously, Mark served as a member of the Executive Team at Engineers Without Borders for several years. And before that, Mark spent fourteen years working for a heavy industrial consulting engineering firm based in Vancouver. Mark and his partner Colette live in Kamloops, British Columbia, Canada with their 7-year-old Felix and 5-year old Stella.

Mark Abbott, Director of ECL-Canada and Director of Tech Stewardship at MaRS Discovery District, kicked off the summit by recapping their eight-year journey that has resulted in their current focus on catalyzing and supporting a TS movement. ECL-Canada's journey has coincided with a global awakening regarding the question of humanity's relationship with technology. Mark highlighted their realization that engineering can sometimes be an un-self-aware profession and that the strength of engineers, our capacity as problem-solvers, can also be a weakness.

what is tech stewardship?

A professional identity, orientation and practice. As tech stewards, we continuously discuss, refine and imagine new ways to shape technology for the benefit of all.

purposeful
Tech is not neutral. We imagine, design, and implement technology intentionally for positive impact.

responsible
The pace of tech disruption is accelerating. We anticipate, monitor and manage the complex impacts of tech.

inclusive
Who's driving tech? We expand who and what is considered and involved in decision making.

regenerative
Tech is often extractive. We proceed in a manner that cares for the environment, economy, communities & individuals

Provocation - *THE ECL-CANADA TO TECH STEWARDSHIP STORY*

The main purpose of ECL-Canada's TS Practice Program (TSPP) is to ensure that technology is beneficial for all by impacting the creators and implementors of technology, such as the Engineering Community. Their twin goals are to reach a tipping point in the Engineering Community and to catalyze and support a larger TS movement. Early efforts in building the TS community have been focused on engineering schools at Canadian universities. Over 3,000 students have been exposed to the TSPP since the beginning of 2022. Mark's belief is that engineering undergraduates who are exposed to 40 hours of TS practice throughout their four-year program- ***will radically transform engineering for the benefit of all.***

The TS Practice Program is founded on three core commitments.

Tech Stewardship Core Commitments

Advance Understanding

We continuously deepen our understanding of our relationship with technology, challenge dangerously limited narratives and stereotypes.

Deliberate Values

We seek to understand how our values are shaping and being shaped by the technologies we build and scale.

Practice Behaviours

We support each other to practice the daily behaviours that enable progress in all its forms - from incremental steps all the way to breakthroughs!

Provocation - *THE ECL-CANADA TO TECH STEWARDSHIP STORY*

Mark highlighted several important elements of the Core Commitments. **Advance Understanding** is intended to instill in engineers the ability to question the creation and application of technology. **Deliberate Values** is seeking to build the capacity to see both/and opportunities (as opposed to either/or) in navigating value differences and to encourage more in-depth think around "Can we do it?" versus "Should we do it?" **Practice Behaviors** is about supporting each other in our daily work.

Sample Student Story - Seek Purpose

*"My group's **capstone design project** aims to design an **Arctic Patrol vessel** for the Canadian Coast Guard. This week, we were reviewing the mission of the vessel and how it will interact with the environment and communities of the Canadian Arctic. We found that instead of just designing a vessel to do basic patrol and sovereignty tasks, we could **make our ship more useful by allowing it to support arctic communities and their residents, as well as provide environmental support and ensure the fragile ecosystem remains safe and healthy.** This showed that by Seeking Purpose in our design we could broaden our horizons and help to make a greater effect on the people and environment that our design will interact with."*

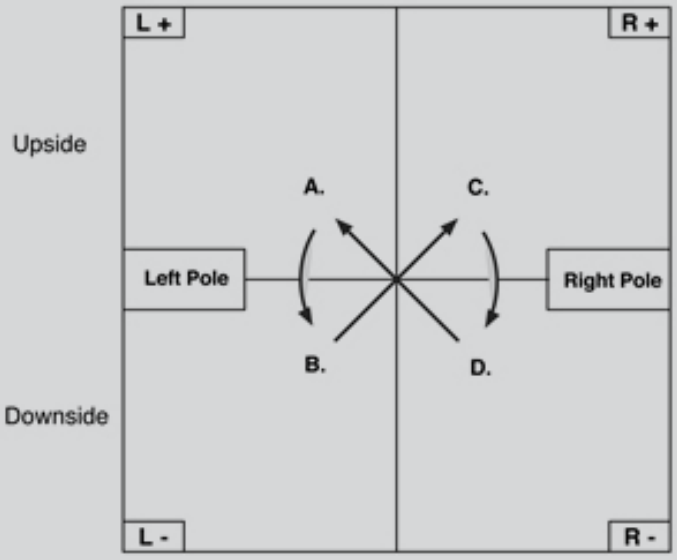
EXERCISE I – TECH DEVELOPMENT & TECH STEWARDSHIP

The first group exercise of the summit centered on the first of the Core Commitments, Advance Understanding of the complex relationship between society and technology. This commitment seeks to instill a greater emphasis on "Should we do it?" (Tech Stewardship) as a complement to the "Can we do it?" (Tech Development) focus that dominates engineering practice. Engineers typically tend toward a "Can we do it?" action-oriented, problem-solving mindset, a mindset that is reinforced by society's view of the role of engineering. In exploring this Core Commitment, participants were asked to use the practice of polarity management (see sidebar). Polarity management seeks to produce "both/and" solutions or responses as opposed to taking an "either/or" approach.

Polarity Management

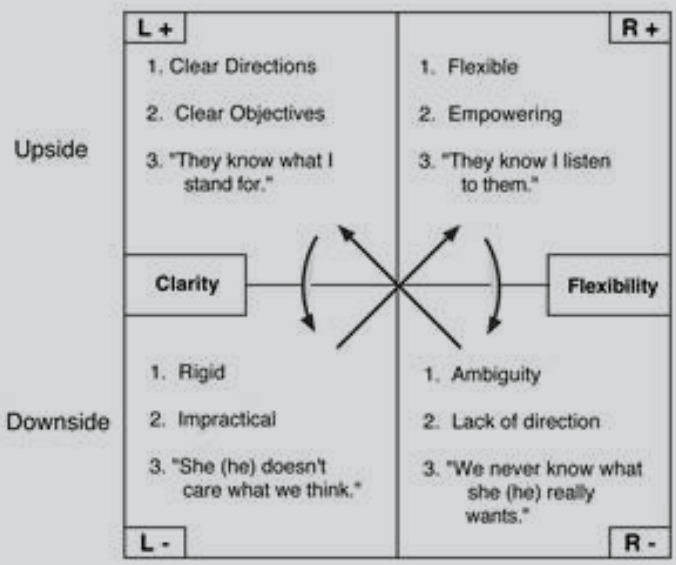
From **Polarity Management: Identifying and Managing Unsolvable Problems**, Barry Johnson

When confronted with a situation or dilemma where there are two seemingly opposite choices that are in fact interdependent, leaders can take a "polarity management" approach to generate possible responses. This approach uses a "polarity map" to represent, understand, and make choices about these situations and dilemmas. After analyzing upsides and downsides, reflect on possibilities for "both-and" approaches that capture more of the upsides and limit more of the downsides of both.



Leadership Style

Clarity vs. Flexibility Polarity



EXERCISE I – TECH DEVELOPMENT & TECH STEWARDSHIP cont.

In the exercise participants completed a polarity grid for the issue of tech development versus tech stewardship. A summary grid that encapsulates all the small groups is shown below.

Upside or Benefits

L+

- Speed and efficiency.
- Generates optimism, energy, and positive attitude.
- Encourages innovation.
- Allows exploration of the limits of our curiosity and creativity, pushing the envelope.
- This approach has solved many problems in the past and has enhanced quality of life.
- Engineering's skill in tech development positions us well to help society; we have a responsibility to do so.
- Urgent global problems that demand tech development.
- Lays the foundation for answering further questions, including "should we do it?"

R+

- Encourages long-term thinking and can result in more long-term approaches.
- Results in an expanded lists of viable options beyond the first option.
- Provides guardrails to unbridled enthusiasm and innovation.
- Creates a generative pause.
- Opportunity for exposing underlying values, biases, and assumptions.
- Moves us beyond only financial considerations to looking at broader societal and environmental impact.
- Produces a more inclusive approach to identifying stakeholders.
- Encourages broader view of ethical issues and exposes ethical dilemmas.

Downside or Costs

L-

- Potential for harmful unanticipated consequences. Failure to understand the pieces of the puzzle let alone how the pieces interact.
- Rapid decisions can lead to reckless decisions.
- Avoidance of asking "Should we do it" and resulting blindness to broader implications.
- Ethical considerations often ignored when pushing the boundaries.
- Potential to overlook consequences for important stakeholders.
- Limits the possibility space- if we jump to doing the first thing rather than exploring the larger possibility space.
- Fear of learning things we may not want to know.
- Risk that we cannot undo things that will be part of society for a long time.
- Risk of unanticipated costs for repairing damages.

R-

- Analysis paralysis. Progress is slow or nothing gets done.
- May lose sight of the original need to be addressed.
- Excessive time spent on process and not enough on solutions and outcomes.
- Loss of energy and commitment.
- Excess fear of unintended consequences that can be paralyzing.
- Limits to the possibilities of technological advances.
- Higher initial costs.
- Favors maintaining the status quo.

EXERCISE I – TECH DEVELOPMENT & TECH STEWARDSHIP cont.

After completing the grid, small groups explored their results, looking for the virtues of both "Can we do it?" and "Should we do it?" Key takeaways from these discussions are summarized below.

- "Both/and" thinking brings balance to some dilemmas, such as in the current supply/demand crunch.
- "Both/and" thinking should be applied in universities to the conflict of research priorities versus teaching priorities.
- Benefits can be context specific, e.g., academic versus private sector consulting.
- The engineering design process needs more "Should we do it?" reflection and thinking.
- The constraints of time and budget are currently limiting our ability to engage with these considerations. We need to transform our work to embed this thinking as a standard process. Can we engage clients in this transformation?
- "Both/and" thinking requires strong communication skills from leaders and an openness to different cultural contexts.
- Balancing "Can we do it?" and "Should we do it?" thinking leads to better solutions, results in greater stakeholder buy-in, and expands the professional identity of engineers. Finding the time and space for this adds value to the work of the engineering community.
- Technology is important for much of our work, but we do not emphasize "Should we do it?" work.
- We need to recognize that in complex systems, we cannot predict every possible outcome, and, at some point, it is OK to make a decision and move forward. But there should always be a commitment to learning and adapting.
- Engineers have a predisposition to "Can we do it?" We need to intentionally seek out and make room for the "Should we do it?" voices.
- Caution is needed regarding the "nice thought, but let's move on…" tendency.
- "Should we do it?" thinking encourages collaboration and integration with other disciplines, including those from outside engineering.
- There is a need for systems thinking in engineering. We are not comfortable with moving outside our normal box.
- Engineering education needs a greater emphasis on stewardship. New academics tend toward a get-it-done perspective.
- Much of what we do is economically driven. This can drive a short-term "Can we do it?" mindset.

ADVANCE UNDERSTANDING

We continuously deepen our understanding of our relationship with technology and challenge dangerously limiting narratives and stereotypes.

"Balancing "Can we do it?" and "Should we do it?" thinking leads to better solutions, results in stakeholder buy-in, and expands the professional identity of engineers. Finding the time and space for this reflective thinking adds value to the work of the engineering community."

EXERCISE II – VALUES & VALUE TENSIONS

The second group exercise of the summit focused on the Core Commitment, Deliberate Values. This commitment is centered on the concept that technology is not value neutral. In fact, our values shape technology, and our values are shaped by technology. The exercise invited participants to reflect on their personal value leanings and their opposites. A typical set of value tensions related to the development and stewardship of technology developed through the work of ECL-Canada was utilized (see exhibit).

Which way do you personally tend to lean?

VALUE 1	Strong Leaning	Moderate Leaning	Moderate Leaning	Strong Leaning	VALUE 2
Providing Focused Value					Ensuring Broad Benefits
Focusing on the Immediate					Focusing on the Long Term
Problem Solving					Critical Reflection
Seizing Opportunities					Minimizing Risks
Blazing A Trail					Patiently Partnering
Deep Expertise					Broad Perspectives
Best Practices					New Approaches
Leveraging Resources					Building Capacity
Efficient Systems					Adaptable Systems

KEY TAKEAWAYS ARE SUMMARIZED BELOW

- Different industries have different values (government, regulators, consultants).
- In general, engineering leans toward efficiency, best practices from the past, and the safe solution. In the private sector this is driven by the need to be profitable.
- Certain industries may push us toward a certain set of values.
- Diversity of value perspectives can be critical to positive outcomes.
- Problem Solving and Critical Reflection can go hand-in-hand; hard to distinguish between the two.
- Our current role can drive alignment with certain values, e.g., in a management role, there is a need to focus on patiently partnering and considering how adaptable an organization is.
- Values are personal but are impacted by profession / industry.
- Some forms of work require both sides of a value tension.
- Tensions within a project team can help to provide necessary balance and creative energy.
- Academia sees a shift in demographics that requires adaptability. Teaching and holding these tensions is important to learning.
- Infrastructure segment is dominated by forces that limit long-term thinking with excess focus on short-term results, despite long lifetimes of most infrastructure assets.
- Values can evolve over time with learning and experience.
- There is a need for balance between problem solving and critical reflection.
- ECL attracts those with long-term focus.
- The engineering community needs to increase its self-awareness related to values and develop a sense of perspicacity – noticing and clearly seeing the values that are in play.
- We must ensure that those who possess non-mainstream values do not leave engineering. Their voices and values will enrich and enliven our work.

EXERCISE II – VALUES & VALUE TENSIONS cont.

PERSONAL STORIES OF VALUE TENSIONS

I learned late in my career as a practicing engineer to focus more on the long term. I had a chance to be part of a program management team dealing with a large infrastructure project. I was leading the inclusion of sustainable design in all elements of the program. Teams were really focused on economic elements - which was limiting the long-term thinking. Shifting mindsets was not easy.

In my leadership role in my firm, I always tried to bring in long-term thinking. What I did not realize was that the long-term thinking is far from the day-to-day concerns of most staff, so you need to create relevance.

I am not an engineer, but I am someone who looks at engineering projects and sees the pattern of focusing on economic factors and tight timelines. And then we talk about "unintended consequences" – things that were inevitable were not considered, e.g., the Manhattan project.

Philosophically my value is the long term. Practically my value is on getting things done. Societally we know it's important to think long term, but then things happen. Think about plastics - took us a long time to figure it out. Needed to be in our face before we did something. We accepted false solutions - like "we'll just recycle."

I see avoiding legal risks as limiting possibility. Risk averse options are safe, but they may not be the most innovative or long range. The tendency to be risk averse is a big driver.

In my career, I have found that clients often respond to new approaches to solving old problems in very positive ways. Especially in areas where we can leverage technology in ways that deliver high value vs investment, we help to uphold the values of the mission/organization as well as employ best practices, but then do so in ways that are also advanced and innovative enough to often maximize the power and utilization of resources that often are falling into scarcity.

DELIBERATE VALUES

We seek to understand how our values are shaping and being shaped by the technologies we build to scale.

- "The engineering community needs to increase its self-awareness related to values and develop a sense of perspicacity – noticing and clearly seeing the values that are in play."
- "We must ensure that those who possess non-mainstream values do not leave engineering. Their voices and values will enrich and enliven our work."

Provocations

Provocateurs Janna Rosales, Professor at Memorial University of Newfoundland, and Micheal Mooney, Executive Director of Creative Labs North and President-Elect of the Ontario Association of Certified Technologists and Technicians, informed the summit discussions with reflections on the incorporation of TS into their segments of the Engineering Community. Janna described her experiences in teaching TS, through the integration of TS into her Engineering Professionalism courses and through the application of TS in students' capstone projects. Micheal outlined his goal to incorporate TS into regulation and licensure.

TEACHING TECHNOLOGICAL STEWARDSHIP

JANNA ROSALES
PROFESSOR AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND

BIO: Janna Rosales teaches ethics and professionalism in the Faculty of Engineering and Applied Science at Memorial University of Newfoundland. A committed educator, she received the President's Award for Outstanding Teaching (Lecturers and Instructional Staff) for 2020, the Dean's Award for Teaching Excellence in 2021, and held the Chair for Teaching and Learning for the Faculty of Engineering from 2015-2017. She is a member of the (Canadian) Engineering Change Lab's Strategy Team and an active contributor to the Tech Stewardship Practice Program.

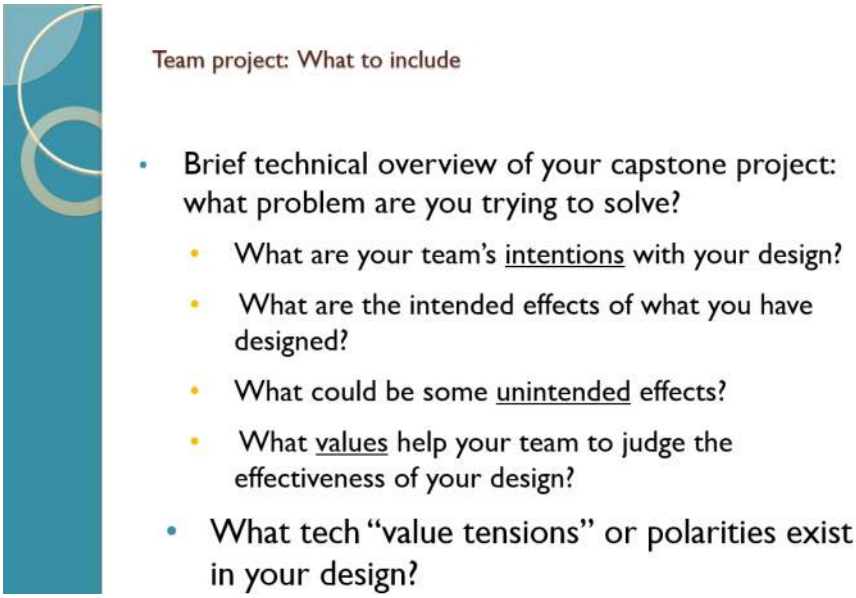
Janna Rosales described how TS dovetails with the other aspects of her teaching. She views the TS program as an important overlay to a student co-op / internship. She has incorporated the TS Practice Program into her Engineering Professionalism course (see exhibit).

Learning Outcomes for ENGI 8152 "Engineering Professionalism II":

- Identify the range of skills, or attributes, required to become a competent professional engineer.
- Apply the concepts of professional ethics, accountability and equity.
- Analyze the social and environmental aspects of engineering activities. (Where possible, students will use their Senior Design Projects as case studies).
- Demonstrate an understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
- Work effectively as a team member and leader.
- Reflect on the relationship between technology and society.

TEACHING TECHNOLOGICAL STEWARDSHIP cont.

She is also working to incorporate TS into students' Senior Design capstone project. She challenges students to use TS as a framework for deeper thinking about their projects. They focus on the intended and unintended impacts of the projects and the value tensions that should be considered in their design decisions (see exhibit). The students develop three polarity maps for TS behaviors applicable to their projects, considering the challenges and opportunities that arise as they navigate these polarities. Students are evaluated on the depth of their analyses.



The outcomes that Janna has noticed include:

- While some students viewed TS as a checklist, others did deeper analyses.
- Several teams adopted "I'm a Tech Steward" language.
- Students utilized TS principles in evaluating the work of other teams.
- Students learn to equate TS to integrity, broadening their view of the meaning of professional integrity.
- Role models from the TSPP were important in instilling this sense of integrity and professionalism.
- Exposure to TS has created more willingness for students to speak up in their internships.
- TS has helped students clarify the relationship of their own values to their work.
- Increased awareness of TS issues in society.
- Realization that engineering is a caring profession and a calling to serve people.

Janna stated that her main conclusion from the inclusion of TS has been recognition of the importance of value polarities and a both/and approach. TS has created awareness in students of the importance of reflecting on their work rather than just accepting their assignments. She indicated that her university is now considering a TS spine for the entire curriculum rather than just in one or two courses. She believes that students need to hear the TS message as early as possible and have it repeated often throughout their program. Teaching TS provides a valuable alternative framework to what it means to be an engineer.

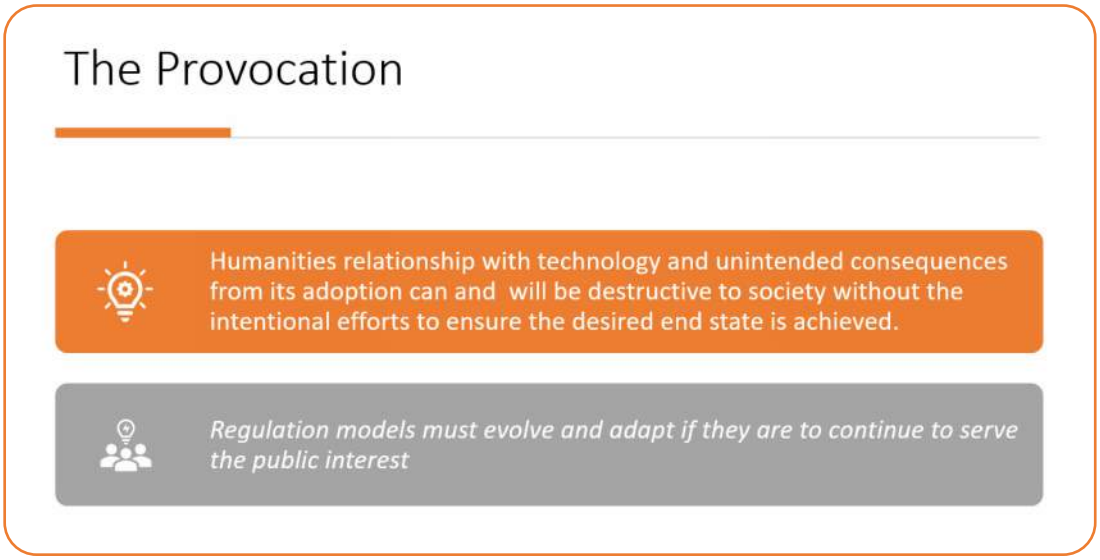
Provocations

TECH STEWARDSHIP IN REGULATION & PRACTICE

MICHEAL MOONEY
EXECUTIVE DIRECTOR, CREATIVE LAB NORTH, PRESIDENT-ELECT, ONTARIO ASSOCIATION OF CERTIFIED ENGINEERING TECHNICIANS & TECHNOLOGISTS

BIO: Micheal is a Certified Engineering Technologist, (ON), and Applied Science Technologist, (BC), with 20 years' experience in technology and engineering sector, driving collaboration and innovation within highly complex and heavily regulated environments. Currently, active as the Executive Director of Creative Lab North, and President-Elect of OACETT. Micheal is a dedicated advocate for diversity, inclusion and human rights in both physical and digital realms, with a focus on the role technology can play in bridging the growing equity gaps and promoting economic development.

Micheal Mooney described his application of TS in his dual roles in private practice and as the President-Elect of the Ontario Association of Certified Engineering Technicians and Technologists (OACETT). Micheal began by describing his view of our current technological imperative, "the concept that new technologies are inevitable, essential and that they must be developed and accepted for the good of society." Micheal believes this concept must be challenged. He stated his belief that our relationship with the unintended consequences of technology will be destructive to society without intentional efforts to ensure a positive end state. This challenge implies that regulation models must evolve and adapt to continue to serve the public interest. In Micheal's view, status quo = failure. TS can enable keeping pace with rapid change through development of a set of tools and resources to be able to address challenges that have not been encountered before.

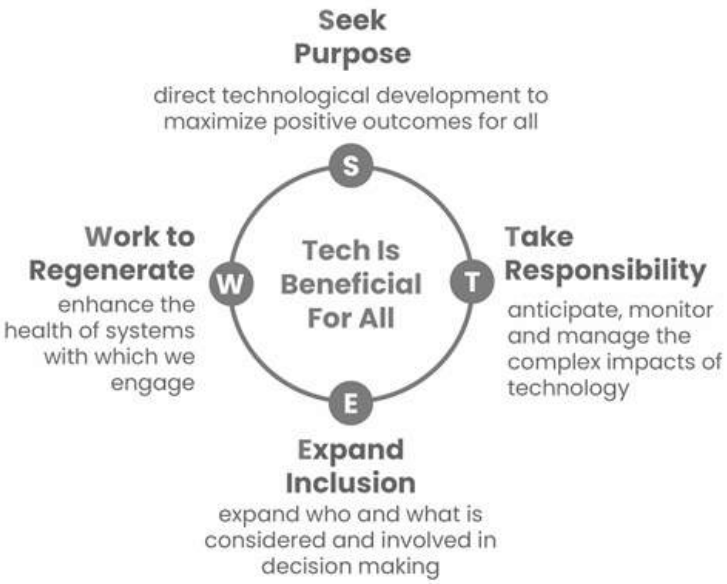


Micheal described what is currently happening in Canada with respect to engaging with the engineering community to update and evolve regulation and licensing. OACETT is a pilot for development of TS principles and practice as a mandatory element of licensing and certification. Work is also underway to add DEI thinking and social problem-solving in the training of engineers and to changing the narrative with respect to technology and the role it plays in influencing socio-economic conditions. As an example of what is resulting from new approaches to training and regulation, Micheal cited an uptick in a TS approach to coding and software development, e.g., treatment processes.

EXERCISE III – TECH STEWARDSHIP PRACTICE BEHAVIORS

In the third exercise of the summit, participants reflected on the behaviors that contribute to tech stewardship using the master set of four principle tech stewardship behaviors developed by ECL-Canada.

Participants were asked which of the four tech stewardship behaviors resonated most closely with their work, to think of examples from their work, and to reflect on the lessons learned from these stories. Participants were also asked to consider the dominant behaviors in their segment of the engineering community.



KEY TAKEAWAYS ARE SUMMARIZED BELOW

- For tech to benefit all, it must be used responsibly, in an inclusive way. Procurement models limit this.
- Inclusion is key, which is distinct from diversity.
- Change is difficult when there are well-developed counter-positions coming from outside of an engineering team.
- There is a bias toward purpose behaviors, but all four behaviors must be considered.
- Going from nothing to something in TS is a big leap. Supporting the process should be emphasized through the provision of more resources. Do not let perfect be the enemy of good.
- All behaviors work together and reinforce the others.
- Engineering lacks focus on regenerative work in all fields. This is a concern, as the health of the entire system is at stake. This behavior needs to be built in.
- Creating a space for tech stewardship questioning is critical.
- There is a lack of "taking responsibility" behavior in the consulting engineering field.
- Balance of all four behaviors is needed.
- We are making progress. These conversations around TS are becoming more common.
- Goal of TS is ensuring that spaces / pauses for consideration of value tensions and reflective practice is commonplace.

Practice Behaviors

We support each other to practice the daily behaviors that enable progress in all its forms.

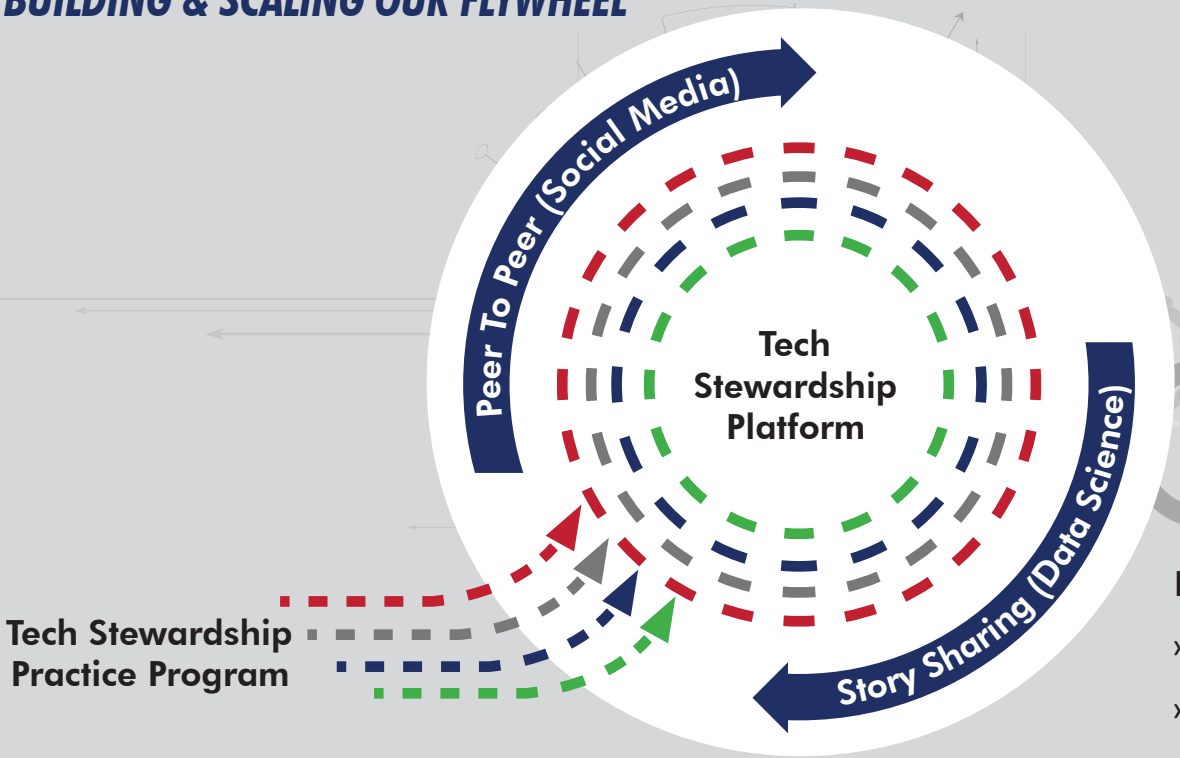
"The goal of TS is ensuring that spaces / pauses for consideration of value tensions and reflective practice is commonplace."

LOOKING AHEAD – THE FUTURE OF THE TECH STEWARDSHIP INITIATIVE

Wrapping up the summit, Mark Abbott outlined ECL-Canada's plans for the future of the TS initiative. He offered a reminder that today's problems are the result of yesterday's practices, and that policy will never keep up with new tech. This means we must intervene with those developing technologies.

ECL-Canada's goals are to build and scale through creating learning loops built on story sharing within communities. They seek to bring together "Can we do it?" and "Should we do it?" professions. They are hoping to move from students to faculties, entire schools, post-secondary education, companies, and pools of consultants and reach a tipping point of 25% of the Canadian engineering community practicing TS.

BUILDING & SCALING OUR FLYWHEEL



Tech Stewardship Practice Program

Learning Loop

- Communities
- Individuals
- Stories

EXPLORING TECH STEWARDSHIP APPLICATIONS WITHIN THE U.S. ENGINEERING COMMUNITY

In the final group exercise of the summit, participants explored TS applications within the U.S. engineering community – in practice, in academia and K-12, within societies and associations, and within regulatory authorities. Key takeaways are summarized below.

ENGINEERING PRACTICE

- Incorporate TS practices and evaluation of values into hiring practices.
- Could firms adopt the TS Practice Program? Could interns play a role?
- It would be worthwhile to find a way of tying societal good to implementation of TS strategy within a firm.
- Consider TS as a service offered to clients.
- Foster understanding of B-corporations and their correlation with TS.
- Incorporate TS into leadership development programs.
- Advocacy for TS consideration in procurement.
- Build TS into project management processes.
- Be open to flexibility in application of TS.

ACADEMIA & K-12

- Embed TS into curriculum as early as possible.
- Incorporate into multiple courses, not just a single class.
- Changing curriculum is not easy; we should not rely too heavily on academia in teaching TS.
- Introduce TS to ASEE Ethics Division.

SOCIETIES AND ASSOCIATIONS

- Help spread the word on TS through educational programs.
- Associations have influence on ABET.
- Incorporate TS into leadership development programs.
- Advocacy for TS consideration in procurement.
- Train entire association leadership team in TS.
- Utilize associations to develop TS standards that could be used as standards.

REGULATION

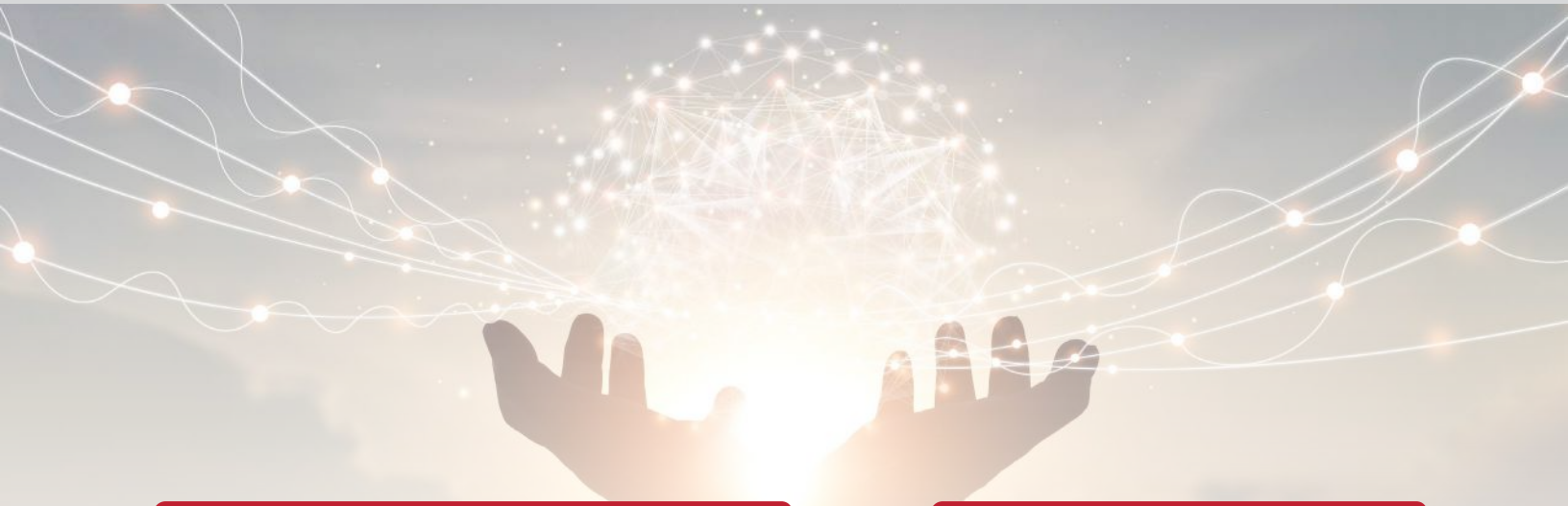
- TS could be part of the ethics component of licensure. How to achieve this is not clear.
- Consider micro-credentialing / certification in TS. The TSPP offers a micro-credential to participants completing the program.
- Regulation may not be the best way to drive change.
- Ensure that TS is an option for continuing education requirements.
- Consider certification in TS as a component of experience requirements.
- Use a carrot/incentive approach as the most effective way to encourage adoption of TS.




EXPLORING TECH STEWARDSHIP APPLICATIONS WITHIN THE U.S. ENGINEERING COMMUNITY

In his closing comments Mark Abbott emphasized that TS has been built, over the past eight years, by a community. He invited all participants to help in growing that community through their own organizations. TS offers a path forward to stay "ahead of the curve" in bending the arc of technological development toward good for society.

> *Engineering Change Lab Canada is currently getting ready to launch the Fall 2022 student and professional runnings of the Tech Stewardship Practice Program. For the fall, they are looking for opportunities to offer the program and collaborate outside of Canada. If you are interested in bringing TSPP to your company or school, please reach out to Mark Abbott directly (markabbott@engineeringchangelab.ca).*



Complete provocateur presentations are available at the link below.

Summit 15 Provocateur Presentations

Click to view

A full recording of the summit is available at this link.

Summit 15 Recording

Click to watch