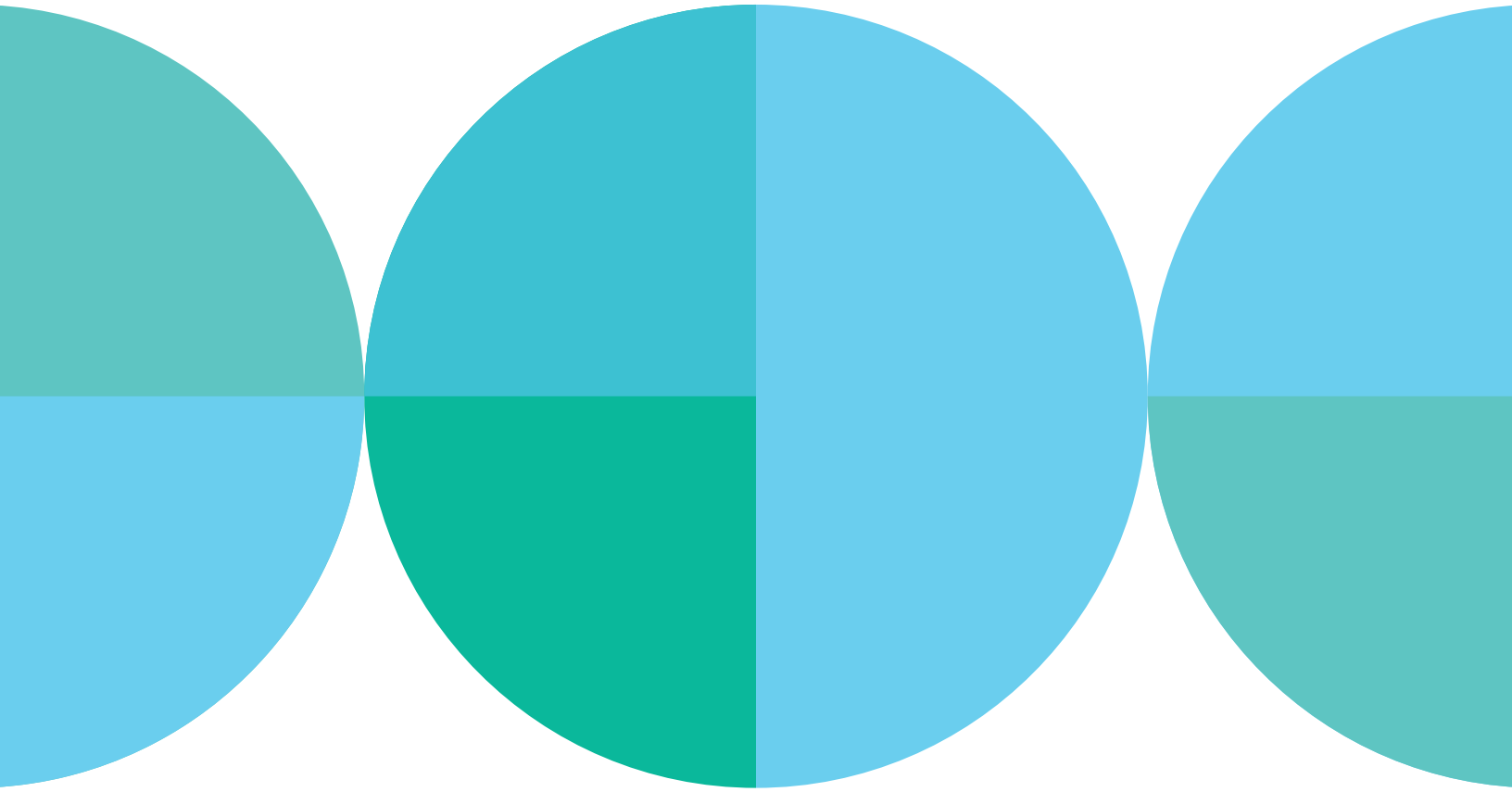
RESPONSIBLE INNOVATION IN CANADA AND BEYOND

Understanding and Improving
the Social Impacts of Technology



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PREFACE

As a not-for-profit, national centre of expertise, ICTC strengthens Canada's digital advantage in a global economy. Through trusted research, practical policy advice, and creative capacity-building programs, ICTC fosters globally competitive Canadian industries enabled by innovative and diverse digital talent. In partnership with a vast network of industry leaders, academic partners, and policy makers from across Canada, ICTC has empowered a robust and inclusive digital economy for over 25 years.

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ABSTRACT

Technology is an omnipresent part of everyday life, as are decisions about the ethical and safe use of technology. When we decide whether to enable location services on a new app, set up two-factor authentication for a new service, or consider taking a carbon-free transportation alternative to our destination, we are working to improve the social impacts of technology. Along with our own decisions as users, a myriad of other stakeholders—including designers, developers, policymakers, and investors—also impact the technologies that they contribute to or regulate. Accordingly, while many small, everyday decisions can improve technologies' social impact, on a broader level, it may seem difficult, overwhelming, or too complex to try to turn the tide of technology's impact on privacy rights, our climate and environment, or human behaviour. Efforts to create "tech for good," regulatory initiatives, public education, ethical investing, and other social and technical tools might all appear to be small, separate efforts, even though they all aim toward the same larger goal.

As such, while there are many highly specific guidelines, calls to action, and standards for improving technologies or practices, the field of ethical technology in Canada lacks a synthesis aimed at all parties, including the general public and the private and public sectors. Considering a vast array of technologies and topics (including artificial intelligence [AI], open data, labour and automation, and climate and environment) this paper identifies individuals and organizations working at the intersection of technology and social outcomes. Drawing from a series of in-depth interviews, it synthesizes shared considerations, challenges, frameworks, and best practices for improving the social impact of technology from a wide variety of perspectives.

Key Words:

TECHNOLOGY
SOCIAL IMPACT
RESPONSIBLE INNOVATION
HUMAN RIGHTS
ARTIFICIAL INTELLIGENCE (AI)
OPEN DATA
ENVIRONMENTAL TECHNOLOGY
AUTOMATION
PRIVACY
CANADA

EXECUTIVE SUMMARY

All of us interact with technology on a daily basis, and, intentionally or unintentionally, make small choices pertaining to technology's ethical and safe use. When we download a new app and decide whether or not to enable location services, set up two-factor authentication on a new service, and consider taking a carbon-free transportation alternative to our destination, we are working to improve the social impacts of technology. Along with our own decisions as users, myriad other stakeholders—including designers, developers, policymakers, and investors—also impact the technologies they contribute to or regulate. Accordingly, while many small, everyday decisions can improve technologies' social impact, on a broader level, it may seem difficult, overwhelming, or too complex to try to turn the tide of technology's impact on privacy rights, our climate and environment, or human behaviour.

While there are many highly specific guidelines, calls to action, and standards for improving particular technologies or practices, the field of ethical technology in Canada lacks a synthesis aimed at all parties, including the general public and the private and public sectors. Considering a vast array of technologies and topics (including artificial intelligence (AI), open data, labour and automation, and climate and environment) this paper identifies individuals and organizations working at the intersection of technology and social outcomes. Drawing from a series of in-depth interviews, it synthesizes shared considerations, challenges, frameworks, and best practices for improving the social impact of technology from a wide variety of perspectives.

Technologies with different applications share common challenges. Emerging technologies with diverse applications may change at a rapid pace, come with unanticipated social challenges, or impact human behaviour in new ways. In addition, new technologies may re-entrench social inequalities or come with inordinate power imbalances. The idea of "ethical technology" or "tech for good" calls for solutions that are inclusive and just, undo inequalities, share positive outcomes, and permit user agency.

Across the world, organizations have proposed common principles for improving the social impact of technology. Several overarching frameworks, widely known (such as the concept of human rights) or domain-specific (such as the European Union's mandate for Responsible Research and Innovation) establish common values and principles for ethical technology. These include:

ANTICIPATION proactively mitigating adverse effects;

INCLUSION AND DIVERSITY at all stages of a technology's lifecycle;

JUSTICE AND FAIRNESS understanding and reversing disproportionate impacts, power imbalances, and systemic effects;

INTERDISCIPLINARITY AND COLLABORATION across many domains;

SELF-AWARENESS OR REFLEXIVITY of one's own position and perspective;

AGENCY AND CHOICE for those using or impacted by a technology.

There are also critiques of these principles, related to incentivization, organizational capacity, and implementation—however, many of these critiques are addressed by specific methods, standards, or other tools designed to bring overarching values down to a pragmatic, operational level.

To design ethical technology, we must extend the innovation lifecycle beyond design, prototyping, and assessment, to include investment, hiring, deployment, and use. Many well-known models for technology development, like Waterfall and Agile, include the stages of design, quality assurance, and deployment; however, a socially contextualized understanding of technology solution design helps ensure ethical practices throughout the entirety of a project's lifecycle. In addition, there are many practical frameworks for each stage of technology development and deployment that make high-level principles like "anticipation" specific and achievable, such as environmental, social, and corporate governance (ESG) investing, ethical hacking, and privacy impact assessments (PIAs).

Improving the social impact of technology means defining stakeholder tasks clearly and achievably, mitigating the issue of *diffusion of responsibility.* In the ethical technology field, there is a risk of either over-implicating innovators, designers, and engineers (creating an overwhelming burden) or sharing responsibility diffusely, with the potential for investors, users, innovators, policymakers, and others able to shift blame for negative outcomes to other parties. Clear, achievable strategies are required to improve the impact of technologies, with each stakeholder feeling capable and confident in doing what they can.

Turning responsibility into action can take many forms:

AGENDA-SETTING: DIRECT ACTION, ACTIVISM, AND COMMUNITY ORGANIZING
The ethical technology field has a significant and growing history of engagement from activists and implicated communities, including cyberactivism, consumer activism, lobbying, technology collectives, and ethical tech-focused hackathons.

PUBLIC ENGAGEMENT
Market researchers, regulators, designers, and other parties may use engagement or consultation to design and assess a product, implement a product respectfully, disseminate information about safe and ethical use, and beyond. Best practices include early/upstream engagement, establishing clear goals, including diverse and underrepresented voices, careful facilitation method selection, iteration, and a willingness to change a project based on feedback.

POLICY AND REGULATION

Regulation can be government led or market led, and includes indirect and direct measures to improve technology's social impacts. While market-led responses can be beneficial and useful, there is some danger of "ethics-washing" (a charge primarily aimed at marketing). Private-led regulation may also be driven by private interests or motives—in these contexts, decisive, clear, and enforceable government-led regulation is key. Importantly, for matters that exist in the public domain, such as issues related to privacy or human rights, the appropriate venue for policy and oversight response is the civil sector (the government, in consultation with individuals).

EDUCATION AND TRAINING

Proactive education and training for the public (e.g., for cyber hygiene), students (e.g., ethics in engineering), industry (e.g., inclusion and diversity training), and government (e.g., familiarity with automated decision-making) are all key components of improving the social impact of technology. In addition, research organizations are playing an increasing role in this space, with some conferences, journals, and grants attaching social impact statements to admissions or funding.

TECHNOLOGY SOLUTIONS FOR GOOD

Many technology solutions are designed to improve the impacts of other technology solutions—for example, privacy-enhancing technologies (PETs), open source tools, or carbon sequestering technologies all seek to solve existing problems and uphold the common principles listed earlier, including consumer agency and choice.

The unprecedented impact of the COVID-19 pandemic has heightened Canada's awareness of technology-related challenges, along with the importance of creating a robust, resilient, and just system for technology that is a social good for all. While the field of ethical technology is vast and complex, interviewees in this study identified numerous practical strategies for improving social impacts.

PART I
INTRODUCTION AND CONTEXT

INTRODUCTION

In 2020, the world moved online to slow the spread of COVID-19, the European Union began to challenge the efficacy of other nations' privacy legislation,[1] the United States held anti-trust hearings in relation to big tech,[2] and Canada developed a privacy-focused, national coronavirus contact tracing app, opting for a Bluetooth solution rather than a GPS-based tracker.[3] Simultaneously, significant challenges exist in the field of technology. The pervasive threat of climate change, spurred on in part by increased development and digital carbon footprints, is accompanied by concerns about labour displacement, privacy and security, and power imbalances in the application of new technologies like facial recognition.

Amid these challenges, members of the public are increasingly familiar with the idea that technology may come with positive or negative social and environmental impacts. Improving these impacts, however, may seem too large, complex, or impersonal to take on. In preparation for this paper, the Information and Communications Technology Council (ICTC) spoke with a collection of practitioners working to improve the social impacts of technology in different ways.[4] Their shared experiences are distilled here into a set of actionable best practices for a wide variety of stakeholders, to help all parties understand and move toward a better future for technology and humanity.

Part I of this paper introduces the urgency of considering technology's social impact. Borrowing from interviewees' comments on why they've chosen to work in the ethical technology field, this section of the study lists key reasons for stepping up to improve technologies.

Part II outlines several high-level, over-arching frameworks that set out the shared principles of ethical technology. Just as the concept of human rights helps us to name shared values and standards of living, so too does it and other frameworks help us understand what ethical technology is and how to achieve it.

Part I

REASONS FOR IMPROVEMENT

RAPID TECHNOLOGICAL CHANGE
UNINTENDED ADVERSE CONSEQUENCES
CONSEQUENCES FOR BEHAVIOUR AND WELLNESS
POWER IMBALANCES AND INEQUALITIES
RENT-SEEKING SOLUTIONS
UNILATERAL DECISION-MAKING

Part II

COMMON PRINCIPLES

ANTICIPATION
INCLUSION AND DIVERSITY
INTERDISCIPLINARITY AND COLLABORATION
JUSTICE AND FAIRNESS
SELF AWARENESS AND REFLEXIVITY
AGENCY AND CHOICE

[1] *Joshua Meltzer, "The Court of Justice of the European Union in Schrems II: The impact of GDPR on data flows and national security," Brookings, August 5, 2020, https://www.brookings.edu/research/the-court-of-justice-of-the-european-union-in-schrems-ii-the-impact-of-gdpr-on-data-flows-and-national-security/*

[2] *Casey Newton, "The tech antitrust hearing was good, actually," The Verge, July 30, 2020, https://www.theverge.com/interface/2020/7/30/21346575/tech-antitrust-hearing-recap-bezos-zuckerberg-cook-pichai*

[3] *Ben Cousins, "4 takeaways from contact tracing apps in other countries," CTV News, June 18, 2020, https://www.ctvnews.ca/health/coronavirus/4-takeaways-from-contact-tracing-apps-in-other-countries-1.4990497*

[4] *Collectively, ICTC conducted interviews with more than 18 practitioners from industry, consulting, academia, non-governmental organizations, and not-for-profits. Each interview was approximately 45 minutes to an hour in length and followed a semi-structured format. For the purposes of this paper, "technology" was left unspecified for interviewees, allowing them to select and comment upon their own areas of expertise. Accordingly, practitioners commented on technologies including social media, synthetic data, clean and green tech, AI, industrial and manufacturing technologies, and beyond.*

The technology solution lifecycle is a core part of improving technologies' social impact. Too frequently, we consider innovation to be limited to design and deployment, rather than considering the impact of strategies like inclusive hiring, impact assessments, and ethical investment. Each stage of socially responsible technology development has many existing guidelines, rubrics, and best practices.

Part III examines the stages of the technology solution lifecycle and various interventions that can improve a technology's outcomes throughout each stage.

***Figure 1:** Study Overview, ICTC, 2020*

Part IV is a synthesis of strategies that all stakeholders—not just developers and designers—can use to help improve the social impacts of technology. The general public's toolbox includes activism, advocacy, and participation in consultations, while governments, companies, and third parties can employ education, regulation, and more. This paper seeks to provide a synthesis that both introduces readers to key concepts and leaves them with pragmatic strategies for making changes in their own actions and ecosystems. At the same time, this paper does not seek to implicate any particular role, technology, or sector—indeed, there are many "tech for good"-style solutions that are seeking to improve the impacts of other technologies, and all types of stakeholders share responsibility for technology's social impacts.

What Are the Social Impacts of Technology, and Why Do They Need Improvement?

> In many ways we're in the middle of this tech culture that very optimistically went and created some profound changes in the world, and then saw the unforeseen consequences from that change and is now reeling from it. Now, I think there is a search for the new paradigm that is going to allow us to go on with technology without these problems.
>
> **— David Jay, Head of Mobilization, Center for Humane Technology**

> We're kind of the bleeding edge here, right? It's only in the last two or three years that these guidelines have emerged. It's all just beginning.
>
> **— Privacy Lawyer and Advocate, United States**

Many readers will come to this paper with an existing sense of what "the social impact of technology" could look like. A new tool, effectively designed to do something more efficiently than was previously possible, usually offers numerous

positive impacts, including economic growth, improved mobility, or increased access to education, healthcare, or other social goods. Increasingly, however, it is clear that new tools also come with externalities, or unintended consequences, the regulation and mitigation of which is made difficult by new frontiers in international business structures, power imbalances between users and providers, and barriers related to expertise and public understanding. In this paper, the "social impacts of technology" refer to both of these things: the positive, usually intentional consequences of a new tool, and the potential negative or unanticipated consequences of the same tool. Throughout this study's secondary and primary research, it has become clear that we are currently in the middle of a transition: emerging technologies are changing at a pace that it is difficult, if not impossible, for regulators to keep up with, and we are collectively beginning to understand the weight of long-term and unanticipated impacts of technologies that are positive in many other ways.

The last two decades have seen a shift from the early rise of social media as a community-building tool to the ongoing debates about mental health and political polarization.[5] Similarly, the promise of artificial intelligence (AI) as a powerful computing tool has been complicated by the growing need to address algorithmic bias in decisions that impact everyday lives.[6] Greater public awareness has driven many of these new conversations. Perhaps best exemplified by the term "techlash,"[7] recent years have seen significant and growing criticism regarding the economic and political power of technology companies.[8] The Facebook-Cambridge Analytica scandal might have been a watershed moment for public awareness of privacy issues raised by technology, and it remains a highly contentious topic.[9] Another sign of growing public interest in technology is the focus of political representatives on topics such as information security, misinformation, open data, technology and labour, and sustainable technology.[10]

Just as the industrial revolution unwittingly encouraged climate change along with improvements to a vast array of quality of life metrics,[11] so too may the new and promising technologies we pilot today have lasting impacts that we might not think to consider. Accordingly, many practitioners are working on the edge of a revolution in technology design, use, and regulation to incorporate long-term resilience and anticipation into our solutions for the future.

[5] *See for example: Changjun Lee, et al., "Does social media use really make people politically polarized? Direct and indirect effects of social media use on political polarization in South Korea," Telematics and Informatics Volume 35, Issue 1, Pages 245-254, April 2018, https://www.sciencedirect.com/science/article/abs/pii/S0736585317305208*

[6] *Matthew Salganik, et al., "Prediction, Machine Learning, and Individual Lives: an interview with Matthew Salganik," HDSR, July 30, 2020, https://hdsr.mitpress.mit.edu/pub/uan1b4m9/release/3*

[7] *"The growing public animosity towards large Silicon Valley platform technology companies and their Chinese equivalents." https://www.ft.com/content/76578fba-fca1-11e8-ac00-57a2a826423e*

[8] *ETHI Committee, "International Grand Committee on Big Data, Privacy, and Democracy," Parliament of Canada, June 13, 2019, https://www.ourcommons.ca/Committees/en/ETHI/StudyActivity?*

[9] *Issie Lapowsky, "How Cambridge Analytica Sparked the Great Privacy Awakening," WIRED, March 17, 2019, https://www.wired.com/story/cambridge-analytica-facebook-privacy-awakening/; Netflix, "The Great Hack," 2019, Netflix, https://www.netflix.com/ca/title/80117542*

[10] *Tony Romm, "Amazon, Apple, Facebook, and Google grilled on Capitol Hill over their market power," The Washington Post, July 29, 2020, https://www.washingtonpost.com/technology/2020/07/29/apple-google-facebook-amazon-congress-hearing/; Lauren Feiner, "Tech competitors are 'blown' away by Congress' CEO grilling and hopeful for antitrust reform," CNBC, July 31, 2020, https://www.cnbc.com/2020/07/31/big-tech-competitors-were-blown-away-by-house-antitrust-ceo-hearing.html; Ryan Avent, "How Robots Will Break Politics," Politico Magazine, January/February 2018, https://www.politico.com/magazine/story/2018/01/05/robots-politics-automation-technology-216220*

[11] *Clark Nardinelli, "Industrial Revolution and the Standard of Living," The Library of Economics and Liberty, https://www.econlib.org/library/Enc/IndustrialRevolutionandtheStandardofLiving.html*

This endeavour may seem too large to be feasible. However, the interviewees consulted throughout this study listed many practical ways in which they, and others, are developing systems to help us all improve technologies' social impacts. This paper aims to provide a starting point for discussion and a synthesis of a vast array of themes and strategies for readers from all disciplines and sectors. Interviewees working in the social impacts of technology space listed the following urgent missions as the reason for their work:

- Keeping pace with technological change
- Mitigating potential unintended consequences of new technology solutions
- Understanding new and possibly dangerous intersections between technology and human behaviour
- Avoiding re-entrenching existing inequalities and working to undo inequalities for the future
- Creating shared-value and shared-equity solutions instead of "rent-seeking" solutions; and
- Diversifying technology-related decision-making and development

PART II
CONSIDERING SOCIAL IMPACT

CONSIDERING SOCIAL IMPACT

Part II of this study examines the ethical principles that help us understand the social impact of technology. Many governments, academics, and innovators have compiled a number of mandates for responsible technology, and each of these lays out important principles. However, some of these principles and mandates might be difficult to fulfill without more specific strategies and tools (to be discussed in Parts III and IV). Accordingly, this section covers the following topics:

- Existing language and frameworks for understanding the social impact of technologies;
- Improving social impact: core common principles; and
- Critiques of high-level frameworks for improving social impact.

Existing Language and Frameworks

Many of us are familiar with the purpose of the Universal Declaration of Human Rights (UDHR) or the Sustainable Development Goals (SDGs). They are intended to help us shape ethical domestic and international policy using shared agreements and common terminology. While numerous criticisms around practicality can be levied against such frameworks (which will be discussed), they bring a wide array of stakeholders together to agree upon shared principles, establishing a common and communicable definition of morality, minimum standards, and aspirations.

Interviewees in this study referenced two different types of frameworks for ethical technology:

HIGH-LEVEL FRAMEWORKS, or overarching frameworks. Like the UDHR, these map out common principles, goals, and standards for all actors in the social impacts of technology space.

SPECIFIC FRAMEWORKS that fit into a particular stage (or sometimes several) of the technology solution lifecycle, such as design methods, marketing practices, or assessment standards, akin to well-known practices like Fair Trade. Specific frameworks (or rubrics, standards, methods, etc.) will be discussed in Part III.

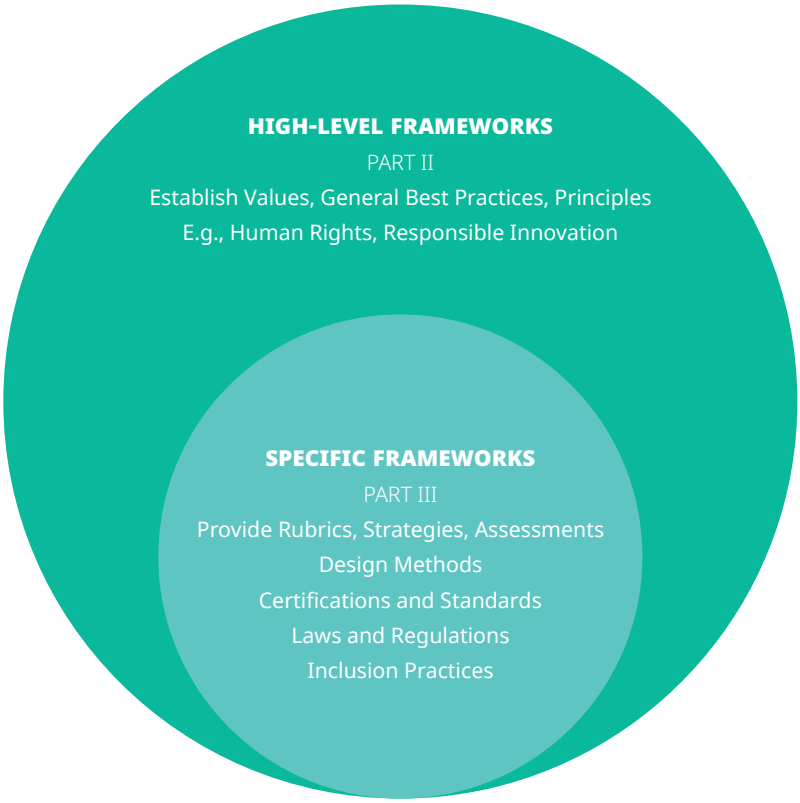


Figure 2: *High-level and Specific Frameworks, ICTC, 2020*

Several **high-level or overarching frameworks** for improving the social impacts of technology exist internationally, often tied to regulation, research, and funding. The list below, while not exhaustive, identifies several frameworks important to Canada and its immediate international context.

Responsible Innovation (RI) and **Responsible Research and Innovation (RRI)** are used widely in the European Union, with some ties to Canada, particularly in research collectives of scholars interested in this field.[12] Broadly speaking, RI holds academic roots and identifies shared principles for improving the social impact of technology, while RRI is a policy-oriented translation of these principles by bodies such as the European Commission.[13]

> Responsible innovation means taking care of the future through collective stewardship of science and innovation in the present.[14]

[12] *For example, the counsel of Responsible Innovation and Technology at the University of Waterloo, "Council for Responsible Innovation," 2020, https://uwaterloo.ca/research/responsible-innovation; as well as several Canadian researchers who have published in the Journal of Responsible Innovation.*
[13] *Richard Owen and Mario Pansera, "Responsible Innovation and Responsible Research and Innovation," In D. Simon, S. Kuhlmann, J. Stamm, and W. Canzler (Eds.), Handbook on Science and Public Policy, 2019, pp. 26-48. Edward Elgar Publishing.*
[14] *Jack Stilgoe, Richard Owen, and Phil Macnaghten, "Developing a framework for responsible innovation," Research Policy 42, no. 9, pp. 1568-1580. November 2013.*

Social Innovation (SI) emerges from the social sciences, which characterize a SI as a "novel solution to a social problem that is more effective, efficient, sustainable, or just, than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals."[15] Organizations such as the Design for Social Innovation and Sustainability (DESIS) Network practice SI principles: DESIS Network, based in Brazil, operates via an international network of design labs.[16] In the Canadian context, organizations such as Employment and Social Development Canada (ESDC) have included SI concepts in policy development and recommendations.[17]

Inclusive Innovation is linked to financial policy and "inclusive growth," a term widely used by the Organization of Economic Cooperation and Development (OECD) and other organizations to refer to economic growth "that is distributed fairly across society and creates opportunities for all."[18] Inclusive innovation is used by various policy organizations to denote initiatives that "directly serve the welfare of lower-income and excluded groups,"[19] innovation that "fosters a thriving middle class,"[20] and other maxims directed at economic wellbeing for a whole society.

Tech for Good is important to include, both for its ubiquity as shorthand for "socially positive technology," and for its frequent use by various organizations as a name for their ethical frameworks.[21] In 2018, the Tech for Good Declaration,[22] a "declaration by the Canadian tech community"[23] emerged from a conference led by Communitech and the Rideau Hall Foundation, and espoused ethical use of data, transparency, and inclusivity.

Human rights, as a pre-existing ethical framework for common social good, has been considered in its intersections with technology by many organizations, including Human Rights Watch,[24] the Office of the High Commissioner on Human Rights (OHCHR),[25] and Canadian organizations linking the Charter of Rights and Freedoms to the digital landscape.[26]

[15] *James Phills, Kriss Deiglmeier, and Dale Miller, "Rediscovering Social Innovation," Stanford Social Innovation Review, 2008, https://ssir.org/articles/entry/rediscovering_social_innovation*
[16] *"About," DESIS Network, 2020, https://www.desisnetwork.org/about/*
[17] *"Inclusive Innovation: New ideas and partnerships for stronger communities," Government of Canada, September 4th, 2018, https://www.canada.ca/en/employment-social-development/programs/social-innovation-social-finance/reports/recommendations-what-we-heard.html*
[18] *OECD, "Inclusive Growth," OECD, https://www.oecd.org/inclusive-growth/#introduction*
[19] *OECD, "Innovation Policies for Inclusive Growth," OECD Publishing, 2015, https://read.oecd-ilibrary.org/science-and-technology/innovation-policies-for-inclusive-growth_9789264229488-en#page7*
[20] *Government of Canada, "Positioning Canada to Lead: An Inclusive Innovation Agenda," Government of Canada, July 26, 2016, https://www.ic.gc.ca/eic/site/062.nsf/eng/h_00009.html*
[21] *For example, Tech for Good Global provides a database of ethical tech jobs, events, and resources, while Tel Aviv's TechForGood is an accelerator-style impact investment firm.*
[22] *"Tech for Good: A Declaration by the Canadian Tech Community," Rideau Hall Foundation and Communitech, accessed September 8, 2020: https://canadianinnovationspace.ca/tech-for-good/*
[23] *"Tech for Good," Rideau Hall Foundation, May 2018, https://www.rhf-frh.ca/our-initiatives/innovation/tech-for-good/*
[24] *"Digital Disruption of Human Rights," Human Rights Watch, March 25, 2016, https://www.hrw.org/news/2016/03/25/digital-disruption-human-rights*
[25] *"Human Rights in the Digital Age," United Nations Human Rights – Office of the High Commissioner, Oct 17, 2019: https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?*
[26] *Aaron Shull, "The Charter and Human Rights in the Digital Age," CIGI, August 16, 2018, https://www.cigionline.org/articles/charter-and-human-rights-digital-age*

While not exhaustive, the above list includes all the overarching frameworks for ethical technology mentioned by more than one interviewee. Others mentioned by interviewees and the project Advisory Committee include climate change (i.e., considering tech's social impact in terms of climate impacts), the Sustainable Livelihoods Framework,[27] and Doughnut Economics.[28] Myriad other frameworks exist and appear in the literature on the social impacts of technology: rather than create a thorough review of these, this study sets out core common principles and pragmatic best practices.

Improving Social Impact: Core Common Principles

High-level frameworks provide ethical guidance for policy and regulation, create shared norms within and between industries, and identify priorities for research and development. The frameworks here, among many others, share several common principles that will be used to guide this paper's discussion. Each of the following principles (which can also be thought of as ethical guidelines for designing, regulating, and using technology) were brought up by interviewees as important values guiding their work. The first two shared principles, Anticipation and Inclusion and Diversity, were the two most frequently discussed by interviewees and have been unpacked in greater detail in the section that follows.

Figure 3: *Common Principles Guiding Ethical Technology, ICTC, 2020*

[27] *Olivier Serrat, "The Sustainable Livelihoods Approach," Knowledge Solutions pp 21-26, May 23, 2017, https://link.springer.com/chapter/10.1007/978-981-10-0983-9_5*
[28] *See Kate Raworth, "What on Earth is the Doughnut?" KateRaworth.com, 2020, https://www.kateraworth.com/doughnut/*

Anticipation

> Originally, we were very reactive—so now, we're going from remediation, to control, to prevention, and that policy shift is still going on.
>
> **— Marie-Louise Bilgin, Co-Project Leader Safe-by-Design, Ministry of Infrastructure and Water Management of the Netherlands**

> I wouldn't necessarily characterize the work as mostly reactionary; rather, the state of the art is constantly evolving, and every company we talk to wants to get into the proactive space. You can come up with some bad things that might happen, but how do you decide whether to just ship what you have and address problems later? It's just a really, really hard problem.
>
> **— Shari Harrison, Founder and CEO, Second Nature Innovation (ex-Apple, ex-Microsoft)**

Principle: Consider the potential adverse effects a technology could have at all stages of its life (design, manufacture, distribution, business-to-business distribution, use, and re-use) in an up-front assessment. Attempt to address them in design prior to implementation. What RI terms "anticipation" is similar to "the precautionary principle" in engineering and natural sciences, with some differences regarding implementation and guidance on risk mitigation.[29]

Challenges: Social outcomes are notoriously difficult to attribute to a single variable: for example, there is significant debate over the relationship between political polarization and social media use. It might be possible to anticipate and mitigate the negative impact of an initiative that has a clear cause and effect established in its intent (e.g., in the case of the Cambridge Analytica leak, where user profiles were built to influence voting activity).[30] However, other circumstances could involve many variables, gradual effects, or unintentional effects, and therefore be more difficult to anticipate and trace to a particular cause.

In addition, **responsibility** for anticipation is frequently left with designers and innovators alone. Several interviewees pointed out the impractical burden this might create for many SMEs and start-ups.

Opportunities: While gradual or multivariate harms are hard to pin down, increased research on and attention to them will, over time, help clarify technology's impact and produce commensurate norms and regulations. At the moment, this principle is useful for spurring more research into the social outcomes of technology and mitigating those which are negative and easier to anticipate, such as CO2 emissions or demographic profiling.

In addition, **multi-stage** anticipation, where technologies are assessed and reconfigured depending on their context, is an important next step in ensuring that both innovators and adopters respond to potential harms.

[29] *The precautionary principle has been defined as having "four central components: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making." Kriebel et al., "The precautionary principle in environmental science," Environmental Health Perspectives, 2001, vol. 109 no. 9 pp. 871-876.*

[30] *Nicholas Confessore, "Cambridge Analytica and Facebook: The scandal so far," The New York Times, April 4, 2018, https://www.nytimes.com/2018/04/04/us/politics/cambridge-analytica-scandal-fallout.html*

Inclusion and Diversity

> There are a few principles of Responsible Research and Innovation, including anticipation, diversity, and inclusion—but I really see inclusion as the thing that brings about all the others.
>
> **— Kelly Bronson, University of Ottawa/Institute for Science, Society and Policy**

Principle: Including diverse voices in all stages of a technology's lifecycle (investment, hiring, design, prototyping, assessment, deployment, and use) will improve the social outcomes of that technology. For this, both demographic diversity and diversity of experience and background are important.

Challenges: Diversity must be a genuine rather than "check-box" effort. In bringing everyone to the same table, some voices may still be louder than others. Despite widespread inclusion efforts, bias may still occur in outcomes (e.g., algorithmic bias does not necessarily result from groups being underrepresented in design teams or training data, but may also reflect historically worse outcomes for particular demographics).

Opportunities: Consult best practices in public engagement (Part IV), while ensuring that project teams are also inclusive. Consider the perspective of justice and fairness in inclusion and diversity efforts to address inequitable treatment and representation of voices at the table.

Justice and Fairness

> When people differ over what they believe should be given, or when decisions have to be made about how benefits and burdens should be distributed among a group of people, questions of justice or fairness inevitably arise.[31]

Principle: To ensure the success of diversity and inclusion, be aware of issues that have disproportionately impacted or silenced particular groups. Seek to mitigate those issues in the present and reverse them in the future. Systematically consider the potential for disproportionate impact on different communities, and involve those communities in design, hiring, prototyping, and assessment.

[31] *Manuel Velasquez et al., "Justice and Fairness," Issues in Ethics 3, no. 2, 1990.*

Interdisciplinarity and Collaboration

> From a general perspective, collaboration can be defined as "a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible".[32]

Principle: Many disciplines, including engineering, computer sciences, law, social sciences, and policy can help inform socially positive technology design and implementation. Interdisciplinary collaboration improves technology's outcomes. In addition, partnerships between different sectors improve regulation and deployment, while international collaboration may be key to effective regulatory responses to technologies.

Self-Awareness and Reflexivity

> The real challenge is really listening… You're just constantly restrained by your tendency to see what you want to see.
>
> **— Shari Harrison, Founder and CEO, Second Nature Innovation (ex-Apple, ex-Microsoft)**

> Reflexivity "means holding a mirror up to one's own activities, commitments and assumptions, being aware of the limits of knowledge and being mindful that a particular framing of an issue may not be universally held."[33]

Principle: Consider one's own position, perspective, and background, and how that is impacting decision-making. Self awareness and reflexivity can help proponents be more open to significant feedback, listen better to consultations, and anticipate others' needs and perspectives.

Agency and Choice

> Individuals express their autonomy across a variety of social contexts, from the home to the marketplace to the political sphere. Democratic institutions are meant to register and reflect the autonomous political decisions individuals make. Disrupting individual autonomy is thus more than an ethical concern; it has social and political import.[34]

Principle: The relationship between agency, choice, and technology is a complex one, but it is certain that our choices are impacted by the tools and technologies we interact with daily. Disentangling agency from environment and technology

[32] *Gray, 1989, p. 5 in Karsten Bolz and Anne de Bruin, "Responsible innovation and social innovation: toward an integrative research framework," International Journal of Social Economics, 2019, https://www.emerald.com/insight/content/doi/10.1108/IJSE-10-2018-0517/full/html*
[33] *Jack Stilgoe, Richard Owen, and Phil Macnaghten, "Developing a framework for responsible innovation," Research Policy 42, no. 9, pp. 1571. November 2013.*
[34] *Daniel Susser, Beate Roessler, and Helen Nissenbaum, "Technology, Autonomy, and Manipulation," Internet Policy Review 8, no. 2, June 2019.*

may prove to be an impossible task (i.e., at what point are we not influenced by the technology surrounding us?). However, at the end of the day, "opt-in" technology solutions[35] that employ meaningful informed consent can provide individuals greater agency over the technologies that have influence on them. Solutions that are designed to evade the need for consent, manipulate human behaviour and choice, or otherwise diminish agency, were not viewed as positive or preferable by the vast majority of interviewees.

Critiques of High-Level Frameworks for Improving the Social Impacts of Technology

High-level frameworks and principles, while important, are not sufficient on their own to improve the social impacts of technology. There are several powerful critiques of the frameworks listed above, such as RI and SI, primarily to do with pragmatism, specificity, and accountability.

WHERE ARE THE INCENTIVES?

The private sector is an undeniably fundamental player in responsible technology. Even for companies with the best of intentions, profit-driven business models are, in some cases, unaligned with the principles listed above—for example, if inclusion and diversity imply a lengthy and expensive consultation process. Accordingly, additional measures such as industry standards and regulations might be required to operationalize high-level frameworks, as will be discussed in subsequent sections. Similarly, many start-ups are in a uniquely vulnerable position, where their pre-revenue focus is entirely on bringing a product to market, for understandable reasons. In this case, grants for ethical technology design and other funding or accelerator-style programs that offer support along with ethical guidelines might be more helpful. In addition, new methods for tracking the return on investment in ethical technology design and deployment (e.g., financial, social, and environmental outcomes) could help provide incentives for companies, though this could also be tied to the danger of "ethics washing."[36]

WHERE IS THE CAPACITY?

In addition to money, it takes significant expertise and capacity to address each of the principles above effectively. A burgeoning industry of consultants specializing in facilitation, consultation, design workshops, and product assessments is sometimes brought in to help companies develop responsible technology; however, these teams may be "contracted to go through the motions," as one interviewee put it, and sustainable internal capacity remains scarce.

[35] *"E.g., where a user has to actively decide to consent to a technology, rather than a presumption that they give permission."*
[36] *A process whereby "ethics" are "increasingly identified with technology companies' self-regulatory efforts and with shallow appearances of ethical behavior." Elettra Bietti, "From ethics washing to ethics bashing: a view on tech ethics from within moral philosophy," Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency, January 2020, https://dl.acm.org/doi/abs/10.1145/3351095.3372860*

HOW ARE THESE OPERATIONALIZED?

High-level frameworks such as "human rights" can be vague or ignorant of context, with few clear directions about mobilizing their recommendations. They walk the perennial line of needing to set standards for technology that can keep up with the pace of change in this field, and in the effort to be widely applicable they sacrifice enforceability and specificity. Other, more specific tools for responsible technology design and deployment are designed to address this gap.

WHO CREATED THESE FRAMEWORKS?

The project advisory committee raised the point that several of the high-level frameworks identified in this study (such as the UDHR) were created without a diversity of voices at the table. Another example is the overrepresentation of the private sector in developing AI ethics frameworks (at the expense of others, like the broader public, civil society, and unions).[37] The advisory committee discussed the importance of having a multiplicity of voices involved in establishing ethical frameworks as well as being involved in ethical technology development.

In the next section, we turn to methods, frameworks, certifications, and other tools designed to respond to several of these critiques. Each of these brings concrete strategies to bear on a particular stage of the technology solution lifecycle.

[37] *Valentine Goddard, "Art Impact AI: Observations and Strategic Recommendations," AIIA - Alliance Impact Intelligence Artificielle and Canada Council for the Arts, 2020, p.21*

PART III
BRINGING ETHICS INTO THE INNOVATION LIFECYCLE

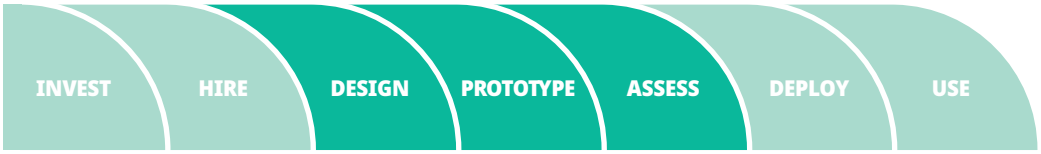
BRINGING ETHICS INTO THE INNOVATION LIFECYCLE

As discussed in Part II, one of the key criticisms of frameworks like human rights and RI is that they can be difficult to operationalize, possibly due to a lack of specificity, context, and understanding of the needs of smaller companies. While high-level frameworks tend to be created by large bodies with broad mandates, such as the United Nations or the European Commission, there are numerous individuals, companies, NGOs, and governments who have developed systems that are specific to their jurisdictions and disciplines. Accordingly, this section turns to methods, frameworks, certifications, and tools designed to bring high-level values and principles to bear on a specific component of the technology lifecycle. It first provides an overview of the technology lifecycle, along with a snapshot of the ethical implications that arise at different stages. It then presents some of the specific strategies that interviewees commented on as improving the social impact of each stage (for example, methods for ethical design, or rubrics for technology assessment). This section covers:

Defining the Innovation Lifecycle

The innovation lifecycle refers generally to the process of creating a new technology. It can be interpreted in a narrow sense, looking only at the steps taken by a design team to create a solution, or it can be interpreted in a much broader sense, encompassing also the investors, hiring teams, marketers, and consumers at either end of the design process. Below, these are referred to as “bounded” and “socially integrated” interpretations or models. Many of the existing models for technology design assume a bounded process that begins and ends with the design team. Conversely, many thinkers in fields like SI and RI argue that innovation should be nested within an understanding of its broader context. This section will provide a look at both approaches.

Visualizing Innovation: Bringing Social Context into Bounded Models



The exact format of the innovation lifecycle will change depending on the type of technology and the design team's approach. Any new technology must go through numerous stages before it is brought to market, and its life by no means ends with the first consumer use. While there are many alternate models for conceptualizing technology solution development, perhaps two of the most well-known today are the "Waterfall" and "Agile" methods, frequently applied both to software development and to other solution design (see Figure 1).

In Waterfall and Agile, the development team is implicated in design, prototyping, and testing. While "testing" suggests the involvement of quality assurance (QA) specialists, user experience (UX) designers, or other stakeholders, there is no explicit involvement of a diverse set of parties, nor any external parties. Agile is in some ways a more socially integrated model than Waterfall, as it interacts with something outside of its own cycle: yet apart from Agile's "Deploy" arrow, as seen in the figure below, there is no other acknowledgement of the "outside" world.

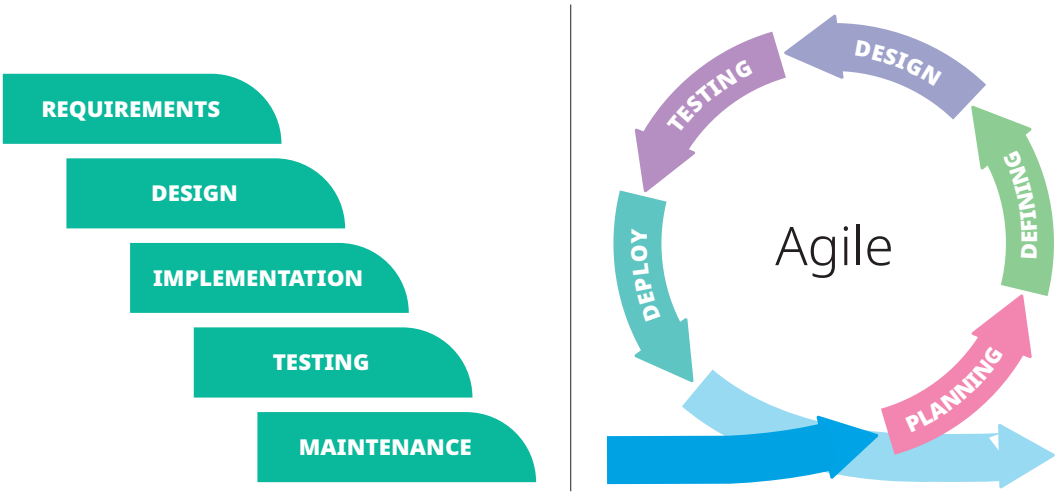
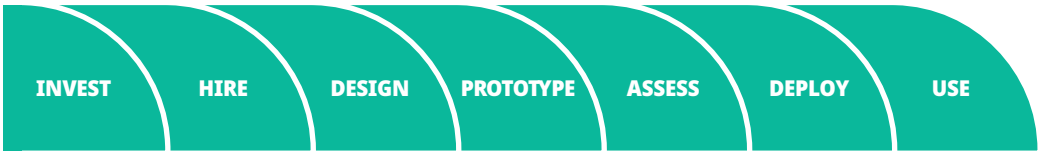


Figure 4: *"Moving from Waterfall to Agile with Kanban." Figure reproduced with permission from Mahesh Singh, "Moving from Waterfall to Agile with Kanban," Digite.com, April 8, 2019. https://www.digite.com/blog/waterfall-to-agile-with-kanban/*

The Integrated Approach: From Investment to Use



Agile has proven to be a broadly effective and popular method, and many visualizations of what an explicitly "ethical" or "social" innovation process might look like include Agile's focus on iteration. Nevertheless, Agile and Waterfall, as visualized here, do not prompt a design team to consider elements such as who they hire, who they consult, or what impact their technology will have on consumers beyond UX.

As discussed in the previous section, many of the "high-level" frameworks that espouse principles of anticipation, inclusion, diversity, and collaboration explicitly bring these concepts into the innovation process. For example, the SI framework below portrays a somewhat "agile" process, but one that incorporates personal values, self-awareness, and collaboration into ideation before the design and prototyping begins. Similarly, an explicit consideration of social impact is incorporated into the innovation cycle. Other frameworks that will be discussed in this section make similar moves to bring considerations of the outside world into design, as shown in the subsequent figure visualizing "design thinking." However, few explicitly include considerations that extend to investment and inclusive hiring, or to the product team being responsive to any issues that are raised after deployment.

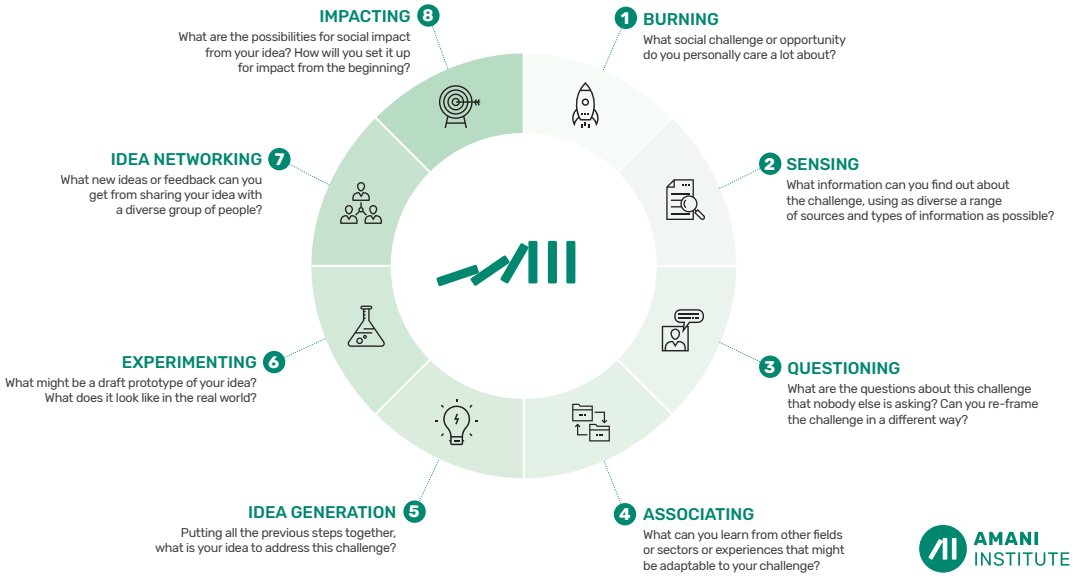


Figure 5: Amani Social Innovation Framework: 8 Steps to Creating a New Idea *In this model of social innovation, the steps "Associating" and "Idea Networking" set up a solution designer to involve "diverse" parties from "other fields or sectors." In addition, the question of "impact" is considered as a part of the lifecycle, as is the question "How will you set it up for impact from the beginning?". Figure reproduced with permission from the Amani Institute, "Develop professionals who create social impact", The Amani Institute, 2020, https://amaniinstitute.org/.*

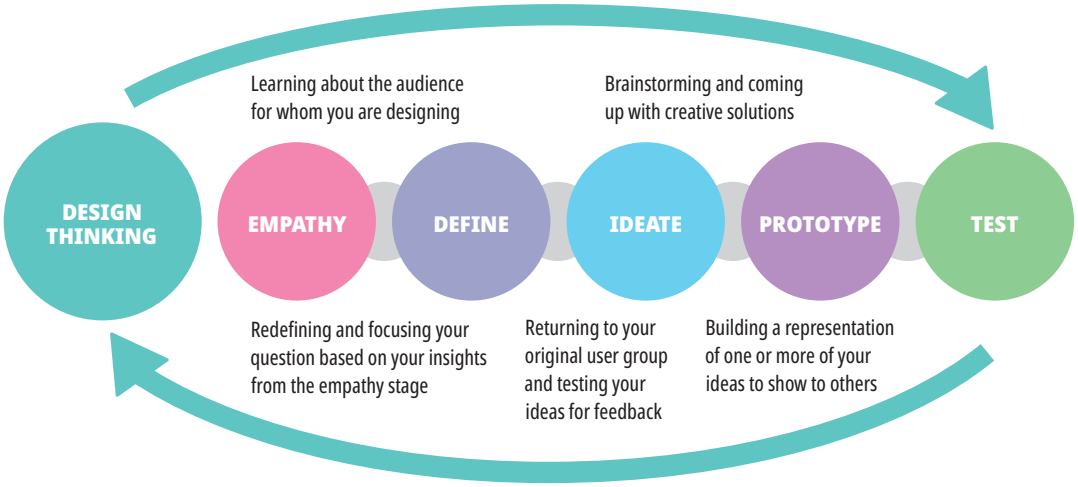


Figure 6: *Design Thinking builds on Agile by incorporating "empathy" and an iterative prototyping process that returns to implicated users for feedback. Image sourced from Wikimedia Commons and reproduced under a Creative Commons Attribution-Share Alike 4.0 International licence.*

In many ways, improving a technology's social impact depends on expanding the concept of what "innovation" means across all its stages by including more (and more diverse) stakeholders and incorporating social outcomes into design, assessment, and beyond. Interviewees commented that many more parties than the design team are implicated in ensuring ethical outcomes. **Accordingly, the following section outlines several key stages in the technology solution lifecycle where practitioners have developed specialized strategies, rubrics, or policies that make high-level principles like "inclusion" specific and achievable.**

Supporting Innovation: Investment & Financing

Over the last decade, retail and corporate demand for new ways to "invest ethically" has grown, and with it, the total volume of assets managed under the "ethical investment" banner.[38] Increasingly, companies and individuals want their investment portfolios to mirror their own ethics and values and have a positive impact on society. "Ethical investing" has many names in finance, including socially responsible investing, impact investing, conscious investing, values-based investing, and more.[39] Some of the more common terms in use are defined below.

ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) INVESTING ESG investing provides a standard set of criteria for assessing a company's environmental impact (e.g., carbon footprint, pollution, etc.), social impact (e.g., employee management, relationship with local communities, suppliers etc.), and governance structure (e.g., relationship with shareholders, executive pay, etc.).[40] Increasingly, investors have relied on these criteria to decide where to allocate their funds.[41]

[38] *"What is Ethical Investing," National Bank of Canada, January 14, 2019: https://nbdb.ca/tips/investment-strategies/the-keys-to-ethical-investing.html*
[39] *Michael Allen, "What Is Ethical Investing and Why Do It," Wealthsimple, Nov 11 2018: https://www.wealthsimple.com/en-ca/learn/what-is-ethical-investing*
[40] *James Chen, "Environmental, Social, and Governance (ESG) Criteria," Investodia, Feb 25, 2020: https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp*
[41] *The Forum for Sustainable and Responsible Investment, "Sustainable investing assets reach $12 trillion as reported by the US SIF Foundation's biennial Report on US Sustainable, Responsible and Impact Investing Trends," 2018: https://www.ussif.org/files/US%20SIF%20Trends%20Report%202018%20Release.pdf*

SOCIALLY RESPONSIBLE INVESTING Socially responsible investing means investing based on ESG scores or any other criteria related to ethics, values, or moral beliefs.[42] Investors who partake in socially responsible investing tend to research the social conduct of firms. They may choose not to invest in an entire industry or just certain companies based on that research.

SUSTAINABLE INVESTING Sustainable investing is investing based on the sustainability of a company's business practices. While the interpretation of sustainability may vary, this could mean a company's environmental impact, its use of responsibly sourced or recycled materials, or their use of renewable energy.

Shaping a Project Team: Hiring and Inclusion

Technology development begins not in the ideation phase, but in selecting the team who will be the creative force behind it. In addition to hiring, advisory boards, community partners, and other structures of project team are often included in the beginnings of a responsible technology initiative.

INCLUSIVE AND DIVERSE HIRING PRACTICES Inclusive and diverse hiring practices can vary significantly in their scope and design. Depending on the organization, they may include anything from rudimentary efforts to educate hiring teams about their potential implicit biases to actionable policies with strict enforcement mechanisms. Similarly, they can be specific in their focus (such as removing references to age, gender, or cultural background from resumes before review) or they can encompass the entire hiring process from recruitment, to interviews, to management. Many organizations like the Government of Canada[43] and Randstad[44] have published research and best practices for promoting equity, diversity, and inclusion in the workforce.

SHARED EQUITY AND COMMUNITY PARTNERSHIPS Technology projects may be wholly or partially co-owned and designed by end-users. Several interviewees noted the success of projects, such as energy or telecommunications projects, that "balance economics with all the various social and environmental impacts because the communities are in the drivers' seat." Many of these comments were with regard to Indigenous communities driving projects in Canada, but the sentiment was echoed with regard to cooperatives and other forms of social enterprise.

ADVISORY BOARDS AND FORMAL REVIEW Much like in an academic context, where ethical review is required as the initial stage of many research projects, advisory boards comprised of a diversity of relevant disciplines can help provide early feedback on a project.

[42] *"What is Ethical Investing," National Bank of Canada, January 14, 2019: https://nbdb.ca/tips/investment-strategies/the-keys-to-ethical-investing.html*
[43] *Treasury Board of Canada Secretariat, "Building a Diverse and Inclusive Public Service: Final Report of the Joint Union/Management Task Force on Diversity and Inclusion," Sept 1, 2018: https://www.canada.ca/en/treasury-board-secretariat/corporate/reports/building-diverse-inclusive-public-service-final-report-joint-union-management-task-force-diversity-inclusion.html*
[44] *"How to successfully hire a diverse workforce," Randstad, accessed Sept 8, 2020: https://www.randstad.ca/employers/workplace-insights/corporate-culture/how-to-successfully-hire-a-diverse-workforce/*

Designing New Technologies: Research, Design, and Prototyping

One of the most-discussed stages of the technology lifecycle, the "design" phase, has numerous existing frameworks and principles applied to it, all seeking to improve the social and environmental outcomes of the eventual solution.

Privacy by design, developed by former Information and Privacy Commissioner for Ontario Ann Cavoukian in 1995, has since gone on to influence extensive regulatory frameworks like the European General Data Protection Regulation (GDPR). The model was raised by interviewees as a useful framework that seeks to minimize the collection of personal data. Privacy by design suggests important commitments around user safety, security, disclosure, and privacy as a default rather than opt-in settings.[45] ***Safety by design*** (as it is known in Europe, also known as **prevention through design**) adopts a similar approach, attempting to ensure that it is not easy for technologies to harm users, though it has faced criticism for, in some manifestations, "designing out users as much as possible in attaining safety."[46]

While both privacy by design and safety by design were often associated with regulatory agencies or watchdogs by interviewees, several ethical design frameworks have also been piloted by the private sector. ***Ethical OS*** originates from Silicon Valley organizations Institute of the Future and the Tech and Society Solutions Lab and identifies "risk zones" along with guidelines for anticipating and designing out those risks, often based on considering different "scenarios" that take the social consequences of technologies to logical extremes (see Figure 7). Importantly, cybersecurity industry practices like penetration testing, "ethical hacking," and ***Red-Teaming*** are also key private sector-led safety protocols. Such practices test products rigorously for vulnerabilities to ensure that they are secure, safe, and private, though their focus is on a particular risk domain. Red-teaming works best when the teams that are responsible for testing are shielded from organizational bias and completely independent from product teams, which can be more revenue and growth-focused. That said, red-teaming is also an expensive practice, making it inaccessible for some companies.

[45] *Ann Cavoukian, "Privacy by Design: The 7 Foundational Principles," accessed via the International Association of Privacy Professionals (IAPP) Resource Centre.*

[46] *Ibo van de Poel, Zoë Robaey, "Safe-by-Design: from Safety to Responsibility" Nanoethics, 11(3): 297–306. Published online 2017 Aug 22. doi: 10.1007/s11569-017-0301-x*

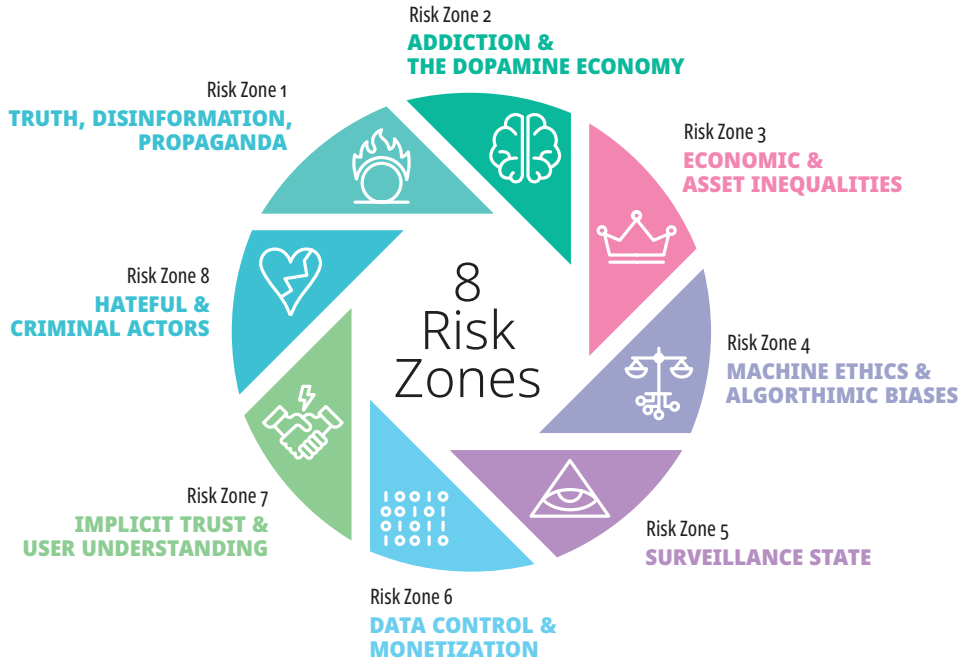


Figure 7: *EthicalOS "8 Risk Zones" ©2018 Institute for the Future and Omidyar Network (CC-BY-NC-SA 4.0)*

The field of UX design has piloted numerous methods for designing effective products. ***Design thinking,*** as one example, is an iterative design method invoked for complex problems. Design thinking begins with the principle of empathizing with a user's needs,[47] and ***human-centred design*** principles contribute to design thinking.[48] Several interviewees employed human-centred design methods in change management, policy design, and technology design, in a process of "empathizing with the user, seeking to understand how they act with [interviewees'] systems." Human-centred design methods were followed by extensive and iterative prototyping, making changes that incorporated both user needs and organizational needs.

However, one interviewee raised the point that strong, human-centred UX design could come with both positive and negative social outcomes: designing a tool with human behaviour in mind might come with addictive or manipulative side-effects, and designers are beholden to their employers' needs as well as user needs.[49] An ongoing conversation about ethics in UX reflects the potential for moral ambiguity in design, and some designers writing about this topic are working to introduce and standardize concepts like "benevolent intent."[50] The related method of value-sensitive design bridges gaps between diverse stakeholders by identifying shared values and designing to take them into

[47] *"Design Thinking," Interaction Design Foundation, Accessed Aug. 25 2020, https://www.interaction-design.org/literature/topics/design-thinking*
[48] *"Human-centred design sits at the intersection of empathy and creativity," IDEO, accessed September 8, 2020: https://www.ideo.org/tools*
[49] *See, for example, the discussion around "Dark Patterns" as in Harry Brignull, "Dark patterns: inside the interfaces designed to trick you," The Verge August 29, 2013: https://www.theverge.com/2013/8/29/4640308/dark-patterns-inside-the-interfaces-designed-to-trick-you*
[50] *Chris Kiess, "Building an Ethics Framework for UX Design," User Experience Magazine 18(5), 2019. http://uxpamagazine.org/building-an-ethics-framework-for-ux-design/.*

account. It identifies stakeholder values, societal values, designer values, and the values that the technology will end up propagating.[51] One interviewee working in this space noted that being "value-driven" in design and implementation means shifting organizational focus to new metrics, and away from metrics like engagement. Some interviewees were considering how to re-define success when number of "clicks" can be misaligned with the incentive to create products based on collective values.

Importantly, many organizations are also working in the space of inclusive design, piloting initiatives that explicitly integrate cultural principles into technology development. One example of this is the working group on Indigenous Protocol and Artificial Intelligence.[52]

Case Study: Contact Tracing

HOW SYSTEM SHOCKS IMPACT THE TECHNOLOGY SOLUTION LIFECYCLE

The COVID-19 pandemic has significantly shocked an interconnected world. While systemic change can often move slowly, the rapid disruption caused by 2020's coronavirus outbreak has demonstrated that emergency measures might expedite the development of policy and technology solutions. On March 11, the World Health Organization declared COVID-19 to be a pandemic, and in the following 14 days, Canada closed its borders and passed an emergency aid bill, provinces declared states of emergency, and schools moved to remote learning, with large parts of the economy and major industries essentially shut down (such as airlines, restaurants, retail, and salons).[53]

As a part of this rapid response, contact tracing solutions were developed. Contact tracing applications aim to alert users who have come into close proximity with people who have tested positive for COVID-19, prompting them to get tested and self-isolate in order to reduce community transmission. While the "move fast and break things" ethos may be rightfully criticized, there has also been an imperative to move fast in this context given emergency measures and public health pressures.

This need for a quick response is seen in the short timelines for national contact tracing apps (as well as rapid adoption by users). For example, Australia's app had two million users within the first 24 hours. Singapore launched their contact tracing app TraceTogether on March 20 and reported 1.4 million users (approximately a quarter of the country). Recent modelling indicates that if 80% of all smartphone users adopted these apps, it could reduce virus reproduction rates by a factor of three.[54]

[51] *For example, the value sensitive design research lab in Seattle offers a number of design toolkits for envisioning and identifying values: https://www.vsdesign.org/.*
[52] *Jason Edward Lewis, ed. 2020, Indigenous Protocol and Artificial Intelligence Position Paper, Honolulu, Hawai'i: The Initiative for Indigenous Futures and the Canadian Institute for Advanced Research (CIFAR).*
[53] *A timeline of events in Canada's fight against COVID-19", City News Toronto, June 18, 2020: https://toronto.citynews.ca/2020/06/18/a-timeline-of-events-in-canadas-fight-against-covid-19/*
[54] *Kelly Servick, "COVID-19 contact tracing apps are coming to a phone near you. How will we know whether they work?", Science (AAAS), May 21, 2020: https://www.sciencemag.org/news/2020/05/countries-around-world-are-rolling-out-contact-tracing-apps-contain-coronavirus-how*

Several interviewees working in the social impacts of technology space reported that they were quickly writing assessments of the privacy and security of these apps to assist government decision-making on which apps to approve and implement.[55] Functionally, some systems (such as Norway's) are centralized to allow governments to view the entire user network. Other countries, such as Switzerland and Germany, are decentralized, meaning that data about recent interactions remain limited to the user's phone. The tradeoffs between user privacy, equity of access, and effectiveness are a matter of current debate, all highlighting the complexity of ensuring that technology has positive social outcomes in times of great stress and need.[56]

Assessing Technologies: Tests, Certifications, and Standards Pre- and Post-Market

There are many ways of assessing the social impact of a technology, prior to a product going to market and after it is released. Several methods are participatory or qualitative, designed to include a wide array of stakeholders and different ways of thinking about a technology's impact, while others are based on quantifiable rubrics and outcomes. The list below is not exhaustive, but it sketches some of the methods that practitioners might use to assess the impact of technologies (a topic covered further in the sections on Regulation and Public Engagement, Part IV).

Qualitative, Holistic, and Participatory Assessments

When used to refer to a method, **Technology Assessment** (TA) "explores the relationship between science, technology and society, [and] brings together researchers from different disciplines such as business, economics, sociology, or biology."[57] TA has a significant presence in Europe, but North American interviewees also led various TA activities, such as "Participatory TA," a consultation method that involves a wide variety of stakeholders (including laypersons or end users) in the assessment process. TA involves many of the core principles discussed earlier in this paper, such as inclusion, diversity, and interdisciplinary collaboration.

In the Canadian context, several interviewees raised **Impact Assessments,** of which there are many, including PIAs, security impact assessments (SIAs), human rights impact assessments, data protection impact assessments (EU), and environmental impact assessments. All of these were discussed as methods in use

[55] *See, for a synthesis of issues concerning contact-tracing applications, Teresa Scassa, Jason Millar, and Kelly Bronson, "Privacy, Ethics, and Contact-tracing Apps," in Colleen M. Flood, Vanessa MacDonnell, Jane Philpott, Sophie Thériault and Sridhar Venkatapuram, eds., Vulnerable: The Law and Policy of COVID-19, University of Ottawa Press, 2020, online: https://ruor.uottawa.ca/handle/10393/40726.*

[56] *Isobel Braithwaite et al, "Automated and partly automated contact tracing: a systematic review to inform the control of COVID-19," Lancet Digital Health 2020, August 19, 2020: https://doi.org/10.1016/S2589-7500(20)30184-9*

[57] *See the European Parliamentary Technology Assessment (EPTA) network, "What is Technology Assessment?" https://eptanetwork.org/about/what-is-ta, accessed August 25, 2020.*

by the practitioners who informed this study. An impact assessment procedure also undertakes extensive and collaborative consultations with stakeholders and rightsholders (such as Indigenous peoples), further discussed in the section on public engagement. **Sustainability Assessments** are another type of impact assessment involving both environmental and social considerations, a "bottom up" process involving many stakeholders.[58] In addition, ethics-oriented UX and QA testing in order to meet accessibility standards can also be considered a form of technology assessment.

Certifications, Standards, and Quantifiable Assessments

While it's entirely possible for assessments to be undertaken collaboratively for the purpose of fostering dialogue, there are also numerous "top-down" rubric-style assessments. Important examples raised by interviewees and in the literature included the **2019 Canadian Algorithmic Impact Assessment** tool,[59] the National Standard of Canada and CIO Strategy Council's **"Ethical design and use of automated decision systems,"**[60] and **Life Cycle Assessment** or **ISO 14040.**[61] While certifications, standards, and assessments will be discussed in greater depth in Part IV: Policy and Regulations, these frameworks provide important checklists for companies and regulators to ensure that their products are meeting social and environmental guidelines. They can be used as direct regulatory tools or as indirect incentives, much like organic or Fair Trade certifications might be sought by companies to attract consumers.

Putting Technology to Use: Implementation, Adoption, and Procurement

Even after inclusive hiring, ethical design, and a rigorous assessment, some technologies can, as one interviewee put it succinctly, "be used for both good and bad purposes." The scope of a technology's application depends on what it is, and another respondent noted that "the more specific a technology is to a certain use case, the easier it is to design safeguards." Anticipating all uses of a technology is difficult; if negative features of a technology cannot be designed out, they must be addressed in the implementation stage. While it is true that every stage of the technology development lifecycle has some ethical considerations, which has the most is a matter of some debate. For example, several interviewees expressed different perspectives on the tension between whether a developer in the design phase or a user in the procurement and implementation phase is more responsible for a technology's impact, as illustrated by the differences in the two quotations below:

[58] *Rajesh Kumar Singh et al., "An overview of sustainability assessment methodologies," Ecological Indicators 9, no. 2, March 2009, pp. 189-212.*
[59] *Mathieu Lemay, "Understanding Canada's Algorithmic Impact Assessment Tool," Towards Data Science, Jun 10, 2019, https://towardsdatascience.com/understanding-canadas-algorithmic-impact-assessment-tool-cd0d3c8cafab.*
[60] *National Standard of Canada, "Ethical design and use of automated decision systems," CAN/CIOSC 101:2019*
[61] *LCA and Social LCA examine the impacts of a product along its entire supply chain. See, for documentation of the framework, https://www.iso.org/fr/standard/37456.html and https://www.lifecycleinitiative.org/starting-life-cycle-thinking/life-cycle-approaches/social-lca/#:~:text=A%20social%20life%20cycle%20assessment,impacts%20along%20the%20life%20cycle.*

> [Certain kinds of] algorithms are agnostic until they're fed data. Creating a tool that generates synthetic datasets, for example, has limited ethical considerations. How it's used is where the ethical considerations need to be applied—it's really about the uses of the capability, not the capability itself.
>
> **— Technologist, Anonymous**

> Companies designing products should conduct due diligence around the sale of their products, asking questions such as "who are we selling it to?" and "are they going to be respecting human rights?" Beyond due diligence, one can also imagine how specific design functionalities that can be implemented into products to minimize their adverse human impacts. For example, products might incorporate audit logs to help investigate misuse, or include or exclude certain functionalities to minimize human rights risks.
>
> **— Vivek Krishnamurthy, Samuelson-Glushko Professor of Law, University of Ottawa**

Accordingly, procurement, B2B sales, rollout, and issues that only appear "at scale" play significant roles in understanding a technology's social impact. This complex topic will be addressed further in the next section on the stakeholders involved in improving the social impacts of technology.

Case Study: Technology, Automation, & Retraining

The impact of technology automation is a longstanding area of concern for practitioners considering the social impact of technology. While technology has created more jobs than it has eliminated overall, rapid technological change has, in some periods of history, involved significant disruption in the short term (such as during the Industrial Revolution).[62] In part due to mixed evidence on the impact of technology on the labour market, some commentators voice increasing concern over the rate of technological advancement: the ubiquity of digital technologies may increase their disruptive reach and speed.[63]

Digital technologies are already integrated into the workforce to "enhance human skills and expertise."[64] While new technologies have increased productivity, prosperity, and net creation of jobs, some fear that upcoming technological disruptions could be different.[65] Pessimistic predictions of large increases in unemployment emphasize cognitive technologies such as machine learning (ML), with some predicting this will impact two-thirds of knowledge workers and

[62] *Moshe Vardi, "What the Industrial Revolution really tells us about the future of automation and work," The Conversation, Sept 1 2017: https://theconversation.com/what-the-industrial-revolution-really-tells-us-about-the-future-of-automation-and-work-82051*
[63] *"Digital Transformation Is Racing Ahead and No Industry Is Immune," Harvard Business Review, July 19, 2017: https://hbr.org/sponsored/2017/07/digital-transformation-is-racing-ahead-and-no-industry-is-immune-2*
[64] *"The Integration of Human and Digital Labor," CIO, Mach 8, 2017: https://www.cio.com/article/3178300/the-integration-of-human-and-digital-labor.html*
[65] *Calum McClellan, "The Impact of Artificial Intelligence - Widespread Job Losses," iot for all, July 1 2020: https://www.iotforall.com/impact-of-artificial-intelligence-job-losses/*

eliminate millions of jobs from the economy.[66] Accordingly, and with a sentiment also echoed by interviewees, a focus on automation and meaningful work is an essential consideration pertaining to the social impact of technology. For example, one interviewee noted that the adoption of new digital technologies (to improve productivity and efficiency) was sometimes at odds with the interests of workers who, understandably, were not supportive of automated systems that would lead to layoffs. Technologies likely to cause layoffs, accordingly, might be useful but best adopted "in the future." Interviewees suggested that it will be crucial for workplaces to understand the opportunity for increased innovation and productivity, but to also consider what this means for their current workers.

One recurring theme that emerged was that automation technologies (whether AI or less advanced software) will undoubtedly impact the tasks of many workers, but this must be done responsibly: there is an increasing emphasis on ensuring that these developments do not eliminate workers or entire roles, but shift the nature of the work and allow workers to concentrate on higher value-added tasks and the meaningful aspects of work. Increasingly, forward-thinking Canadian organizations are analyzing the skills and capabilities of their current employees to see how they can best utilize these new tools to ensure that their workforces are able to adapt. Unfortunately, existing employment models may not be suitable for large-scale re-training or upskilling; several studies have demonstrated the challenges (and dangers of, for example, re-cementing inequalities)[67] seen in large-scale worker retraining efforts. Previous studies have noted that intensive training for dislocated workers can help decrease unemployment but also had a negative effect on total income.[68] Other researchers have reservations regarding the premise of low-wage workers shuffling into high-tech jobs, noting that "improving the outlook for low-wage workers requires more than reforming the reskilling system."[69] Retraining programs have also been criticized for being selective, choosing candidates who were more likely to find a job rather than those most in need.[70] Indeed, previous job-retraining efforts in the US have often been "found to be ineffective according to numerous studies"[71] and provide a cautionary example for future program development. Accordingly, some experts have argued that these challenges require bolder actions, such as universal basic income (UBI)[72] or other greater roles of a welfare state to ensure that Canadians are not left behind by a changing economy that increasingly feels the strain of precarious employment and income inequality.

[66] *"The Integration of Human and Digital Labor," CIO, March 8, 2017: https://www.cio.com/article/3178300/the-integration-of-human-and-digital-labor.html*
[67] *Marcela Escobari, Ian Seyal, and Michael Meaney, "Realism About Reskilling – Upgrading the career prospects of America's low wage workers," Brookings, Dec 2019: https://www.brookings.edu/wp-content/uploads/2019/11/Realism-About-Reskilling-Final-Report.pdf*
[68] *Ronald D'Amico and Peter Schochet, "The Evaluation of the Trade Adjustment Assistance Program: A Synthesis of Major Findings," Mathematica Policy Research, Dec 2012.*
[69] *Marcela Escobari, Ian Seyal, and Michael Meaney, "Realism About Reskilling – Upgrading the career prospects of America's low wage workers," Brookings, Dec 2019: https://www.brookings.edu/wp-content/uploads/2019/11/Realism-About-Reskilling-Final-Report.pdf*
[70] *Kathryn Anderson, Richard Burkhauser, and Jennie Raymond, "The Effect of Creaming on Placement Rates Under the Job Training Partnership Act," ILR Review 46, no. 4, July 1993, pp. 613-625.*
[71] *Jeffrey Selingo, "The False Promises of Worker Retraining," The Atlantic, Jan 8 2018: https://www.theatlantic.com/education/archive/2018/01/the-false-promises-of-worker-retraining/549398/*
[72] *Francis Fong, "Why we need to start thinking seriously about universal basic income ," CPA Canada, August 8, 2020: https://www.cpacanada.ca/en/news/pivot-magazine/2020-08-20-universal-basic-income*

PART IV
STAKEHOLDERS AND STRATEGIES

PRAGMATIC WAYS TO IMPROVE THE SOCIAL IMPACTS OF TECHNOLOGY

STAKEHOLDERS AND STRATEGIES
PRAGMATIC WAYS TO IMPROVE THE SOCIAL IMPACTS OF TECHNOLOGY

Part IV of this paper provides an overview of (a) the **stakeholders** involved in improving the social impact of technology and (b) the **strategies** being used by these stakeholders to improve technology's social impact, as identified by interviewees. These strategies include a focus on the following topics:

SETTING THE AGENDA: DIRECT ACTION, ACTIVISM, AND ADVOCACY

PUBLIC ENGAGEMENT

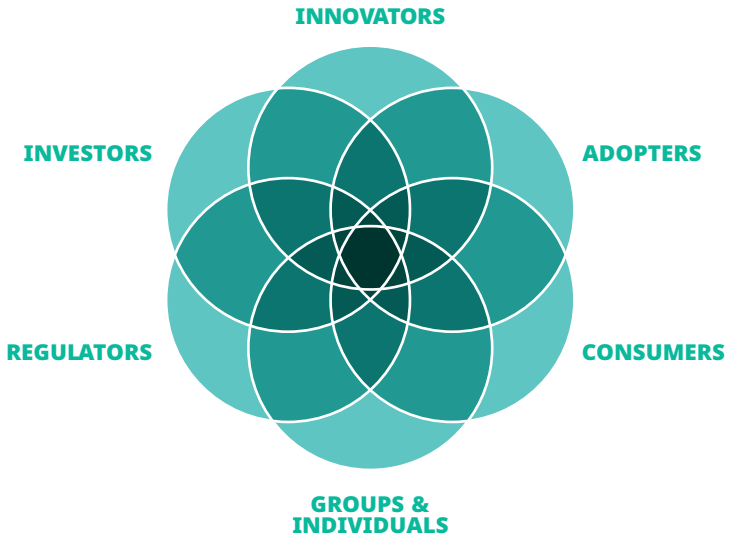
POLICY AND REGULATION

EDUCATION AND TRAINING

TECHNOLOGY FOR GOOD

Stakeholders Across the Innovation Lifecycle

Across the innovation lifecycle, from investment to purchase, is a broad range of stakeholders: regulators, investors, innovators, adopters, consumers, and more. Broadly speaking, an innovation might implicate anyone, including groups and individuals not directly involved in its production or adoption. This could include academics, consultants, or not-for-profits focused specifically on ethical tech. When an innovation process implicates certain rights, such as land rights, consultation rights, or privacy rights, the *rightsholders* are implicated as well.



Stakeholder Responsibility

> We (the Center for Humane Technology) see responsibility everywhere: in design for tech companies; for policymakers, to regulate; best practices for investors; ESGs for shareholders, etc."
>
> **— Shari Harrison, Founder and CEO, Second Nature Innovation, (ex-Apple, ex-Microsoft)**

When asked which stakeholders are responsible for the social impacts of tech, the vast majority of interviewees resoundingly stated, "everybody." Investors hold responsibility for the technology they support, innovators hold responsibility for the technology they create, adopters and consumers hold responsibility for the technology they create a market for, and regulators hold responsibility for the technology they enable. This principle is reinforced by the many mechanisms for ensuring ethical technology across the innovation lifecycle: each is focused on a specific lifecycle stage and designed for use by different stakeholders.

Necessarily, when "everyone" is responsible for an outcome (as is the case with ethical technology) it means responsibility for that outcome is shared—and shared responsibility[73] has important implications for accountability and enforcement. On one hand, shared responsibility can fill in gaps not covered by individual responsibility[74] by enabling accountability in the spaces between actors and their individual actions. At the same time, shared responsibility can result in a diffusion of responsibility, where each actor becomes slightly less responsible for the common outcome they contribute to, yet more capable of shifting blame for that outcome onto someone else.[75] This can make it more difficult for regulatory authorities to ensure transparency, enforce rules, and hold individual stakeholders accountable. It can also make it more difficult for stakeholders to hold one another accountable. For example, a consumer or adopter may have a hard time deciphering the web of organizational partnerships and arrangements that go into creating a single product or service.

The technology sector—which is ripe with partnerships and regularly crosses international borders—is perhaps more prone to the implications of shared responsibility and diffusion of responsibility than others. Domestic laws governing ethical concerns can differ substantially in each jurisdiction—consider, for example, the difference in laws governing privacy and AI in Europe, the United States, and Canada. The feasibility of enforcing domestic law internationally further complicates difficulties stemming from shared responsibility and accountability in tech.

[73] *Shared responsibility refers to "situations where a multiplicity of actors contributes to a single harmful outcome, and legal [or moral] responsibility for this harmful outcome is distributed among more than one of the contributing actors." Andre Nollkaemper, "The duality of shared responsibility," Contemporary Politics 14, no. 5, 2018, pp. 524-544.*

[74] *Shared responsibility refers to "situations where a multiplicity of actors contributes to a single harmful outcome, and legal [or moral] responsibility for this harmful outcome is distributed among more than one of the contributing actors." Andre Nollkaemper, "The duality of shared responsibility," Contemporary Politics 14, no. 5, 2018, pp. 524-544.*

[75] *Andre Nollkaemper, "The duality of shared responsibility," Contemporary Politics 14, no. 5, 2018, pp. 524-544; Christopher Hood, The Blame Game: Spin, bureaucracy, and self preservation in government, Princeton: Princeton University Press, 2011.*

Looking forward, it will be important to identify tools and best practices that can mediate these challenges and ensure transparency and accountability in tech, even where shared responsibility, complex networks of actors, and cross border enforcement makes it difficult.

WHAT'S NEEDED TO COUNTERACT THESE EFFECTS?

No stakeholder is entirely responsible for the social impact of technology. In the ethical technology field, there is a risk of either over-implicating innovators, designers, and engineers (creating an overwhelming burden) or sharing responsibility diffusely, with the potential for investors, users, innovators, policymakers, and others able to shift blame for negative outcomes to other parties. Instead, clear and achievable tasks for each stakeholder are needed: a small shift toward manageable accountability and an attitude of, "we each do what we can." To ensure the production of ethical technology, each stakeholder must use the moderate tools at their disposal, ranging from activism, to education, to technology solutions or "tech for good." The following section discusses the various ways stakeholders can turn their responsibility into action, from a wide range of perspectives.

Setting the Agenda: Direct Action, Activism, and Community Organizing

One of the major avenues of effecting change to address social impacts of technology is activism. Activism refers to direct and vigorous action in support of or opposition to one side of a controversial issue.[76] In this context, digital technology activism often touches on topics such as privacy, surveillance, bias, civil liberties, or labour.

A related approach is community organizing, which refers to a process where people who live near each other come together into an organization that acts in their shared self-interest.[77] Other definitions of community organizing use the concept of "constituencies,"[78] groups of people involved in or served by an organization (rather than simply being defined by geographic range). It has been argued that community organizing is distinguishable from activism if activists are limited to engaging in social protest without a coherent strategy for building power or accomplishing specific changes.[79]

Activism might arise due to concerns over a perceived lack of consultation or social licence for a given project or development, or a lack of regulation. Activism has also been tied to the rise of digital technologies and "digital activism" or "cyberactivism," which has existed since the 1980s.[80] Cyberactivism refers to a

[76] *"Activism," Ohio University Libraries, accessed Sept 8 2020: https://libguides.library.ohio.edu/activism*
[77] *"Community Organizing," Participedia, accessed Sept 8, 2020: https://participedia.net/method/622*
[78] *Dave Beckwith and Chrstina Lopez, "Community Organizing: People Power from the Grassroots," Centre for Community Change, accessed Sept 8 2020: https://comm-org.wisc.edu/papers97/beckwith.htm*
[79] *"Lobbying," OECD, accessed Sept 8, 2020" http://www.oecd.org/corruption/ethics/lobbying/ Chambers, Edward T; Cowan, Michael A. https://archive.org/details/rootsforradicals00edwa; Richard, JS, "Organizing vs Activism," Organizing Work, Oct 1 2018: https://organizing.work/2018/10/organizing-versus-activism/*
[80] *Marcela A Fuentes, "Digital Activism," Britannica, accessed Sept 8 2020: https://www.britannica.com/topic/digital-activism*

number of activities, including online activists' efforts to use the internet (and other technologies) as a medium to reach massive audiences, as well as the targeting of technologies that are seen as problematic. This diversity of activities reflects a tension within the cyberactivist community, as there are criticisms that many early internet activists embraced freedom of speech and digital privacy but missed long-term challenges on the horizon, such as platform monopolies and the challenge of moderating misinformation or dangerous content.[81]

Lobbying often has a negative connotation, invoking the image of well-financed special interest groups applying disproportionate pressure to political decision-making. This paper uses the term in a broader context to include organizations that use advocacy and public awareness-raising to communicate their concerns. The OECD notes that lobbying can be a positive force in democracies, but also risks "powerful groups influencing laws and regulations at the expense of the public interest."[82] In essence, this paper uses these terms to describe the aims of changing a policy or practice, including the "consumer lobby," which might cause a company to change its practices.

Successes and Challenges in Activism and Lobbying

Different types of collective pressure, both from dedicated activists and from the broader public, has had successes in enacting reforms against the negative social impacts of technology. One interviewee raised an example of progress in removing terrorist content from social media, especially after the Christchurch shootings in New Zealand. Indigenous activism in Canada has also seen some measure of success in securing environmental protections[83] against resource development companies and various levels of government.[84]

Consumers and the broader public have an important role to play in influencing change in organizations. For example, increasing societal recognition of the current and future environmental challenges caused by human activity has led to consumers using their purchasing power to pressure companies to offer more sustainable products (with reduced packaging or carbon emissions).[85] Another prominent example that arose during the study was consumer advocacy (amid backlash) to pressure videoconferencing service Zoom into resolving security concerns at the beginning of the COVID-19 pandemic: while Zoom may not have been violating laws, the design of their technology was not consumer-rights friendly, and they faced pressure from competitors to be more transparent and

[81] *Mike Godwin, "Did the Early Internet Activists Blow It?," Slate, Feb 14, 2020: https://slate.com/technology/2020/02/three-decades-internet-freedom-activism.html*
[82] *"Lobbying," OECD, accessed Sept 8, 2020" http://www.oecd.org/corruption/ethics/lobbying/*
[83] *Rayanna Seymour-Hourie, "Indigenous activism in Canada's past, present and future," West Coast Environmental Law, July 1, 2020: https://www.wcel.org/blog/indigenous-activism-in-canadas-past-present-and-future*
[84] *Brent Jang, "'Milestone' proposed deal between Wet'suwet'en Nation, Ottawa, B.C. would recognize hereditary system," Globe and Mail, March 1, 2020: https://www.theglobeandmail.com/canada/british-columbia/article-wetsuweten-nation-proposed-deal-land-title-coastal-gaslink-pipeline/*
[85] *Blaine Friedlander, "Execs: Consumers pushing companies toward sustainability ," Cornell Chronicle, March 25, 2020: https://news.cornell.edu/stories/2020/03/execs-consumers-pushing-companies-toward-sustainability*

respectful of human rights. For example, concerns over suspending the Zoom accounts of human rights activists at the request of the Chinese government led to criticism[86] from activists and US lawmakers, and the company responded by not allowing requests from Beijing to impact users outside of China.[87]

Nevertheless, direct and collective action also comes with challenges. One interviewee made the point that consumer purchasing power, while important, is too often invested with the sole responsibility for governing the production of ethical technology—the argument that it is ethical to produce "whatever there is a market for" overlooks the responsibilities of other stakeholders. In addition, study respondents voiced concerns about the role of special interest groups in managing the social impacts of technology. To provide a sense of scale, it was reported that the five largest technology firms in the US spent $582 million to influence legislation.[88] As an interviewee in this study noted, these industry groups (or informal technology coalitions) typically represent companies advocating a position, rather than necessarily finding out what the public wants.

The increasing scope and complexity of the issues emerging from technology development means that it is difficult for even the best resourced and well-educated human rights activists to keep up with privacy challenges or data tracking (let alone the public, who might lack the time and knowledge to dive into these concerns). Nonetheless, interviewees noted that civil liberties organizations continue to intervene and litigate for public interests.

Successes and Challenges in Local Activism and Community Organizing

Activism and community organizing can also take place in more localized settings that do not necessarily rely on the leverage of broader public sentiment. As discussed, "local" may refer to a geographic region or a "community" formed around a shared organization or interest, such as remote workers for the same company. An interesting example of community-based activism is small farmers in agricultural communities who have banded together. There have been increasing concerns over the inequity between large and small farmers, as well as the balance of power with larger agrobusinesses. Digital technologies have spread to many industries, and companies like Monsanto[89] have purchased data companies to bring together digital agriculture along with their other IP interests, like GMO crops.[90] Furthermore, agricultural machinery is now precision, digital

[86] *Yaqiu Wang, "China's Zoom Bomb', Human Rights Watch, June 16, 2020: https://www.hrw.org/news/2020/06/16/chinas-zoom-bomb*
[87] *Helen Davidson and Lily Kuo, "Zoom admits cutting off activists' accounts in obedience to China," The Guardian, June 12, 2020: https://www.theguardian.com/world/2020/jun/12/zoom-admits-cutting-off-activists-accounts-in-obedience-to-china*
[88] *AJ Dellinger, "How The Biggest Tech Companies Spent Half A Billion Dollars Lobbying Congress," Forbes, April 30, 2019: https://www.forbes.com/sites/ajdellinger/2019/04/30/how-the-biggest-tech-companies-spent-half-a-billion-dollars-lobbying-congress/#4e2cf91757c9*
[89] *Monsanto was acquired in 2018 by Bayer and the name has largely been removed due to the negative associations with the brand. However, the companies will continue to operate as separate legal entities in many countries in the next several years. Source: https://www.bayer.com/en/procurement/monsanto-acquisition ; https://www.washingtonpost.com/news/wonk/wp/2018/06/04/why-monsanto-is-no-more/*
[90] *Jason Davidson, "Bayer, Monsanto and Big Data: Who will control our food system in the era of digital agriculture and mega-mergers? ," Medium, March 30, 2018: https://medium.com/@foe_us/bayer-monsanto-and-big-data-who-will-control-our-food-system-in-the-era-of-digital-agriculture-aae80d991e4d*

machinery. John Deere tractors are filled with sensors and tightly controlled by company software. This space is highly contentious, as farmers have traditionally wanted to be able to use and repair their equipment, but there are now issues over **"right-to-repair"** and how much power companies should have to control their products after they are purchased.[91] Issues of how users may 'tinker' with their products that they own (or have licence to use, with end-user licensing agreements and terms of service) remain contentious as digital rights management (DRM) can limit the use of physical and purchased products. As a result of these developments, some farmers are organizing to develop open-source tools and coalitions (such as the GOAT: Gathering of Open Agricultural Technologies[92] or Farmhack).[93]

Concerns over the negative impact of digital technologies has also led to increased activism and organizing in the technology sector. This is unusual, as the white-collar technology sector has rarely been characterized by collective organizing or social activism. Kickstarter has achieved union recognition, Amazon workers led a cross-technology industry walkout in support of climate change activism, while other players have faced internal hostility against perceived unethical partnerships and government contracts.[94] Workers have also organized with common interests when facing technology-based challenges. For example, ICTC researchers heard an example of pushback against the implementation of new technology for smart infrastructure in a European city due to concerns over its impact on existing workers. A labour researcher, Kai-Hsin Hung, noted "we need opportunities and institutional support for workers to band together to have control over the design and use of technology and the data collected about them in the workplace and at home, so that you and I can have meaningful voice and agency in how this digital transformation occurs (and how it will affect one's work)."

Digital technologies have also been used for workers to communicate and organize. The ongoing COVID-19 pandemic has exacerbated concerns over worker rights and safety, whether for unprotected and uninsured gig workers or those working in large distribution warehouses.[95] There have been efforts for greater coordination by gig workers to push back against digital platforms through organizations like Gig Workers Rising[96] and the International Alliance of App-based Transport Workers (IAATW).[97] It has been noted that "technology has made organizing easier,"[98] with workers using Telegram and Slack to help overcome difficulties of coordinating across large geographic distances. In addition, essential workers like grocery workers and retail employees have used digital

[91] *Kyle Wiens and Elizabeth Chamberlain, "John Deere Just Swindled Farmers out of Their Right to Repair," Wired, Sept 9, 2018: https://www.wired.com/story/john-deere-farmers-right-to-repair/*
[92] *GOAT: Gathering for Open Agricultural Technology, accessed Sept 8, 2020: http://goatech.org/*
[93] *Farmhack Blog, accessed Sept 8, 2020: http://blog.farmhack.org/*
[94] *Nataliya Nedzhvetskaya and JS Tan, "What we learned from over a decade of tech activism," Dec 23, 2019: https://www.theguardian.com/commentisfree/2019/dec/22/tech-worker-activism-2019-what-we-learned*
[95] *Ibid.*
[96] *Gig Workers Rising, accessed Sept 8, 2020: https://www.coworker.org/partnerships/gig-workers-rising*
[97] *Sanjana Varghese, "Gig economy workers have a new weapon in the fight against Uber," Wired, Feb 17, 2020: https://www.wired.co.uk/article/gig-economy-uber-unions*
[98] *"Could the pandemic give America's labour movement a boost?" The Economist, May 9, 2020: https://www.economist.com/finance-and-economics/2020/05/09/could-the-pandemic-give-americas-labour-movement-a-boost*

networks to connect and share information. Increasingly, workers are turning to online communities like Reddit or private Facebook groups for vital information,[99] particularly during the early days of the pandemic marked by confusion and limited corporate communications and coordination. It has been argued by some workers that:

> With the state of business and capitalism in this country, there's been a real crackdown on the flow of information. So these communities are really crucial to cutting through that. It's an asymmetric form of organization... There's no control of this [Facebook group] by the company itself. They can have all sorts of policies in place to limit social media or the ways we interact with the public as Kroger employees, but they don't change the fact that we have these rights under the National Labour Relations Act. These communities are one great example of that.[100]

While digital technology has undoubtedly had negative impacts, it is worth noting the original possibilities championed in the early internet era. These technologies are tools and can also be used for collective efforts to share information and coordinate organization for community causes.

Public Engagement

Public engagement is an essential component of responsible technology and policy design. Market researchers, regulators, and engineers all may use engagement methods to assess what the public, users, or other stakeholders desire to see in an end product. Best practices in this field are heavily documented, and there is a wide and unending variety of methods for facilitation, mediation, and communication. Rowe and Frewer (2005) for example, classify three broad types of public engagement methods:

> **Public communication,** in which an organizer conveys information to the public (uni-directional). For the purposes of this paper, this particular subject is discussed in the section on Education, while this section focuses on public feedback and dialogue.
>
> **Public consultation,** in which an organizer elicits information from the public (also uni-directional), and
>
> **Public participation,** in which there is an exchange of information and dialogue between the organizers and the public.[101]

[99] *Luke Winkie, "Grocery workers are using Facebook and Reddit to swap stories and information," Vox, May 8, 2020: https://www.vox.com/the-goods/2020/5/8/21241887/trader-joes-walmart-kroger-facebook-reddit-information-safety-gloves-masks*
[100] *Ibid.*
[101] *Gene Rowe and Lynn J. Frewer, "A Typology of Public Engagement Mechanisms," Science, Technology, and Human Values, Vol. 30 No. 2, 2005: pp. 251-290.*

Interviewees working to improve the social impacts of technology frequently referred to consultation and "upstream engagement" as essential components of anticipating and mitigating the negative social impacts of technology. Designers of technology and policy may conduct engagement on topics as diverse as:

The privacy features of a new application or platform, such as a social media service;

The information governance of an urban development project, such as Sidewalk Labs;[102]

The appropriate placement of a renewable energy development, such as a windfarm;

Inclusive interface or product design, such as in UX research that engages with persons with disabilities (PWD);

Intellectual property strategy and patenting policy; and

The potential unanticipated impacts of any technology implemented in diverse contexts.

Most interviewees, when asked to define a successful public engagement effort, commented that it should be genuine, with clear goals and outcomes. As such, an exploration of what engagement means, how it is successfully achieved, and common pitfalls is an essential component of this study.

Why Engage?

> All of it is prefaced on the idea that there are multiple kinds of expertise. Credentialed scientists have a really important role to play when it comes to technical decision-making, but there is room and a need for other kinds of expertise as well.
>
> **— Kelly Bronson, University of Ottawa/Institute for Science, Society and Policy**

> The thing that does work is to engage as many stakeholders as possible and really listen to what they have to say, as early as possible in the process. I think that if you just explain the policy to people and why you're working toward it, and give them time to come to the same conclusion, that's a very good way to ensure that policy really works. Early engagement, transparency, communication.
>
> **— Marie-Louise Bilgin, Ministry of Infrastructure and Water Management of the Netherlands**

[102] *Sidewalk Toronto, Accessed Sept 8, 2020: https://www.sidewalktoronto.ca/events/public-roundtable-3/*

Public engagement is motivated by a broad variety of factors—democratization of technical decision-making, inclusivity, anticipation, and many if not all of the principles discussed in the introduction to this paper. Engagement or consultation is not only "the right thing to do," as one interviewee noted: it is also often strategic—technologies need to gain social licence to succeed in the marketplace, and they also need to navigate regulatory and ethical waters to continue succeeding over time. Similarly, technology policy, regulation, or normative frameworks like "privacy by design" or "safety by design" require multi-stakeholder feedback and buy-in in order to succeed across the board.

Why Not Engage?

> A lot of the time people are perplexed—they're like, we did consultations with end users, so what happened? But what they fail to understand is that they didn't take a robust research approach to it. They went into the process with a confirmation bias.
>
> **— Public Engagement Consultant, Anonymous**

Common critiques of engagement frequently pertain more to engagement done poorly than engagement in general. For example, the critique that engagement may subsume expertise (e.g., in a case such as a referendum on a complex topic) might be avoided by tailoring goals to reflect the expertise that participants hold and involving a wide variety of stakeholders in designing and leading a policy, rather than saying "yes" or "no" to something fully formed. However, several meaningful critiques of engagement for engagement's sake were raised during interviews:

Engagement takes time and money. Particularly for smaller private sector organizations, it might be difficult to earmark resources for engagement unless doing so is a regulatory requirement. In some cases, such as UX research, engagement has a tangible value proposition—in others, where engagement is more about understanding a product's long-term impact on people and/or the environment after it has traded hands several times, upstream engagement may still be "the right thing to do," but it remains undeniably expensive and difficult. A burgeoning industry of third-party consultants is growing to help companies with this effort, and regulators in some parts of the world are tying consultation requirements to grant and R&D funding, but this challenge still has a long way to go to be overcome. It is possible that only a slow movement to normalize considering the social impacts of technology (in a similar way to now normalized considerations of workplace health and safety) will make this change.

Engagement that has no chance of impacting decision-making should not be held. Nearly all interviewees agreed that this is a quick way to lose public trust. For example, some respondents in the third-

party consulting space discussed the problem of clients hiring them to do engagements that were intended to check a box, without any intention to follow up on recommendations. In these cases, consultants find themselves needing to work on "organizational culture readiness" for their clients, to create "enlightened proponents" of the work they're doing—a task that is not always achievable, nor a stipulated part of their work.

It is important that engagement not be haphazard. A robust approach, with clear methods, goals, and design, is key to success.

Case Study: Is Engagement Ever Risky? The Sidewalk Labs Situation

The Waterfront Toronto and Alphabet "Sidewalk Labs" Smart Cities project was cancelled on May 7, 2020, while this study's interviews were being run—accordingly, several interviewees commented upon it as a unique case study. For some, it remains unclear whether the project's contentious engagement process or the stated "economic uncertainty" raised by the beginning of COVID-19 contributed more to the project's end, but no interviewee suggested that engagement had gone particularly well for the project proponents.

The two quotations below illustrate different existing takes on Sidewalk Labs' consultation process, the first suggesting that the quality and type of engagement resulted in failure; the second suggesting that complex and technical topics may not be appropriate for public debate. Several of the best practices for public engagement on technical topics, listed later in this section, speak further to this discussion.

> There was a partnership between a vendor and a public agency. A lot of the initial consultation was vendor-led, and there was a sizable proportion of residents that were concerned about that… Then, when Waterfront Toronto took over those consultations from the vendor, they continued to run them in ways that still attempted to constrain the kinds of conversations that could be had. That, again, caused a lot of public opposition and negative perceptions of the project, as well as of the public agency's role in facilitating the project, which, from an advocacy point of view, they deserved. But even if I were to flip it and be on the public agency side, that is, enthused about the project, that prescriptive approach to consultation was truly unnecessary because a genuine meaningful consultation could have eventually led to different outcomes.
>
> **— Privacy Expert, Anonymous**

> Many people can relate to topics like privacy, but when you're talking about a more niche project, people may need to be educated if they want to participate in the discussion. When it comes to privacy, lots of people want to get involved in the discussion, but for us, with such a niche area of focus, we can only engage people who have an understanding of the tools. It's a much more limited group of people.
>
> **— Technologist, Anonymous**

Engagement Methods

> There's a lot to unpack there. It ultimately depends on what you're trying to do. The first thing is for there to be clear expectations."
>
> **— Rachel Shin, Academy for Sustainable Innovation**

> In terms of how to facilitate things, it's about creating a strong context before a meeting. I always write a CPR—context, purpose, results."
>
> **— Mary-Kate Craig, Anwaatin Inc.**

There are hundreds of methods for public engagement. The site Participedia offers a list of 327 methods and resources[103] for engaging the public in different ways: from one-on-one interviews, to public debates, to participatory concept mapping. Large international organization such as the International Association for Public Participation (IAP2) exist to help foster professional development in participation methods around the world.[104] This paper does not seek to create an exhaustive list of engagement methods, but to illustrate the diversity of pragmatic tools that can be harnessed for effective consultations, along with the best practices associated with them.

Some interviewees had clear types and names for the methods they used in their work, including several that take a psychological approach to understanding users and policy impacts (e.g., behavioural insights,[105] an approach espoused by the OECD for effective policy design). Other methods, such as the body of tactics known as deliberative methods,[106] move the focus from psychology to dialogue and consensus. Each of these sets of methods has an extensive army of practitioners and resources, and it is important to select methods carefully through sound knowledge of participants, goals, topic, and facilitators.

[103] *Participedia, accessed Sept 8, 2020: https://participedia.net/*
[104] *International Association for Public Participation, accessed Oct 10, 2020, https://www.iap2.org/mpage/Home*
[105] *"Chapter 1. Introductory guide to BASIC," OECD, accessed Sept 8, 2020: https://www.oecd-ilibrary.org/sites/9ea76a8f-en/1/2/1/index.html?itemId=/content/publication/9ea76a8f- enand_csp_=8eae351f7e3b3dcec1ef7c6c5776219fanditemIGO=oecdanditemContentType=book*
[106] *"Deliberative Engagement Methods," nsfconsulting, accessed Sept 8, 2020: http://nsfconsulting.com.au/deliberative-community-engagement-methods/*

Best Practices

What does "success" mean in public engagement or consultation, and what are the components of "success"?

Even though interviewees came from a broad spectrum of disciplines, industries, and sectors, those who engaged in consultation agreed on some central principles:

I **IF YOU'RE GOING TO ENGAGE, DO IT EARLY.**
Engagement should be "upstream"—it is essential to consult stakeholders early in a project, before project decisions are already made. Never do engagement that is just a PR exercise. Ideally, involve participants in the design stage of policy or technology.

II **HAVE CLEAR GOALS AND OUTCOMES.**
Go into your engagement with clearly established goals and outcomes that participants know about. Offer follow-up and some kind of tangible deliverable.

III **INVITE A DIVERSITY OF PARTICIPANTS AS WELL AS SUBJECT-MATTER EXPERTS, AND DESIGN YOUR SESSIONS TO INCLUDE THOSE WHO ARE LESS FREQUENTLY HEARD.**

Interviewees often commented on the importance of a wide variety of participation: "bringing in as many voices as possible."

Actively invite and include stakeholders who are not often invited to engage, or not often able to attend. Consider tactics like demographic segmentation to ensure that you have convened a diverse group, and do not assume that those who make it to a formal group engagement session are representative of the broader population.

Schedule engagements at a variety of times and days so that a variety of people will be free and able to attend (e.g., always holding engagements during a 9–5 weekday will exclude many without flexible workplaces).

Be aware of how position and worldview have shaped engagement goals and topics. The engagement agenda is likely to be shaped by the assumptions and preconceptions of a project team. Many new engagement methods exist to enhance participation not only in decision-making, but also in setting an engagement's agenda.[107]

Be aware of power imbalances in engagement sessions. If some voices are louder than others, select a facilitation method that helps to mitigate this, and/or conduct interviews with those who do not choose to speak or who are not able to attend.

[107] *See, for example, Jason Chilvers and Matthew Kearnes, "Remaking Participation in Science and Democracy," Science, Technology, and Human Values 46, no. 3, 2019, pp. 347-380.*

> Yep, I've been part of imbalanced consultation. It's where there's too much representation from government and not enough representation from end users… I've been in consultation rooms where there have been 22 of my colleagues and three average people, and it just felt more like an ambush to them than anything else.
>
> **— Public Engagement Consultant, Anonymous**

IV ENSURE THAT THE ENGAGEMENT TEAM OVERLAPS WITH DESIGN AND DECISION-MAKING TEAMS.

Related to ensuring that the right diversity of participants attends, engagement must not be siloed from product or policy development. In the case of large companies, large departments, and organizations that hire engagement consultants, there is a risk that stakeholder "exercises" will not be meaningfully communicated to design and decision-making teams.

> There are entire divisions of companies that seem like they do nothing but go and do exercises with various stakeholders. They work with stakeholders to redesign features so that these stakeholders can understand the complexities and trade offs of what they're doing. But how well those public outreach teams are connected to the teams that make the decisions is unclear. I think companies don't want their product teams to be too big, and they also have a hard time creating an interface between consultation groups and design groups.
>
> **— David Jay, Head of Mobilization, Center for Humane Technology**

V SELECT A METHOD APPROPRIATE TO YOUR AUDIENCE, TOPIC, AND GOALS.

The engagement method, and the degree of information it communicates prior to dialogue, should reflect both the topic and the audience.

Is your session intended to communicate, consult, or create dialogue?
As illustrated in the opening of this section, these are three different goals with different types of relevant methods.

What is the current state of public awareness around the topic?
Will the activity be considering a technology that people have extensive familiarity with (such as wind energy or solar power) or something new, unfamiliar, without common metaphors/understandings already in place (such as machine learning, synthetic data, or carbon capture and storage)?

Tailor complex topics to focus on your participants' expertise. Avoid the idea that engagement on a complex topic has to be "dumbed down" for a public or non-specialist audience. Rather, recall the premise that "there are multiple kinds of expertise," where scientists and engineers bring one kind of expertise to the table, and the public or users will be much more equipped than other parties to figure out how a technology will be used and the impact it will have on existing patterns of life. Consider allowing participants to define their own subjects of interest with a less leading engagement method.

Select a method with consensus or diversity in mind. Is engagement intended to lead to consensus (e.g., we are moving forward with this project, yes or no) or diversity (e.g., how many different types of people may use this technology, in what ways)? Select a method carefully based on engagement goals: for example, consensus conferences are one form of deliberative method that aim to find common ground in contentious topics, though typically to improve public communications rather than to derive policies.[108]

VI ITERATE.
Particularly when involving stakeholders in policy or technology design, craft your approach to be iterative—shape a product based on initial findings then bring it back for refinement and troubleshooting.

VII BE WILLING TO CHANGE YOUR MIND.
Perhaps most importantly, engagements must be genuine: it is important for participants to feel that dissent, should it exist, will be registered and treated with respect. This lesson is explored and reiterated in the subsequent case study on the history of Indigenous consultation in Canada.

Case Study: From Indigenous "Consultation" to "Co-ownership" and Lessons for Other Sectors

Best practices in technology-related public engagement and consultation in Canada have learned from an extensive history—including several breakthroughs and many missteps—of engagement with Indigenous peoples regarding land-based renewable and non-renewable energy technologies. Interviewees who discussed this topic raised several key moments in Canadian history, including the Mackenzie Valley Pipeline Inquiry and the Impact Assessment Act 2019 (IAA 2019), as key innovations in responsible engagement for energy technology projects. The unique context of land-based rights, the duty to consult, and private sector development interests has gradually produced a number of core lessons for responsible consultation and engagement that can benefit other sectors.

Echoing the best practice "be willing to change your mind," several scholars who have written about energy consultations in Canada have commented upon the damage that a hollow process can do to trust, reputation, and participants in consultations, who may be forced to repeat themselves to no end:

> The cumulative effect of this disappointment (with consultations and impact assessment) is a psychological and spiritual fatigue, occurring around the older, more traditional members of the community. They are tired of expressing the same concerns and telling the same stories, which seem to have no effect on the course of development.[109]

[108] *"Consensus Conference," Participedia, accessed Sept 8, 2020: https://participedia.net/method/163#:~:text=Consensus%20conferences%20are%20meetings%20designed,common%20ground%20regarding%20contentious%20issues.*
[109] *Remarks of the authors of the Environment Impact Assessment – Kearl Lake Project. (Imperial Oil, 2005:6-2) in Janelle Marie Baker and Clinton Westman, "Extracting knowledge: Social science, environmental impact assessment, and Indigenous consultation in the oil sands of Alberta, Canada," The Extractive Industries and Society 5, no. 1, 2018, p. 145.*

SUCCESSES AND INNOVATIONS IN CONSULTATION RAISED BY INTERVIEWEES

The Mackenzie Valley Pipeline or "Berger" Inquiry (after Justice Thomas Berger) of 1974-1977 resulted in the report Northern Frontier, Northern Homeland and introduced several important practices, such as holding hearings within communities and providing interpretive services for individuals to testify in their own languages, as well as encouraging radio and press coverage (fostering both accessibility and accountability). In addition, the inquiry's decision, that a pipeline should not be built for at least 10 years, reinforced that testimony had a genuine impact.[110] The IAA 2019 was also discussed by interviewees as a promising step in improving the status and standard of impact assessments in Canada. For example, one interviewee noted that the act contained a stipulation that impacted communities co-author the impact assessment, while others have commented upon its commitment to "meaningful participation" and its role as an instructive example of an act that grapples with the balance of broad public interest and just recognition of Indigenous perspectives.[111]

As noted in several interviews, lessons from engaging with Indigenous nations in Canada are directly applicable to other situations where a project proponent is working with a geographic community for implementation—in addition to energy projects, other examples might include smart cities technologies that influence urban planning, or mobility and transit technologies. Engagement that includes co-ownership and shared returns, along with an active effort to match project goals to community priorities and pre-existing patterns of life, is more likely to meet with success.

> Projects that try to embed themselves in the practices that already exist—consulting either the stakeholders around them or consumers—in a way where they give new opportunities: those are better examples than those who come in to change everything because there's a great opportunity that they've identified before doing any stakeholder consultation.
>
> **— Zoë Robaey, Assistant Professor in Ethics of Technology, Wageningen University**

[110] *Frances Abele, "The Lasting Impact of the Berger Inquiry into the Construction of a Pipeline in the MacKenzie Valley," in Commissions of Inquiry and Policy Change: A Comparative Analysis, Gregory Inwood, Carolyn Johns (Eds), Toronto, University of Toronto Press, 2014, pp. 88-112.*

[111] *Gwendolyn Blue, Kelly Bronson, and Alana Lajoie-O'Malley, Beyond participation and distribution: a scoping review to advance a comprehensive justice framework for impact assessment, Social Sciences and Humanities Research Council and Impact Assessment Agency of Canada, 2020.*

Policy and Regulation

What is Policy and Regulation?

Policy and regulation tend to be associated exclusively with government action, though importantly, they exist elsewhere in other forms. Just as governments establish policy and regulation in their respective jurisdictions, market actors like professional bodies and industry associations establish professional standards, codes of conduct, industry certifications, and more. Together, government and market-led responses can seek to govern innovation, mitigate negative impacts of technology, and maximize positive ones.

The Spectrum of Policy Instruments: Government Regulation and Market Regulation

ACTOR	NO ACTION	INDIRECT ACTION	DIRECT ACTION
Gov. led gov, public driven	Ad-hoc decisions around the social impacts of tech No clear, universal examples of right and wrong	Tying grant funding to specific outcomes Tying grant funding eligibility to SIAs/PIAs Tying grant funding or government procurement to almost anything Tying tax breaks or other incentives to certain kinds of behaviour Tying taxes or other disincentives to negative behaviour Funding/promoting social impact of technology experts	Defining legal and illegal activity Establishing de jure standards Creating legal obligations (e.g., PIAs and moving burden of privacy from consumer) Creating a right and establishing rights holders (data subject rights, labour rights, consultation rights) Requiring permits or approval for certain kinds of activities
Market led, consumer / industry driven	Ad-hoc decisions around the social impacts of tech No clear, universal examples of right and wrong	Thought-leading Creating industry "best practices" Creating industry guidelines Marketing claims and other incentives for consumers/ branding Consumer education	Creating mandatory professional standards (Engineering, for example) Creating product standards, certifications Creating professional certifications

Figure 8: *The Spectrum of Policy Instruments, ICTC, 2020*

Inclusive Regulation

As with all aspects of innovation, policy and regulation should be informed by consultation and engagement with relevant stakeholders, and embody principles of inclusion, diversity, and reflexivity. Similarly, policy and regulation should be designed and implemented in a way that is fair and takes the needs and preferences a broad range of stakeholders into consideration. Interviewees in this study highlighted the importance of diversity and inclusion, not just in technology development, but in technology governance as well. Technology governance, both in Canada and around the world experiences an acute lack of diversity and inclusion. For example, although it has near-equal gender representation, the Government of Canada's Advisory Council on Artificial Intelligence can benefit from increased representation of people of colour. Other venues for public consultation on AI, such as the Office of the Privacy Commissioner's consultation on AI and PIPEDA (the Personal Information Protection and Electronic Documents Act), can also be difficult to access for members of the general public, as significant time investments and prior knowledge of the subject area are necessary prerequisites to contributing.

Government Policy and Regulation

Government responses to new technologies range from direct regulation, to indirect policy responses like tax incentives or funding criteria, to no response at all. Direct regulation, which clarifies legal or illegal activity in a space, will often serve to "raise the floor" of innovation by prohibiting certain behaviours or outcomes or creating mandatory standards that innovators must adhere to. Data protection standards and environmental standards are a good example of this kind of response. In other contexts, however, direct government responses may also serve to address power imbalances created or exacerbated by new technology. In such cases, new categories of rights—privacy rights, labour rights, land rights, or consultation rights, for example—can provide disadvantaged or underrepresented groups the leverage needed to counteract negative outcomes from emerging tech. Where direct regulation is unwarranted or unfitting, indirect responses can instead be used to influence the behaviour and decisions of actors involved in innovation. Tax incentives or disincentives can impact cost-benefit analysis and decision making, and eligibility requirements for public funding programs can alter innovators' priorities. Some programs, for example, require innovators to conduct PIAs, environmental impact assessments, or algorithmic impact assessments for projects in order to access funding.

Governments are uniquely positioned to establish regulation and policy that applies universally in their respective jurisdictions—impacting all relevant innovators equally and in turn, raising the floor of innovation. This ability is somewhat unique to government actors, along with enforcement power; where chosen measures have clear enforcement mechanisms, with teeth, direct

government responses can be an effective way to secure outcomes. Regulation and policy without clear and effective enforcement mechanisms, on the other hand, are often disregarded by industry. Interviewees in this study were quick to note that under financial or other resource constraints, innovators will often opt for doing only what is necessary. Amid many competing priorities, the "go-to" standard tends to be what is *legally required.* Similarly, when new regulations or policy frameworks invoke changes in the design or development process, it usually also costs innovators money, and innovators will be hesitant to enact those changes without adequate incentive. Often, that incentive needs to be in the form of enforceable legislation and government oversight.

That said, governments do experience some challenges responding to new technology. For one, their legitimacy to create, enact, and enforce new regulations and policy is often contingent on public consensus, and when technologies are new and their impacts are still only being discovered, public consensus is not always present. Different stakeholders may not always agree on what a negative and positive outcome looks like. Moreover, when the impacts of technology are not yet known, direct regulation or policy responses are not always appropriate. Government's challenge, then, is designing new regulations and policy responses that are rigid and detailed enough to have an impact, but dynamic and technology-neutral enough to stay relevant across contexts and over time, and at the same time, not stifle future innovation. In grey areas where technologies are still relatively new and broad consensus on positive and negative outcomes has not yet been reached, direct government action may be the wrong answer. This is also true in contexts where specific or tailored policy responses are needed, giving way to market-based responses.

Market-led Policy and Regulation

In contrast to government-led policy and regulation, market-led responses tend not to be universally applicable to all innovators in a given jurisdiction. Instead, market-based responses are more often driven by a specific actor or group of actors who choose to self-regulate in order to address a specific set of issues. These actors may consist of many stakeholders, including innovators, investors, adopters, and consumers, each of which pursues policy and regulation for different reasons. Innovators and adopters might self-regulate in order to highlight themselves as distinct from the competition. They may also want to avoid regulation, or simply want to address an ethical issue not addressed by government. Investors and consumers, on the other hand, may want to seek clarity over the ethical implications of their purchases and investments. Like government-led policy and regulation, market-led responses can be both direct and indirect. Direct responses include mandatory courses or certifications, ethics standards, and codes of conduct for membership-based professional associations. Indirect responses consist of things like product identifiers (e.g., sustainable or green product distinctions), which may make consumers more likely to purchase

one product over another. A similar concept is ethical or sustainable investment certificates, which highlight certain investment portfolios as more ethically conscious than others.

These kinds of self-imposed policies and regulations work alongside government-led responses in two ways: first, by filling in gaps where government-led policy and regulation is inappropriate or unwarranted, and second, by providing enhanced governance in niche areas within the bounds government regulation. That said, interviewees highlighted that for matters clearly existing in the public domain, such as issues related to individual privacy or human rights, government is the appropriate oversight authority. For these kinds of issues, it is also necessary to require the participation of the civil sector (people) in the development of regulations.

Where appropriate, market-led responses can be beneficial by being more malleable than government-led responses, and therefore easier to change or adapt when needed. However, interviewees in this study also noted that what is adaptable is also expendable, and in contexts where other things like time, money, or engagement metrics are the top priority, or in times of crisis, optional and/or poorly enforced policy and regulation is easily set aside.[112] Moreover, many market-led solutions are optional and, in turn, not mandatory for all stakeholders involved in innovation. Different jurisdictions—and different actors within jurisdictions—may adopt different responses, leading to patchwork governance models that are confusing and inconsistent from the perspective of consumers and innovators alike.

Best Practices for Policy and Regulation

These best practices for policy and regulation are informed by discussion with academic, civil society, and industry experts, whose work focuses in detail on the social impacts of technology.

Government-led responses are decisive and reliable policy tools that should be used where appropriate. Government-led policy and regulation are the backbone of any policy response to emerging technology—backed by clear authority to establish and enforce, they are important to enact where possible and where appropriate. Interviewees noted that government responses are both universally applicable and mandatory for stakeholders to follow, making them more reliable than market-led responses in times of resource constraint or crisis. Moreover, they help clarify for innovators and consumers what is fundamentally required; innovators can have many competing priorities, and mandatory policy and regulation can help clarify what is legally required, and what is a "nice to have."

[112] *"Government admits breaking privacy law with NHS test and trace," The Guardian, July 2020: https://www.theguardian.com/technology/2020/jul/20/uk-government-admits-breaking-privacy-law-with-test-and-trace-contact-tracing-data-breaches-coronavirus ; "Coronavirus: Coronavirus: England's test and trace programme 'breaks GDPR data law," BBC, July 20, 2020: https://www.bbc.com/news/technology-53466471; "Trump administration allows companies to break pollution laws during coronavirus pandemic," The Guardian, March 27, 2020: https://www.theguardian.com/environment/2020/mar/27/trump-pollution-laws-epa-allows-companies-pollute-without-penalty-during-coronavirus*

For matters existing in the public domain, such as issues related to privacy or human rights, the public domain is also the most appropriate venue for policy response. Phrased in other words, for certain types of issues, the government, in consultation with individuals, should lead the response.

Government policy should be clear for businesses. New regulations and policy should seek to eliminate any associated burden and confusion for businesses and other stakeholders. Regulators should take a single window approach, where interested parties can easily clarify their responsibilities under the law, irrespective of the associated government department, etc.

Policy and regulation are only as effective as their enforcement strategies. Interviewees highlighted enforcement strategies as key to ensuring that innovators follow rules. In contexts where other things like time, money, or engagement metrics are the top priority, optional and/or poorly enforced policy and regulation is easily set aside. Many innovators also operate in a global economic context where vastly different and rapidly changing domestic laws and cultural norms can be overly burdensome and confusing to navigate. Interviewees noted that in this context, policy and regulation with clear and effective enforcement strategies thrive. Some components of an effective enforcement strategy include:

- Training, education, and awareness programs to ensure all relevant actors understand their respective obligations and responsibilities.
- Incentives, dis-incentives, sanctions, and other penalties that can be used to respond to violations and promote or deter wanted and unwanted behaviours.
- A transparent enforcement body that can receive and respond to violation complaints and perform audits; and is armed with the tools, resources, powers, and authority needed to carry out enforcement.

Market-led responses can be beneficial and useful; however, virtue signalling and ethics washing pose a threat to their credibility and should be deterred. Some stakeholders readily use ethics-related content to supplement communications and marketing strategies, even while engaging in potentially unethical behaviour. For example, interviewees noted that it is not uncommon for stakeholders to adopt ethics guidelines or value statements that are purposefully vague or difficult to implement in order to appear ethically conscious without establishing any real form of accountability. Some private consulting firms have also begun providing for-profit auditing services, for algorithms and other

emerging technologies, that result in consumer-facing *seals of approval.*[113] For these kinds of public-facing, market-based responses, being able to distinguish good from malicious intent is vital. Of course, not all companies engage in ethics conversations only for show, and many do hold a legitimate interest in creating positive impacts through their technology. However, ethics washing and virtue signalling motivated by illegitimate interests pose a serious threat to the legitimacy of other market-led responses that are effective and well-intended.

Traditional market competition can be an effective tool where government-led policy and regulation is unfitting or unwarranted; however, it requires effective oversight and cooperation. Interviewees noted that traditional, market-based competition can be useful in avoiding "hard law" or direct policy and regulation that may be overbearing. Innovators, adopters, investors, and consumers who see value in "tech for good" can promote those kinds of products and services through investment and purchase. For market competition to effectively manage the social impacts of technology, however, there would need to be a reliable set of product standards, certifications, and ethics codes in place, not only trusted by adopters, investors, and consumers, but also ensured with some level of oversight and accountability. In addition to this, interviewees highlighted the many inherent power imbalances that make some groups and individuals more capable of influencing the market through purchases and investments than others—measures aimed at correcting these imbalances would be an important part of any competition-based solution.

> The challenge we should be taking on in [the developed world] is to try to promote competition based on human rights, so technologists are aware that if they don't take into account human rights, then the consumer will react and use other technologies instead.
>
> **— Academic Expert, Europe**

[113] *ORCAA: O'Neil Risk Consulting and Algorithmic Auditing: https://orcaarisk.com/; "This company audits algorithms to see how biased they are," MIT Technology Review https://www.technologyreview.com/2018/05/09/142959/a-new-company-audits-algorithms-to-see-how-biased-they-are/*

Case Study: Regulating Emerging Tech—A Timeline of AI Governance in Canada

Budget 2017, which referenced AI almost 20 times, was the first Canadian federal budget to mention AI since at least 2010, and perhaps ever. With bold ambition, it outlined plans to reinforce world class AI research and "position Canada as a world-leading destination for companies seeking to invest in AI."[114] Most importantly, it earmarked $125 million to implement the PanCanadian Artificial Intelligence Strategy. The original budget and CIFAR announcements made no mention of the ethical or legal implications of AI; this was later added to the official objectives under the newly established AI and Society program.[115]

A year later, in 2018, the federal ethics committee tabled its report on Canada's private sector privacy law.[116] The report highlighted important issues related to AI ethics and recommended that the federal government consider implementing measures to improve algorithmic transparency in Canada. At the time—and still today—pre-existing marketplace frameworks like the Charter of Rights and Freedoms and PIPEDA were the only legal tools available to govern AI in Canada.[117]

Over the following months, AI ethics built strong momentum. From March to June, Canada hosted several meetings with the G7 focused on ethical AI development,[118] and CIFAR launched its first call for proposals under the AI and Society program.[119] By the fall, Canada had signed on to several international declarations on ethical AI and launched the first national consultation on a data-heavy, emerging technology like AI.

However, it wasn't until 2019 that a clearer policy direction began to emerge. ISED published a new digital charter for Canada in May, following the National Digital and Data Consultations, and then the consultation summary report in October.[120] Both identified control and consent over data, transparency, and consumer protection as key governing principles going forward. The report further concluded that "Canadians want more transparency in how their data is being collected and how it is being used," and that "current consent-based models with complex and lengthy privacy policies are inadequate and do not help to build trust."[121]

[114] *"Building a Strong Middle Class – Budget 2017," Government of Canada, https://www.budget.gc.ca/2017/docs/plan/budget-2017-en.pdf*
[115] *"CIFAR Pan-Canadian Artificial Intelligence Strategy," accessed Sept 8, 2020: https://www.cifar.ca/ai/pan-canadian-artificial-intelligence-strategy*
[116] *"TOWARDS PRIVACY BY DESIGN:REVIEW OF THE PERSONAL INFORMATION PROTECTION AND ELECTRONIC DOCUMENTS ACT," House of Commons Canada, February 2018: https://www.ourcommons.ca/Content/Committee/421/ETHI/Reports/RP9690701/ethirp12/ethirp12-e.pdf*
[117] *Jesse Hirsh, "The Policy Deficit Behind Canadian Artificial Intelligence," Centre for International Governance Innovation, Feb 13, 2018: https://www.cigionline.org/articles/policy-deficit-behind-canadian-artificial-intelligence*
[118] *"Annex B:G7 Innovation Ministers' Statement on Artificial Intelligence," March 28, 2018: http://www.g8.utoronto.ca/employment/2018-labour-annex-b-en.html; "Charlevoix Common Vision for the Future of Artificial Intelligence," June 9, 2018: http://www.g7.utoronto.ca/summit/2018charlevoix/ai-commitment.html*
[119] *"CIFAR launches AI and Society workshop call for proposals," CIFAR, April 19, 2018: https://www.cifar.ca/cifarnews/2018/04/19/cifar-launches-ai-society-workshop-call-for-proposals*
[120] *"Canada's Digital Charter in Action: A Plan by Canadians, for Canadians," Innovation, Science, and Economic Development Canada, 2019: https://www.ic.gc.ca/eic/site/062.nsf/vwapj/Digitalcharter_Report_EN.pdf/$file/Digitalcharter_Report_EN.pdf*
[121] *Ibid.*

Following the election in October 2019, privacy, ethics, and AI were referenced in the mandate letters of four federal Ministers.[122] Collectively, over the course of this government, they were to advance Canada's Digital Charter, enhance the powers of the privacy commissioner, create new regulations for large digital companies to better protect people's personal data, and work on the ethical use of data tools like AI for better government. Unfortunately, COVID-19 and other disruptions to parliament, have delayed delivery on this agenda. Despite improvements to public-sector governance tools,[123] today, like in 2018, pre-existing marketplace frameworks like the Charter of Rights and Freedoms and PIPEDA are the only legal tools available to govern AI in Canada's private sector. That said, the federal government introduced new legislation in November 2020, that, if passed, would establish new tools to govern this space.

Why Does Regulation and Policy Take so Long?

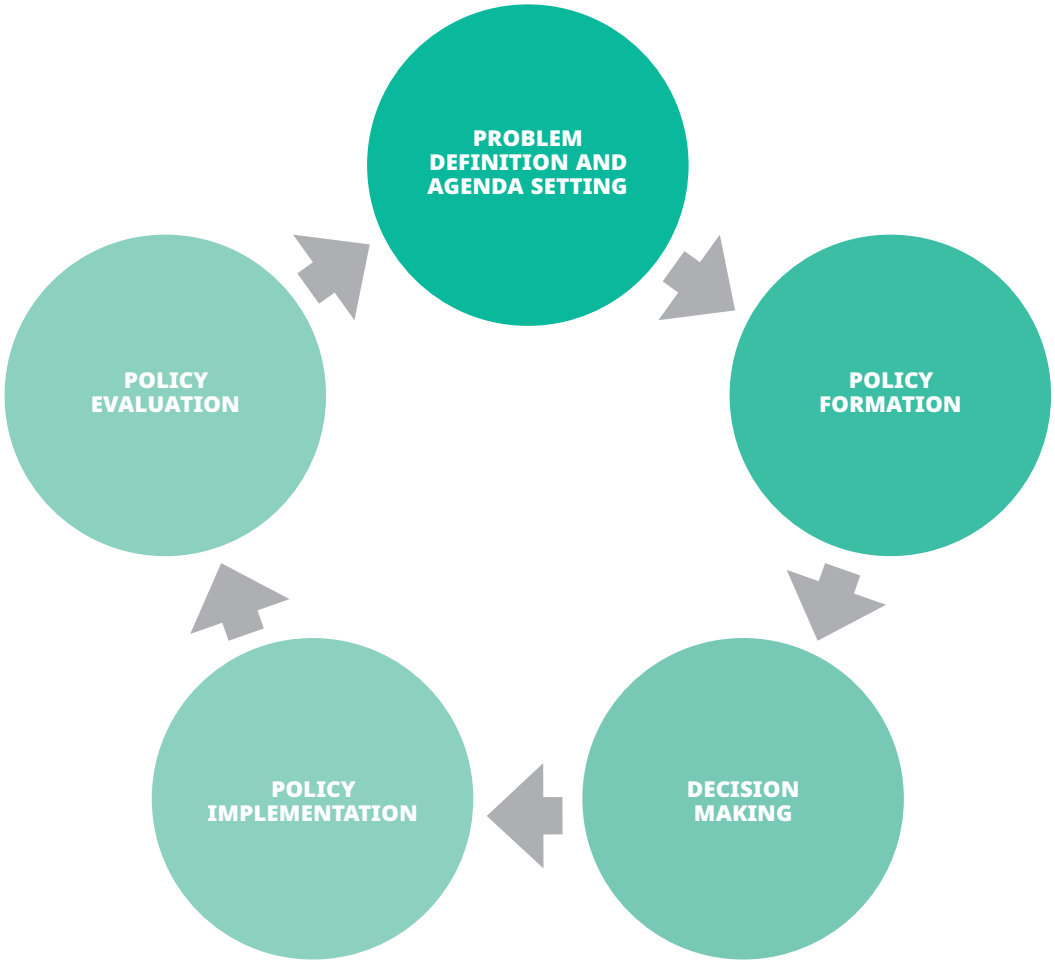
In Canada and in many jurisdictions around the world, at a high level, policy formulation follows a general, cyclical process that spans five stages from problem definition to policy evaluation. However, these steps are not always in sequence and, in practice, can be shuffled, skipped, or repeated. Much of this depends on the scope of the policy in question as well as the level of consensus that has been reached by stakeholders affected by the proposed solutions. When policy solutions are more limited in their scope, and when there is greater consensus among relevant stakeholders and therefore greater political legitimacy, stages like decision-making and policy implementation can be reached at a faster pace. External events and factors can also impact the process. Crises, events, or other triggers can place a policy problem higher up, or further down, in a government's and society's priorities. Changes in government due to elections can also stem or accelerate policy progress to date.

Similarly, this process can take place simultaneously for several types of policy responses to the same or similar problems. In the case of AI governance in Canada, many policy responses that are narrow in scope have already reached the implementation and evaluation stages. Examples include the Government Directive on Automated Decision Making, Algorithmic Impact Assessment, and approved AI vendors list, which apply only to federal government activity. Others that are broader in their scope have not yet surpassed problem definition, nor reached policy formulation. This includes updates to Canadian privacy law and competition law.

[122] *This includes the Minister of Innovation, Science, and Industry; Minister of Digital Government; Minister of Canadian Heritage; and Minister of Justice and Attorney General of Canada, Justin Trudeau, Prime Minister of Canada, Prime Minister's Office, December 13, 2019, https://pm.gc.ca/en/mandate-letters*

[123] *"AI-IA Invitation to Qualify for Artificial Intelligence Source List (EN578-180001/A)," Public Works and Government Services Canada, Sept 20, 2018: https://buyandsell.gc.ca/procurement-data/tender-notice/PW-EE-017-33817 ; Algorithmic Impact Assessment (Archived) , Government of Canada, https://canada-ca.github.io/digital-playbook-guide-numerique/views-vues/automated-decision-automatise/en/algorithmic-impact-assessment.html; "Directive on Automated Decision-Making," Government of Canada, Feb 5, 2019: https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=32592*

THE POLICY CYCLE (HOWLETT, 2014)[124]



Education and Training

Education can refer to formal schooling, raising public awareness through advocacy and communication, or educating policymakers or the private sector. Education is an essential tool in improving the social impacts of technology: it helps consumers to self-advocate, engineers and designers to consider pertinent risks, researchers to stay up-to-date with pressing topics,[125] and policymakers to enact more appropriate regulation.[126]

[124] *Michael Howlett, "Policy Design: What, Who, How, and Why?" January 2014, L'instrumentation et ses effets (pp.281-315), https://www.researchgate.net/publication/307638330_Policy_Design_What_Who_How_and_Why*

[125] *Universities are increasingly expanding research in this area as well as the development of interdisciplinary institutes to look at the complex questions posed by these new technologies. An example of this is the University of Toronto's Ethics of AI Lab. https://www.utoronto.ca/news/u-t-s-centre-ethics-launches-oxford-handbook-ethics-ai*

[126] *For example, the OECD notes that often regulatory frameworks lack the agility to accommodate the increasing pace of tech development. https://www.oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf*

Given the wide applicability of education, it is unsurprising that there is a need to consider both the role of *creators* of technology as well as *consumers* of technology. Increasingly, however, the trend of user-created content, data, and algorithms that incorporate "consumer" actions into larger processes obfuscates the line between these two roles. This section will examine emerging developments in "tech literacy," including awareness and targeted training for improving the social impacts of technology.

Case Study: The First Nations Information Governance Centre (FNIGC) and OCAP®[127]

OCAP®, which stands for ownership, control, access, and possession, is a set of information governance principles asserting First Nations "control over data collection processes in their communities, and that they own and control how this information can be used."[128] Established in 1998, OCAP® is trademarked by the First Nations Information Governance Centre (FNIGC), an incorporated non-profit that conducts First Nations surveys and supports data sovereignty for First Nations in what is now known as Canada. FNIGC offers training for researchers, policymakers, and other interested parties in OCAP® principles, the potential for community harm from misuse of First Nations data, jurisdictional issues, and practical implementation. This training program stands as a strong example of a well-known effort to improve the ethical use of data by educating practitioners, and it was mentioned both by the project advisory committee and by reviewers as an essential inclusion in this study.

Education for the Public

Interviewees emphasized the need for the public to understand social challenges related to technologies: a classic example is the privacy, security, and mental-health risks of certain online activities for youth.[129] In addition, respondents commented upon the need for the public to understand wide-ranging areas of concern such as: data extraction/usage by corporations, end-user licensing agreements, or terms-of-use contracts that are purposefully long and difficult to interpret. Undoubtedly, future efforts to change the status quo will require better understanding of complex topics from citizens, who can in turn demand legislative changes to recognize the unprecedented territory we find ourselves in.[130] Yet, despite the recognition that education efforts are crucial, it remains difficult to streamline public education and messaging around subjects that require an intermediate level of computer literacy.

[127] *OCAP® is a registered trademark of the First Nations Information Governance Centre (FNIGC). Learn more about OCAP® at https://fnigc.ca/ocap.*
[128] *First Nations Information Governance Centre, "OCAP," https://fnigc.ca/ocap.*
[129] *Ann Cavoukian, "Online Privacy: Make Youth Awareness and Education a Priority," Information and Privacy Commissioner Ontario, March 2009: https://www.ipc.on.ca/wp-content/uploads/resources/youthonline.pdf*
[130] *Steven Pearlstein, "Beating up on Big Tech is fun and easy. Restraining it will require rewriting the law," Washington Post, July 30, 2020: https://www.washingtonpost.com/business/2020/07/30/antitrust-amazon-apple-facebook-google/*

BEST PRACTICES

Despite the challenges raised by complex topics, public education is essential. It can be achieved through engagement with larger stakeholder groups (comprised by the public) and, as discussed in the section on consultation and engagement, should be proactive rather than reactive, with transparent goals. In addition, interviewees noted that when sharing information and educating about new technologies, responsible usage involves building on local strength, acknowledging local knowledge, and aiming for incremental improvements rather than radical solutions or abrupt changes in behaviour.

Ultimately, efforts to raise overall awareness of the complexity of technological developments are crucial toward moving public sentiment. Improvements to basic education in terms of computer literacy, "cyber hygiene," diversity in technology, and privacy awareness will help future digital citizens to self-advocate and create better social impacts for themselves and others. In turn, public education results in increased interest in research, government policy (or regulatory measures), and industry efforts to consider public concerns.

Education within Postsecondary Institutions and Academia

Unsurprisingly, the research sector and post-secondary institutions also inform the debate over the social impacts of technology. Academics often take leadership roles in bringing together specialized, deep expertise in new technologies and their impact, identifying opportunities and challenges, while organizing cutting-edge research to inform work in the public and private sectors. In addition, postsecondary institutions provide crucial components of education and training, including digital literacy for citizens, ethics for future technology solution designers and engineers, and relevant training for future policymakers.

ROLE OF RESEARCH AND RESEARCH FUNDING

As discussed briefly in the section on regulation and policy, interviewees noted the significant role of public funding in education, training, and research at the post-secondary level. In Canada, it is typically government that supports fundamental research, supplying large long-term investments in science before private investors enter the equation. Public funding and research help ensure that new developments are studied neutrally, avoiding potential incentive misalignment around technological developments and the goal of social good. The increasing focus on social good, conflict of interest, and research can be seen in initiatives like NeurIPS (a leading conference in machine learning), which has introduced a requirement for AI researchers to account for social impact as well as any financial conflicts of interest.[131] In addition, the Government of Canada has

[131] *Khari Johnson, "NeurIPS requires AI researchers to account for societal impact and financial conflicts of interest," VentureBeat, Feb 24 , 2020: https://venturebeat.com/2020/02/24/neurips-requires-ai-researchers-to-account-for-societal-impact-and-financial-conflicts-of-interest/*

introduced charters guiding principles such as equity, diversity, and inclusion in research.[132] Interviewees and advisory committee members highlighted this as a positive development, contending that the purpose of public research is public service, such that incorporating social good into research outcomes is a core component of innovation policy.[133]

STUDENT EDUCATION AND KNOWLEDGE TRANSLATION

> The student of today is the company employee of tomorrow, so we hope to give them an early understanding of safety with regard to innovation.
>
> **— Marie-Louise Bilgin, Ministry of Infrastructure and Water Management of the Netherlands**

Several interviewees, including some speaking from an international lens, noted that post-secondary student education is a core component of ethical solution design. Indeed, ethical and responsible design thinking may be increasingly integrated into post secondary research curricula. The aforementioned "techlash" and growing awareness of technology-related risks has led to grassroot support for ethics classes in computer science and engineering.[134] Concerns over AI in particular have resulted in increased offerings in coursework to explore AI ethics, impacts on the workforce, and technology regulation. Interestingly, this is sometimes done in conjunction with the private sector.[135]

Interviewees also discussed outreach and educational activities operated through civil liberties groups, with some organizations utilizing full-time, dedicated education staff to conduct workshops or courses. Such staff typically focus on visiting students in classrooms and informing students of technology-related issues that risk civil liberties (such as surveillance, censorship, and improper use of personal data).

Education and Training for Industry

Industry is often at the forefront of new technologies, and given this leadership role, technology leaders are well-positioned to educate others about technologies' positive and the negative impacts. However, there can be uneven levels of understanding of the social impacts of technologies within the technology sector. Developing expertise in this field might be even more difficult for industries that have traditionally been isolated from digital technology but now use digital tools. Accordingly, technologists may be experts in innovation and development, but there is a risk that they may not be best positioned to understand the larger ethical implications of the development of powerful new technologies. It has been noted

[132] *Government of Canada 2019, Dimensions: equity, diversity and inclusion Canada, accessed October 10, 2020, http://www.nserc-crsng.gc.ca/NSERC-CRSNG/EDI-EDI/Dimensions-Charter_Dimensions-Charte_eng.asp*
[133] *One interviewee also mentioned the work of Maria Mazzucato, an economist who argues that modern economies reward activities that extract value rather than create it, thus demanding changes in how investments are made and monitored, as well as how GDP takes public research spending into account.*
[134] *"Why computer science students are demanding more ethics classes," CBC Radio, Sept 7, 2018: https://www.cbc.ca/radio/spark/the-spark-guide-to-life-episode-five-ethics-1.5191015/why-computer-science-students-are-demanding-more-ethics-classes-1.4812742*
[135] *Melissa Hellmann, "University Offers Free Class on Artificial Intelligence Ethics ," Governing, Feb 12, 2020: https://www.governing.com/now/University-Offers-Free-Class-on-Artificial-Intelligence-Ethics.html*

that, "If technology can mould us, and technologists are the ones who shape that technology, we should demand some level of ethics training for technologists."[136]

Speaking more broadly, industry training has long been a popular suggestion for ensuring workers are up to date with changes in the workplace. Technology can act as both the cause of and solution to issues of social impact: digital disruption has necessitated the development of new skills or competencies frameworks, while also providing the opportunity for improved skills development. Examples include bootcamps, micro-learning frameworks, technology-oriented partnerships with traditional academic institutions, and education offerings that strive for flexibility in when and where learning occurs.

COVID-19 has accelerated these developments. A rapid move toward digital delivery of services, optimization, and online shopping has led to initiatives to build ties between the technology sector and traditional businesses. For example, in Ontario, Communitech has been involved in efforts to "Digitize Main Street," by helping businesses navigate challenges like building online shopping platforms or search engine optimization (SEO) strategies, tasks that were previously not considered core business considerations. **Accordingly, digital literacy needs now cover an increasing array of industries, not only those that are traditionally technology related.**

PRACTICAL APPLICATIONS OF INDUSTRY EDUCATION AND TRAINING

At the level of individual organizations, there are several examples of the role of industry training or education outreach.

Training development teams to design with anticipation: One area of opportunity highlighted in ICTC's primary research was in the area of privacy assessments, with one subject matter expert noting that proper education in this area involves the use of responsible planning: there are often multiple ways for companies to achieve their overall business goals, and responsible planning helps them select a way that respects the personal information of customers. If executed properly, companies can achieve business objectives in a less intrusive way, to ensure that real value is being generated for end-users. Responsible planning for privacy involves ensuring that there is consumer choice and transparency in how information is used. This is also tied to the aforementioned Privacy by Design framework (Part III), which examines these issues in a fundamental, deliberate way with foresight (designed with the protection of user privacy as a core principle) rather than trying to fix issues or mistakes after the fact.

[136] *Irina Raicu, "Rethinking Ethics Training in Silicon Valley," The Atlantic, May 26, 2017: https://www.theatlantic.com/technology/archive/2017/05/rethinking-ethics-training-in-silicon-valley/525456/*

Training development teams to foster inclusion and diversity: Another area of interest for industry training involves mitigating algorithmic bias in the workplace to ensure companies are not exacerbating existing inequalities. Some examples of this include training companies to increase the level of diversity in AI development teams, improve representativeness in datasets, and employ ethics committee oversight.[137]

Training staff in order to adopt new technologies responsibly: Some organizations are working to prepare workforces to embrace new digital technologies. As one interviewee noted, ever-present concerns over the rapid developments of technology hang over many workforces, but some companies are acting proactively to train their staff, recognizing that greater digitization will be more challenging for some team members than others (who may span different generations and comfort with technology).

The changing nature of work and the impact of rapidly developing technologies and AI automation (with the associated risk of job loss) was also reflected in discussions with industry stakeholders. Addressing these worries of job losses and ensuring that Canadians can take advantage of the potential benefits of productivity will require continued research and multi-stakeholder efforts. For a more detailed discussion on labour, automation, and skills training, please see the associated case study included in this report at the end of Part III.

Education for Governments and Policymakers

Another key area of outreach and education is for governments and policymakers. The rapid disruptions resulting from the growth of digital technology have posed a significant challenge to public sector and government regulatory needs. For example, governments face tensions between the openness of the internet balanced against protection and security, with "mounting pressure to act forcefully to protect national security, their citizens, and their domestic economies," and some experts in the area believe this will result in a "future of increased Internet regulation or legislation."[138] Indeed, there is a risk that policymaking unsupported by high-quality technology education for the public sector may further fragment the internet along national boundaries (such as seen in geopolitical tensions between the US, China, and Russia that threaten to result in a 'splinternet')[139] and undermine human rights; the "sheer complexity of the security landscape will test even the most sophisticated governments' coordination, capacity and effectiveness."[140]

[137] *Ryan McLaughlin, Trevor Quan, On the Edge of Tomorrow—Canada's AI Augmented workforce, Information and Communications Technology Council, December 2019.*
[138] *"The Role of Government," Internet Society, accessed Sept 8, 2020: https://future.internetsociety.org/2017/introduction-drivers-of-change-areas-of-impact/drivers-of-change/the-role-of-government/*
[139] *James Clayton, "Is the US about to split the internet?," BBC News, Aug 6, 2020: https://www.bbc.com/news/technology-53686390*
[140] *"The Role of Government," Internet Society, accessed Sept 8, 2020: https://future.internetsociety.org/2017/introduction-drivers-of-change-areas-of-impact/drivers-of-change/the-role-of-government/*

Despite these challenges, there are reasons for optimism. The backlash against big technology and fears of dystopian surveillance states have raised awareness of the inherent privacy risks that come with the growth of digital technologies. This can be seen in the prominence of discussions over data usage policy and privacy protections for governments,[141] particularly visible in the context of smart cities.[142] Furthermore, there are indications that governments are increasingly well-prepared and informed in their discussions of technology-related issues (in contrast to previous efforts).[143] Advisory committee members recognized the challenge of keeping the public sector up-to-date on the nuances of emerging technologies and recommended that governments maintain networks of subject-matter experts from a variety of sectors to help inform regulatory efforts.

Technology for Good

What Are Technology Solutions?

In the same way that policy and regulation can "raise the floor" of innovation by creating universal standards for innovators to comply with, companies, organizations, and individuals can "raise the ceiling" of innovation with new technology that addresses existing problems or enhances quality of life. Technology solutions can also serve to address power imbalances created or exacerbated by new technology—much like policy and regulation, technology solutions can provide disadvantaged or underrepresented groups the leverage needed to counteract negative outcomes from emerging tech.

Technology solutions, or "tech for good," can address a wide array of social and ethical concerns, including those related to labour, privacy, discrimination, and the environment. Technology solutions can be complex—like some technical approaches to improving privacy—but they can also be quite simple. For example, New York artist Adam Harvey created an online repository of makeup techniques that can evade facial recognition technology.[144] Likewise, some interviewees noted that in some contexts, the most appropriate response to negative impacts created by technology is to not create more technology.

Finally, technology solutions can have many purposes. Some are simply market responses to societal problems (e.g., carbon sequestering) or consumer demand (e.g., privacy-focused search engines), while others represent a form of community protest, activism, or organizing (e.g., the facial recognition evasion makeup techniques).

[141] *Kalev Leetaru, "Why Government Needs Data Privacy Policies," Forbes, July 26, 2016: https://www.forbes.com/sites/kalevleetaru/2016/07/26/why-government-needs-data-privacy-policies/#527ca75a4b5d*
[142] *"Smart City Privacy," Future of Privacy Forum, accessed Sept 8, 2020: https://fpf.org/smart-city-privacy/*
[143] *Steve Denning, "Why Big Tech Should Regulate Itself," Forbes, Aug 2, 2020: https://www.forbes.com/sites/stevedenning/2020/08/02/why-big-tech-should-regulate-itself/#7553c1382677*
[144] *"Computer Vision Dazzle Camouflage," accessed Sept 8, 2020: https://cvdazzle.com/*

In many ways, technology solutions are subtle acknowledgements that responsibility for the social outcomes of technology is held by actors beyond just those involved in the development of a single technology product or service. Investors, developers, adopters, and consumers are inherently accountable for the technology that they financially support, create, or establish a market for, but for many, responsibility for social outcomes does not end there. Technology solutions can solve any range of problems, including those created other technology companies, organizations, or individuals.

> The positive new solution could be to address a harm in somebody else's product. In order to really solve these problems, there needs to be a holistic approach across multiple actors.
>
> **— Shari Harrison, Founder and CEO, Second Nature Innovation, (ex-Apple, ex-Microsoft)**

Strategies and best practices for designing ethical technology are discussed in detail in this paper's earlier section on the technology solution lifecycle. To recap in brief, it is beneficial to adopt an innovation framework that involves stakeholders outside of the design team, considers social impact, and makes use of the many tools built for ethical technology development.

ATTRIBUTES OF TECHNOLOGY SOLUTIONS

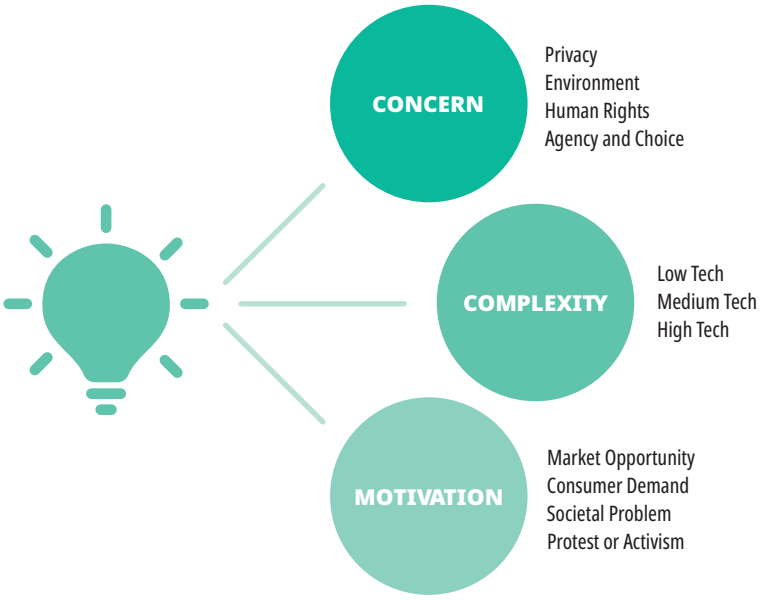


Figure 9: *Attributes of technology solutions for improving social impacts, ICTC, 2020*

Privacy Enhancing Technologies

Privacy enhancing technologies (PETs) are technical solutions that are purposefully built to enhance data privacy. While not a requirement, many PETs are designed to be incorporated into existing technology products or processes to decrease the associated privacy risks. Synthetic data, for example, is used to

decrease privacy risk in data analysis, AI, and other data processes. Synthetic data tools use existing datasets to create new, synthetic datasets, which maintain the same statistical and relational properties as the original dataset, maximizing the utility of the data while significantly decreasing the risk of re-identification.[145] Synthetic data and other PETs are high-technology solutions that are created in response to privacy concerns to address a market opportunity. While synthetic data tools can be used to mitigate concerns related to *individual privacy,* it is important to note that they cannot be used to satisfy all ethical concerns, such as those related to biases in data or to group privacy.[146]

Tools for Workplace Diversity

While technology can present risk of harm, it can also be used to better train staff and result in more inclusive behaviour. For example, one interviewee noted that the use of data and algorithmic nudging could be used in customer service to remind staff to use preferred gender pronouns, inform employees of specific issues faced by Indigenous peoples or other disadvantaged groups, and try to address issues that may reflect systemic discrimination.

Another positive example of the use of technology in educating and shaping behaviour is the establishment of automated systems to address issues of unintended bias. For example, a program can automatically flag internal applicants that have repeatedly applied (and failed to receive) promotions or transfers for review. While this could reflect a lack of suitability for the position, it might also indicate blind spots with regard to diversity and inclusion.

Open Source "Hacking" Tools

In 2017, a group of students at the California Polytechnic State University dedicated their capstone project to helping farmers overcome repair monopolies and more easily fix their tractors at a lower cost.[147] Farming equipment, in recent years, has become increasingly high-technology and difficult to repair; formal repair processes involving official retailers can cost farmers thousands of dollars.[148] The project, dubbed "Tractor Hacking," is an open source, do-it-yourself approach to fixing high-technology tractors. It consists of a series of technical documents and an open-source diagnostic tool that, together, provide farmers the resources they need to fix their equipment on their own. Tractor Hacking is a medium- to high-tech, activist solution that was created to give farmers more agency.

[145] *"Getting Access to COVID-19 Data: Experiences, Challenges, and Technologies," Electronic Health Information Laboratory (CHEO Research Institute), accessed Sept 8, 2020: https://drive.google.com/file/d/1nW5Yk-ohLNcPnTXU1jLNu5YhZUKsLvyf/view*

[146] *Group privacy asserts that groups, in addition to individuals, have a right to privacy, as it is possible to collect, use, and disclose general information that belongs not just to one individual, but to a whole group of individuals. Group information can be used for many purposes, including nefarious purposes such as discrimination. Importantly, it is possible to neglect group privacy, even if individual privacy concerns are addressed. Michelle Loi and Markus Christen, "Two Concepts of Group Privacy," May 29, 2019, https://link.springer.com/article/10.1007/s13347-019-00351-0*

[147] *"Tractor Hacking," accessed Sept 2020: https://tractorhacking.github.io/about/*

[148] *Jason Koebler, "Tractor-Hacking Farmers Are Leading a Revolt Against Big Tech's Repair Monopolies," Vice, Feb 14 2018: https://www.vice.com/en_us/article/kzp7ny/tractor-hacking-right-to-repair*

CONCLUSION

All of us interact with technology on a daily basis, and, intentionally or unintentionally, make small choices pertaining to technology's ethical and safe use. Technologists, the public sector, investors, and numerous groups shape technology's impact, with different levels of influence and expertise. As users, when we download a new app and decide whether or not to enable location services, set up two-factor authentication on a new service, and consider taking a carbon-free transportation alternative to our destination, we are working to improve the social impacts of technology. Nevertheless, numerous small decisions, such as whether or not to read a new 10-page user privacy agreement, necessarily breed fatigue—accordingly, this report has sought to emphasize that all stakeholders and parties have some role to play in ethical technology. The burden of improving the social impact of technology should not fall upon any one set of shoulders such as consumers, technologists, or regulators. Nevertheless, this report also acknowledges the inherent power imbalances in technology solutions, with users and the public typically left with less leverage than other parties. The principles of anticipation, inclusion and diversity, reflexivity, justice and fairness, and interdisciplinarity and collaboration can be embraced by all stakeholders in the ethical technology ecosystem, but their impact might be most salient for the private and public sectors.

Accordingly, the common principles outlined throughout this study are implemented in a variety of ways. In Part III, they are brought to life by specific tools for the innovation lifecycle, including technology assessment rubrics and ethical design practices. The core message from the lifecycle overview is that it is essential to extend what we think of as the "innovation lifecycle" to bring social context into traditional technology development. We could consider inclusive and diverse hiring practices as a precursor to ethical algorithm design, for example, or extend "prototyping" to responsive alterations to a product after deployment if issues begin to emerge.

Technologists' involvement in improving the social impact of technology is essential; nevertheless, there are also numerous tools and strategies available to other types of stakeholders. While consumers and users do suffer from power imbalances, agenda-setting activities such as advocacy, community organizing, and direct action have seen success in this space. In addition, the public is often "engaged" by technology and policy proponents, and public participation will see greater impact with improvements to engagement methods. Importantly, if engagement is to occur, it must be meaningful and well-designed. Successful engagements are often conducted early, with clear goals and outcomes, and include a diversity of participants in a way that is mindful of systemic imbalances in accessibility and design. Engagements also often need to be iterative.

Policy and regulation are well-known tools for improving social impacts. Policy and regulation can be government led, market led, or hybrid, with numerous direct and indirect measures for helping change behaviour. Government-led initiatives, where appropriate, are the backbone of any response to emerging technology: done well, they offer clarity, are universally applicable, and have clear enforcement strategies. Market-led policy can also be helpful for introducing competitive norms, but faces the danger of falling into "ethics-washing." Another key tool for improving social impact is education and training. For the public, this means helping users, both young and old, understand and use technologies safely, with regard to "cyber hygiene," privacy awareness, and other key skills. In post-secondary institutions, technologists of the future can be exposed to ethical design classes as a norm, earlier in their careers. Researchers and policymakers can also learn more about diversity and inclusion, as well as technology literacy for improved research and policy outcomes. Finally, technologists are also in a position to mitigate the impact of other technologies via tools such as privacy enhancing technologies, open source alternatives to proprietary systems, and environmental technologies, among many others.

This study has provided a synthesis of frameworks for ethical technology design, as well as pragmatic strategies that all stakeholders can use to improve the social impact of technology. In order to move the needle on the issues discussed throughout the course of this paper, a cultural shift is needed: it is important for each reader and stakeholder to consider where they fit in the technology ecosystem, what they can do to improve it, and what next steps are manageable and practicable.

The questions that arise from these technology-related developments are complex and difficult to address. Often there is no single, perfect solution, only a series of trade-offs. Nevertheless, these are important discussions to have, and this paper aims to help provide some key principles and common terminology to consider as Canada continues to investigate these issues. Despite shocks to the world system such as COVID-19, heightened awareness of technology-related challenges is highlighting the importance of creating a robust and resilient system to ensure that technology remains a social good for all.

APPENDIX I: RESEARCH METHODS AND TOOLS

SECONDARY RESEARCH This study began with a mandate to investigate the social impact of technology in Canada, a broad scope, the first phase of which involved exploring and narrowing the research focus. In the initial phase of this project, the study team investigated four domains where technology had a social impact via an exploratory literature review: labour rights, surveillance and privacy, data fairness, and climate and environment. Through these reviews, the team identified a shared focus on frameworks that seek to improve the social impact of technology, such as inclusive innovation, responsible innovation, and ethical technology design practices like human-centred design. A further review of these topics, in concert with feedback from the advisory committee, led the team to focus their research on developing a synthesis of best practices and considerations that could be applied across each of the four domains identified above. The search for best practices, frameworks, and considerations informed the interview questionnaire for both sets of interviews discussed below.

PRIMARY RESEARCH

1. **INTERVIEWEE IDENTIFICATION** The study team drafted a list of interviewees who worked to improve the social impacts of technology in one of the following four domains: labour rights, surveillance and privacy, data fairness, and climate and environment. In selecting participants from a variety of subject matter areas, the study team aimed to identify shared practices for improving technology's impact across each of the four domains that would be, ideally, broadly applicable.
2. **EXPLORATORY INTERVIEWS** The study team first conducted a series of semi-structured exploratory interviews of 45 min – 1 hour in length to help refine research questions and shape a finalized interview questionnaire. Each of the four interviewers conducted two exploratory interviews with practitioners in their domain focus, listed above, for a total of eight exploratory in-depth interviews. Interviews touched upon the frameworks that practitioners used to improve the social impacts of technologies, other best practices they considered, who held responsibilities for technologies' impacts, and any further literature or sources they would recommend.
3. **SEMI-STRUCTURED INTERVIEWS** Once refining the project questionnaire with the help of the exploratory interviews, the study team went on to conduct additional semi-structured interviews with 18 practitioners about their work improving the social impacts of technologies until saturation was reached. Together, both sets of interviews held the following characteristics:

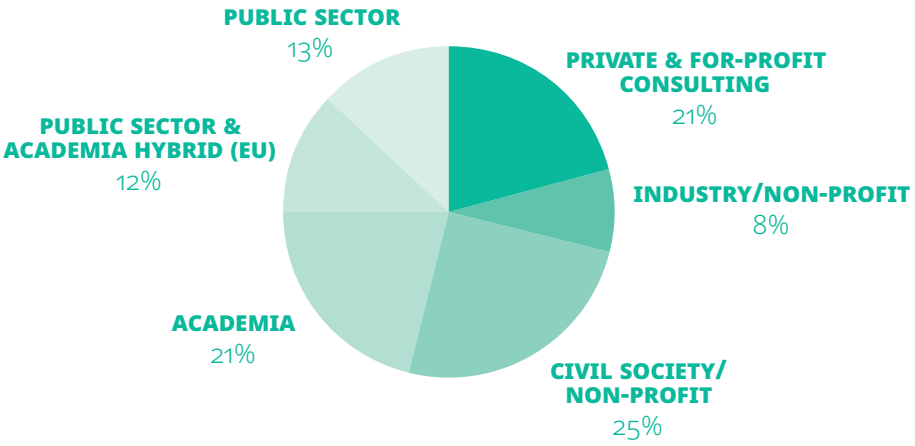


Figure 10: *Interviewees by Sector (n=24)*

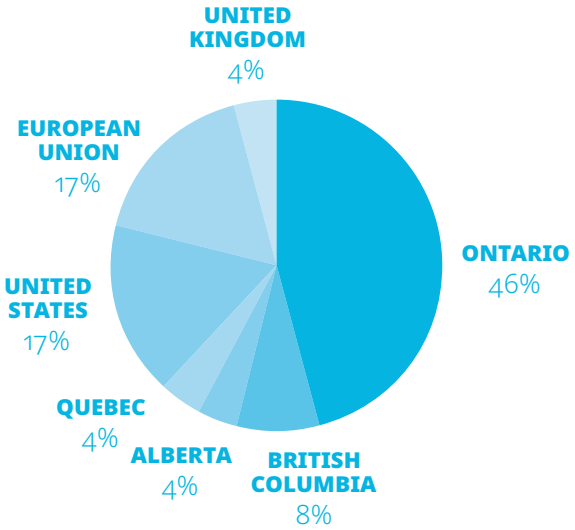


Figure 11: *Interviewees by Region (n=24)*

ANALYSIS

The research team used a qualitative coding process to synthesize all interview transcripts. The open-source qualitative analysis software Taguette[149] was used with anonymized transcripts to facilitate transcript coding.

[149] *Rémi Rampin, Vicky Steeves, and Sarah DeMott. (2020, August 26). Taguette (Version 0.9.2). Zenodo. https://doi.org/10.5281/zenodo.4002742*

STUDY REVIEW

The **Project Advisory Committee** was comprised of eight individuals from government, the private sector, and the not-for-profit/NGO space, each of whom worked with technology in the area of regulation, green/clean-technology design, surveillance and privacy, or inclusion and diversity. The Project Advisory Committee was convened for two meetings to review and comment upon study progress.

This paper underwent both **internal** and **external** review during its drafting process. Two internal reviewers from ICTC who were not part of the research team reviewed the study's first draft for completeness, accuracy, and rigour. Simultaneously, two reviewers from outside of ICTC reviewed the paper for completeness and usefulness for practitioners working in the social impacts of technology ecosystem. Reviewer suggestions were incorporated into the final document prior to release.

STUDY LIMITATIONS

Diversity and Inclusion in Research Advisors. While this study's interviewees approached gender parity and represented some diversity of ethnic and national background, the project advisory committee had strong regional and gender diversity but lacked ethnic diversity. Future research into this topic should ensure that both project informants and project advisors reflect a greater diversity of knowledge and experience.

Regional Representation of Interviewees. Interviewees disproportionately represented the province of Ontario, in part because of the region's proximity to the federal government and thus to regulation and consultation around ethical technology. While the research advisory committee was comprised of more participants from western and northern Canada, future studies of this kind should aim to ensure greater regional diversity.

Context of COVID-19 Pandemic. This project was operating during the COVID-19 pandemic shutdown. Accordingly, all research activities occurred remotely, and some invited interviewees were unavailable due to the unique circumstances of the lockdown, new constraints on the workplace, and remote connectivity availability. Future work on this topic would benefit from in-person workshops and engagement with a broader public audience.