ENGINEERING
CHANGE
LAB

Engineering Change Lab Workshop #14 Harvest

Engineering Ethics in a world of rapid technological change

+

Silicon Valley Learning Journeys

The first joint workshop held by
Engineering Change Lab Canada &
Engineering Change Lab USA

Lawrence Hall of Science
X - the Moonshot Factory
Stanford Technology Ventures
Program

July 15-16, 2019
Berkeley City Club • Berkeley, California

July 16-17, 2019
San Francisco Bay Area

EVENT GOALS

- Stretch participants understanding of Technological Stewardship
- Engage with members of the engineering community in the San Fransisco Bay Area who are thinking about, and actively engaged in shaping the emerging future of engineering and technology.
- Introduce the ECL-Canada and ECL-USA communities in order to build connections and learn from one and other.

JOINT WORKSHOP LOCATION

The Joint workshop was held in the historic Berkeley City Club, built in 1929 by famous architect Julia Morgan. As part of the agenda, a representative from the Berkeley City Club Conservancy gave a talk on the history of the building and on Julia Morgan - a pioneering architect and trail blazer who in addition to her many famous building projects also blew through many glass ceilings.

PARTICIPANTING ORGANIZATIONS

CANADIAN CONTINGENT - Joint workshop + Learning Journeys

Actua • Allenvision Consulting • Career Cycles • Canadian Engineering Education Challenge • Canadian Federation of Engineering Students • Colleen M Shannon Professional Corporation • Concordia University - Gina Cody School of Engineering and Computer Science • Engineers Canada • Ontario Tech University • Professional Engineers Ontario • Social Currents • Stratos • Suncor Energy • Thin Air Labs • The McConnell Family Foundation • University of British Columbia - Faculty of Applied Science • York University - Lassonde School of Engineering

US CONTINGENT - Joint workshop

ACEC• AIA • Arcadis • ASCE • ASME • Black & Veatch • Degenkolb Engineers • Deltek • Foster Growth • Gannett Fleming • Harris & Associates • IEEE • Jacobs • KL&A • Kyle V. Davy Consulting • Lamp Rynearson • Lemelson Foundation • MSA Professional Services • National Academy of Engineering • Nevada State Board of Professional Engineers & Land Surveyors • NSPE • Pennoni • Pinyon Environmental • PK Electrical • Purdue University • Regional Transportation District (Denver) • Southern California Edison • Stanford University • Stolfus & Associates • Taylor Design • Texas Society of Professional Engineers • University of Nebraska • Walter P. Moore

Joint Workshop Day 1
Engineering Ethics In A World Of Rapid Technological Change

Provocateur #1
Rosalyn Berne
Center for Engineering Ethics and Society, National Academy of Engineers

Micro vs. Macro Ethics. Rapid change means the engineering community must develop the capacity to engage in "macro-ethical" decision-making -- "engaging others to define crucial choices related to technological society and how to confront them."

Provocateur #2
Arthur Schwartz
Deputy Executive Director & General Counsel, National Society of Professional Engineers

Case study of Robert Moses' vs. Jane Jacobs' visions for cities. Moses addressed infrastructure through only a technical lens. Jacobs led the opposition to Moses' projects viewing cities as complex, social, living systems.

Provocateur #3
Greg Hart
Partner, Thin Air Labs

"Will 21st Century urban development using Smart Cities technologies follow a similar path to the way 20th Century cities were shaped by the automobile?" Concept of "doughnut economics," recognizing both ecological ceilings and social foundations of well-being.

IEEE
Advancing Technology for Humanity

Exemplar Spotlight
Lloyd Green, Institute of Electrical and Electronics Engineers
New release of *Ethically Aligned Design A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems* is an innovative and comprehensive approach to the ethics of engineering practice. Download the publication at ethicsinaction.ieee.org.

Day 1 Key takeaways

- Macro-ethical decision-making requires engineers to develop skills in facilitating systems thinking – adopting a holistic viewpoint and recognizing context and complexity.
- Engineers need to develop reflective thinking skills – pausing to consider the bigger picture, thinking long term, and recognizing unintended consequences.
- Engineers need to be aware of the limitations of "technology goggles," focusing solely on technical solutions.
- Macro-ethical decision-making requires engineers to be engaged earlier and more collaboratively in project selection / problem formulation.

- Macro-ethical issues and dilemmas require multi-disciplinary approaches and creative collaborations that recognize human impacts as well as technological solutions.
- More involvement of the public and all impacted stakeholders is needed in macro-ethical decision making.
- Communities need to take a proactive approach to defining their future, and engineers need to be at the table.
- The engineering education system needs to address the need for non-technical skills.

Joint Workshop Day 2
Entrepreneurship & Engineering

Provocateurs #1
Tom Byers, Professor, Department of Management Science & Engineering, Stanford University
&
Ikhlaq Sidhu, Faculty Director & Chief Scientist, Sutardja Centre for Entrepreneurship & Technology, University of California-Berkeley

Educational perspective on entrepreneurship: "Students are begging us to use the entrepreneurship course to bring ethics to life."

Provocateur #2
Alissa Fitzgerald, Founder, A.M. Fitzgerald & Associates

Several key factors in engineering entrepreneurship are changing. Social acceptance of non-traditional career paths. Free access to a world of information and resources (Google, etc.). Networking tools making the world a smaller place. New funding mechanisms. "We have a collegial organization. We explore decisions together. For example, we decided together to turn down a lucrative e-cigarettes contract."

Provocateur #3
Tim Draimin, Senior Advisor
The JW McConnell Family Foundation

"Innovation has a direction as well as a rate." The rise of purpose: seeing shifts from entrepreneurship to social entrepreneurship; from profit-centered business to social impact-centered business and creating an inclusive economy; from traditional purposes to "higher / noble purposes;" from stockholders to multiple stakeholders; from innovation to mission-oriented innovation.

For detailed notes on the day, see the Summit 6 reports on the ECL-USA website at www.ecl-usa.org

Day 2 Key takeaways

- Surprising how quickly the conversation about entrepreneurship surfaced ethical aspects and imperatives.
- Entrepreneurship represents a major opportunity and path for engineers in society, a return to the role of engineers in the 19th Century.
- "Engineer Entrepreneurs" can offer value beyond traditional economically oriented engineers because of their professional mindsets, value systems, and ethics.
- Entrepreneurship is traditionally focused on the power of the individual, but we also need entrepreneurial engineering organizations and collaborations.
- The trend of engineering schools teaching entrepreneurship and adding robust ethics components is positive for the future.
- Recognizing the contributions of "engineer entrepreneurs" will help in attracting young people with entrepreneurial potential to engineering.
- How is public sector entrepreneurship rewarded? Engineers are good at designing incremental improvements, but are they good at creating and inventing new technologies? How could that capacity be nurtured?
- There are significant gaps in engineering licensure by engineer entrepreneurs. How can our licensure model adapt to accommodate engineering entrepreneurs?
- Opportunities exist in the linkage of engineering, entrepreneurship, and purpose (linking concepts of macro-ethical decision-making and technological stewardship).
- There is a strong need to incorporate robust macro-ethical development as part of growing the next generation of engineer entrepreneurs.

Learning Journeys:

Learning Journeys are loosely structured; the goals are to have open and honest conversations, to hear the perspectives and experiences of others, and to learn what challenges and opportunities they see. The primary difference between a field trip or site visit and a Learning Journey is the quality of conversations between hosts and visitors as well as between the visitors themselves. A Learning Journey provides a chance to engage in disciplined observation, and explore and challenge your own assumptions.
Three practices provide the foundation for these learnings:

Suspending judgment—allowing yourself to be open to hearing and seeing perspectives and ideas that are different from your own.

Reflecting—allowing yourself to slow down and quiet your own thinking to be open to others' and your own deeper thoughts.

Debriefing—sharing your thinking with the others in the group so that a larger picture can be co-created through the varied perspectives that you each bring.

July 16 - opening the Learning Journeys together
Lawrence Hall of Science
Informal STEM learning experiences as a way of fostering interest and engagement. Meeting learners where they are through engaging workshops and outreach programs. STEM for social good through design challenges. Digital engineering internships for 21st century learning

July 17 morning
X: The Moonshot Factory
Introduction to the moonshot factory. Three criteria for a moonshot project: 1) Positively affect the lives of millions or billions of people; 2) Opportunity for a new technology application; 3) Possibility for billion dollar business. To provide a taste of what it's like to develop ideas at X, participants played a new game that they are piloting. Each person is dealt a few cards highlighting a challenge and emerging technology to stimulate a new venture idea. Everyone shares their ideas and then their group picks one idea to develop. After some time developing the idea, each group had a chance to pitch their idea to the remaining groups, who gave feedback.

July 17 afternoon
Stanford University Department of Management Science & Engineering
Infusing ethics across the curriculum is one of the President of Stanford's top priorities. Experienced part of a new course based on case studies to help engineers be in touch with their and their companies principles and values. Will set students up to make better decisions when tough decisions are presented. Better debate and discussion around a set of guiding principles. There will still be conflict, but will help engineers to navigate better.

Closing

Canadian participant reflections

Contrasting "Engineering Ethics" with "Technological Stewardship": Technological puts focus on outcome instead of process (Engineering). Connects us to the wealth of social science thinking/resources. However, need to reclaim the popular usage of the word

Stewardship can put a focus on macro + proactive, while Ethics tends to be currently heard as micro and low-bar. Interesting that we are reclaiming one word (Technological) and not seeking to reclaim the other (Ethics).

I feel privileged to be part of this group... We need to establish a higher responsibility for involvement. How can we truly become co-creators of a better future?

I see this group as taking a leading role in beginning to grapple with the challenge of addressing macro in addition to micro ethics.

Law is an example of a profession that grounds itself in philosophy, but effectively moves to applied ethics.

Quoting our host from X: "We need to fall in love with the problem, not our solutions."

What is the difference between Technological Stewardship and Engineering Ethics? Need to be clear about the underlying intent and strategic choices we're making in our language.

ECL-Can / ECL-USA Reflections - different context, starting points, and stages. ECL-USA has more senior industry, but less overall diversity. Their current stage similar in many ways to what ECL-Can now calls our "Explore" phase. To what extent are we on similar paths?

The parallels between Technological Stewardship and the environmental movement are useful - this is long term change!

My glass is more than half full. I'm heartened by the ethics threads we see emerging. There is a rising tide. The ECL doesn't have to start the work - we just need to support and connect it.

I loved the moonshot approach and think some aspects of it could be really useful in our ECL work" (i.e. 10x thinking)

Future (Smart) Cities - should the ECL continue to focus on this topic as a means of connecting the engineering community into bigger conversations in a new way (i.e. bringing a Technological Stewardship lens)?

Felt like I was at the centre of a new religion. There are pros and cons with any new system of belief... What are the default Silicon Valley values that are being embedded?

Thanks to all participants and contributors for making the
Engineering Ethics in a world of rapid technological change workshop
& **the Silicon Valley Learning Journeys** a
success -- and for helping advance technological stewardship!

If you or your organization is interested in participating
in a future workshop, please contact us.

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