

EVIDENCE BRIEF

The **Social Sciences and Humanities Research Council** in collaboration with the **Future Skills Centre**

SSHRC's Imagining Canada's Future initiative mobilizes social sciences and humanities research to address emerging economic, societal and knowledge needs for Canada, and help guide decision-making across all sectors toward a better future. This evidence brief addresses the Future Challenge Area of: **Skills and Work in the Digital Economy**

Ethical tech innovation: Uniting educational initiatives and professional practice

About the project

Despite the increasing attention paid to the impact of technological innovation and the role played by engineers, there remains an inadequate understanding about what is being done to address these implications. Part of the reason for this, in North America at least, is the limited impetus from engineering departments to engage in, let alone document, ethical teaching interventions. This neglect is matched by a general perception in engineering that ethical implications are either tangential or outside its scope. This lack of knowledge poses significant challenges for the entire engineering profession, particularly since it makes it difficult for educators to effectively deliver and assess ethical training. To better understand the scope of ethical training and education in engineering, and how to embed these interventions,

we convened an interdisciplinary group of scholars to achieve the following three specific objectives:

1. conduct a scoping review of existing literature from the past 10 years to identify recent knowledge and gaps on effective approaches to embedding ethics in the tech industry;
2. conduct semistructured interviews with key industry leaders and experts about the need for ethics training in engineering; and
3. disseminate these findings to multiple audiences from academia, industry, professional organizations and the public.

Key findings

Literature review overview

- Our literature review of 337 sources revealed that direct interventions have occurred in over 40 countries, and at least 16 articles describe interventions involving multinational collaborations.
- While the trend in publication numbers appears somewhat flat over the first eight years of study, a marked increase appears in the two most recent years, with almost 60% more publications in 2020 compared to 2018.
- Most published interventions focused exclusively on academia (87%). Of these, 85% focus on students, with 82% of student-focused interventions targeting undergraduates.

Combined analysis: literature + expert interviews

- This project analyzed the literature alongside data from 10 expert interviews (representing both Canadian and international perspectives).
- We first provide an overview of key **barriers** preventing uptake in tech-ethics training, covering both the “intangible” contexts of engineering **identity** and the **terminology** we use to discuss engineering ethics, and the more “concrete” issues related to engineering education **institutions** and their surrounding **infrastructure**.
- We then outline a suite of **priority areas** that can be mobilized to **cultivate buy-in** and **alignment** from across the diverse stakeholders that comprise the engineering community.

Identity and terminology

- A narrow definition of “engineering” presents one of the primary impediments to cultivating buy-in for ethical training in engineering.
- A lack of consistent terminology and definitions about the role of ethical thinking in engineering prevents us from achieving widespread consensus about how these ideas align with engineers’ core work and values.

Institutions and infrastructure

- Accreditation bodies, professional organizations and industry are all powerful forces of influence on the ways in which ethics instruction can be integrated into engineering programs and is perceived as a priority within those systems.
- Current institutional pressures related to funding (for research and for programs), faculty promotion requirements, and timeline expectations often impede or disincentivize efforts to develop robust ethics-focused curriculum initiatives within engineering programs.

Priority areas for cultivating buy-in and alignment

- Engineering should embrace the current reality that technological work benefits from (and often **requires**) input and expertise from a range of disciplinary perspectives.
- To produce large-scale, meaningful and lasting change in the engineering profession that centres the values associated with ethical thinking and responsible innovation, we need to undertake multiple, simultaneous initiatives across academia, industry and even government.
- Ethics education research in engineering needs to develop more robust assessment methods for evaluating the efficacy of current and new pedagogical interventions.

Policy implications

- Governing bodies, professional engineering organizations, industry practitioners and academic institutions should collaborate on new standards and guidelines that prioritize the ethical dimensions and societal/environmental impacts of technology; the resulting legislation will then align with broader cross-sector initiatives to promote a cohesive approach to responsible innovation practices.
- Academia and government alike should develop funding opportunities that specifically promote the development of interdisciplinary ethics training; these types of funding should target both academic research and broader industry/ community initiatives to help foster collaborations that can resolve the current research/practice gap.
- Academic institutions should prioritize creating research and teaching opportunities for faculty to engage with projects related to tech ethics in ways that are rewarded equally to technical work; these initiatives should support the development of robust criteria for teaching, training and assessing engineering programs’ graduate attributes / student outcomes related to ethical awareness.

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FURTHER INFORMATION

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The Future Skills Centre (FSC) is a forward-thinking centre for research and collaboration, dedicated to preparing Canadians for employment success. As a pan-Canadian community, we are collaborating to rigorously identify, test, measure and share innovative approaches to assessing and developing the skills Canadians need to thrive in the days and years ahead.