PARTICIPATORY toward ANTICIPATORY (PtA)

The Systemic Journey of Designing Participatory Technology Assessment (pTA) Policy Deliberation Process

By Su Lynn Myat

Supervised by Dr. Peter Jones

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Major Research Project (MRP)

MDes Strategic Foresight and Innovation (SFI)

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Supervised by Dr. Peter Jones

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DECLARATION

ABSTRACT

This study aims to instigate a paradigm shift in how we think about technological futures. At present, technologies are often treated as sources of potential harm to be managed by governments and subject experts. But this study takes a different view. Technological choices are social choices, and part of broader sociopolitical and sociocultural phenomena. As such, decisions about technology should be made by society as a whole before these technologies become widely adopted. To explore this, the study uses "Technology Assessment" (TA) as a foundational concept through which collective action on technological choices can take place.

Focusing on the Canadian context, the research traces the landscape of TA from past to present. It identifies the Science Council of Canada (SCC) as the key institution in the past and highlights Health Technology Assessment (HTA) and Foresight as today's main TA-like activities. Through this exploration, the study examines both the challenges and opportunities for establishing a participatory TA mechanism in Canada. Key challenges include the fragmentation of TA functions under the Governor in Council, the historic push to empower the private sector, Canada's reliance on the U.S., and the dominance of evidence-based policymaking.

At the same time, the study also finds promising ground from which participatory TA can begin to take root. These include Canada's demonstrated readiness from both past and present, its strengthening ties with Europe and its policy models, and a broader shift from evidence-based to mission-driven policymaking. Recognizing these opportunities and the timeliness of the moment, the study proposes a policy deliberation process called Participatory toward Anticipatory (PtA), designed to support public involvement in technological development and policymaking. Finally, the paper concludes with insights from prototype testing of the PtA process, demonstrating how it can enable meaningful public participation in shaping technological futures.

ACKNOWLEDGEMENT

Hereby, I would like to thank Peter, who has been the guiding star throughout this journey. I'm deeply grateful for his kindness and understanding.

I also want to acknowledge the generosity of the experts who took part in the in-depth interviews. Their willingness to respond to my cold emails was a surprise and a gift. I hope to pay it forward if I ever get the chance.

My heartfelt thanks also go to the members of the public who believed in the PtA process and contributed their time and energy.

A special thank-you goes to Alecos (Alexander Christakis). Though we only interacted a few times, the warmth and trust he extended gave me the strength to keep going.

This note of gratitude also extends to my friends, Travis, Ugochi, and Zareen, for all the Thursdays we survived together on this bumpy ride. Thank you, and best of luck in all your journeys ahead.

And last, but definitely not least and the biggest thank you of all, to my beloved partner, Dinesh, who has shown incredible patience through all my moments of madness. I couldn't have done this without you.

DEDICATION

For those of us from the past, present and future.

PREFACE

A Personal Story Behind the Study

This study is deeply personal to me. I am passionate about the issue because I have lived its complexities. Coming from Myanmar, a developing country, I have always thought of technology as something akin to playing with fire. It holds immense potential to uplift those who are most disadvantaged, like many in my country, but it also has the capacity to produce unforeseen harms that deepen existing vulnerabilities. I have seen both.

I graduated with a Master's in Public Administration from the Central European University in 2020. It was always my dream to use what I had learned to contribute to the development of my country, which has long suffered under military dictatorship and civil conflict. When the democratic opposition led by Aung San Suu Kyi came to power in 2015, there was a collective sense of hope and urgency, and many of us felt compelled to be part of the rebuilding process. That's why I studied abroad and returned home. I joined the United Nations Development Programme (UNDP) on January 11, 2021, working to accelerate the Sustainable Development Goals (SDGs) by supporting community-driven innovations across the country. But just three weeks later, on February 1, the military staged a coup. In a single day, the energy, investment, and hope of countless people, including myself, were crushed. The country plunged even deeper into civil war, with violence now spreading to areas far beyond the ethnic regions that had long borne the brunt of conflict. Every day since then, the death toll has risen, and the situation has worsened.

In the aftermath, I found myself constantly asking: what just happened? While there were warning signs, few believed the military would dare act so boldly, given the overwhelming public support for the civilian government. But later, I came to understand that the support of the people was not the military's primary concern. What truly threatened them was the international legitimacy Aung San Suu Kyi had garnered, especially from Western countries. Ironically, that support began to fracture after the Rohingya crisis. When Myanmar was brought before the International Court of Justice (ICJ), and later accused of genocide, Aung San Suu Kyi herself went to defend the country, not to excuse

the military's actions, but because the allegations implicated not only the military, but Burmese society as a whole.

One of the pieces of evidence used in the case was public social media content. Ordinary people, caught up in waves of misinformation, had shared posts filled with hate speech against the Rohingya. Social media, especially Facebook, played a dangerous role in fanning those flames. Many in Myanmar went from living without any phone or internet to suddenly accessing social media, Facebook in particular, which many came to see as the entire internet. With little to no digital literacy, they became both the victims and the amplifiers of online misinformation.

I have traveled across Myanmar for fieldwork, talking to people in rural and marginalized communities. As someone who values qualitative research and deeply respects lived experience, I have developed great empathy for them. These communities are passionate and expressive, at times even perceived as aggressive when it comes to topics they care deeply about, but they are also some of the most generous people I've ever met. In rural areas, strangers are treated like family. Homes are open. Meals are shared. Yet these same communities, with almost no prior exposure to digital technologies, were suddenly handed a powerful tool without fully understanding the impact it could have.

At first glance, the story of social media and the story of the coup might seem unrelated. But they are connected. Aung San Suu Kyi's decision to defend the Burmese people in international court was deeply controversial and cost her the support of the Western alliances that once strengthened her political position. Without that backing, she no longer posed a significant threat to the military, and they seized their chance. The country is now in chaos. Villages are being burned, and lives are being lost.

This is just one example of how technologies, often created with the best of intentions, can have iatrogenic effects, causing harm even while trying to do good. Their impacts are not the same for every society. That's why I believe it is essential for communities and local voices to be part of shaping how technologies are developed, used, and governed. It should not be a matter of education catching up after the fact. People must be informed and engaged throughout the process. Even if a technology leads to undesirable outcomes, at least the people will have had agency in the decisions that brought them there.

I truly believe in the power of democracy, perhaps because we've had so little of it in my country. This study is my attempt to democratize the development of technology. As a graduate of public administration, someone who loves listening to people and doing research with them, I am deeply committed to bottom-up approaches that value local knowledge and lived experience. I have seen how decisions made far away, whether in Silicon Valley or international courts, can dramatically alter the lives of people in small and politically fragile countries like Myanmar.

This is my effort to influence the culture and governance of technology itself. I want to create ways for people, especially those often left out of global conversations, to participate in guiding the technologies that shape their futures. Though I am now far from home, this work is my way of giving back. I hope that the ripples of this research can reach the people I care about most, and contribute, however modestly, to a more equitable and thoughtful technological future.

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KEY ABBREVIATIONS

TA	Technology Assessment
pTA	Participatory Technology Assessment
PtA	Participatory toward Anticipatory Process/Project
SCC	The Science Council of Canada
CCA	Canadian Council of Academies
HTA	Health Technology Assessment
CDA	Canada's Drug Agency
EBPM	Evidence Based Policy Making

CHAPTER 1

Introduction

INTRODUCTION

SUMMARY

Chapter 1 introduces the Participatory toward Anticipatory (PtA) project. It explains the context and rationale, outlines the primary and secondary research questions, presents the researcher's positionality statement, and describes key concepts and the Systemic Design methodology used throughout the research.

CONTEXT AND RATIONAL

Rethinking the Paradigm of Technology Development

Today, our societies rely heavily on technology. Our daily lives are shaped profoundly by rapid technological advancements. Roser (2023) illustrated the pace of this change by comparing it to the experiences of our ancestors:

> *"Technological change was extremely slow in the past – the technologies that our ancestors got used to in their childhood were still central to their lives in their old age. In stark contrast to those days, we live in a time of extraordinarily fast technological change. For recent generations, it was common for technologies that were unimaginable in their youth to become common later in life."* (Roser, 2023)

Technological progress has undoubtedly contributed to improving human well-being, however, concerns about its unintended negative consequences have also grown over the decades. As innovation cycles shorten and new technologies are rapidly introduced, these consequences have at times posed unprecedented challenges to societies. Advanced technologies have come to public attention due to their potential for misuse, particularly in surveillance, discrimination, and digital manipulation. Palantir Technologies, for instance, has faced backlash over its collaboration with U.S. Immigration and Customs Enforcement (ICE), accused of enabling mass surveillance and deportation effort. (Business Insider, 2020). Similarly, deepfake technology has raised concerns due to its ability to create realistic fake videos that can harm reputations. AI surveillance in schools, initially designed to prevent violence, has also exposed sensitive student data, such as LGBTQ+ identities, without consent. This has sparked public outcry, with some drawing comparisons to the Cold War-era 'Lavender Scare'. (CityNews Halifax, 2025; Rauch, 2024). Additionally, Hungary's 2025 law banning Pride events and using facial recognition has drawn criticism for human rights violations (AP News, 2025). These examples highlight how misuse of rapidly evolving technologies can intensify discrimination and undermine civil liberties.

In response, governments have introduced various laws and regulations to mitigate these

effects. However, they often struggle to keep pace with the speed of technological change, resulting in actions that are reactive rather than proactive. **Most current government interventions are framed by the question, "How can society benefit from technology while minimizing its negative consequences?" This view positions technology as the "cause" of potential harm, to be corrected or adjusted.** This paradigm tends to place decision-making in the hands of technology developers —mainly private companies—and policymakers who regulate their impacts. Yet, it rarely considers the meaningful involvement of the public—the very people who experience both the benefits and harms of technological innovation.

With the emergence of transformative technologies like Artificial Intelligence (AI) and quantum computing, this existing framework is no longer sufficient to address their complex social and political implications. For instance, Corrêa et al., 2023 described the recent surge in interest around AI ethics as an "AI ethics boom", a time characterized by an unprecedented demand for regulation and normative guidance in the AI industry. They analyzed 200 documents from governments, corporations, academic institutions, and Non-Government Organizations (NGOs) across five languages, all offering ethical guidelines on AI development. Similarly, Yuval Noah Harari raised concerns about the societal impact of AI during a 2024 conversation with Ian Bremmer. He warned that "*AI is the first technology in history that can take power away from us"* due to its potential for autonomous decision-making. Harari also predicted that the foundational stories that shape our societies may change, as AI now possesses the ability to create new narratives independently.

Now is the time to initiate a paradigm shift in our approach to technology development. Rather than focusing solely on managing consequences and taking a largely passive stance, society must adopt a more active role in shaping technological futures. **The critical question for this new paradigm is not "How do we mitigate harm?" but "What does it mean to choose and deploy a certain technology?"** This question was first proposed by Ahmad and Christakis in 1979 when introducing their Policy-Sensitive Model of Technology Assessment. Instead of dealing with the consequences only after the fact, this new paradigm seeks to consciously deploy technologies that are valuable to society. It reflects **a paradigm that treats technology not merely as a tool or a threat but as a sociopolitical and sociocultural phenomenon** deeply embedded in society.

Within this framework, **the selection of a technology is recognized as a social choice. That is, choosing a technology is inherently tied to choosing a direction for society.** Every new technology we adopt shapes the path toward a particular future. Therefore, the development and deployment of technology must involve the public, those who create and sustain the foundations of society through shared values, cultural norms, and social

structures. Although introduced over four decades ago, this call for a new paradigm is more relevant now than ever. In the 2024 Future Week panel series hosted by Policy Horizons Canada, Elizabeth Seger, Director of Digital Policy and former researcher on AI governance at Oxford, emphasized the urgent need for civic engagement to build public trust in new technologies like AI. Similarly, Sun-ha Hong, Assistant Professor at Simon Fraser University, highlighted the importance of collective approaches. He urged policymakers to focus on understanding what people want, rather than fixating solely on understanding or controlling technologies like AI. If technologies are shaping the futures we inhabit, the public must play a central role in shaping those technologies.

RESEARCH QUESTION

Building on this call for a new paradigm in technology development, this research project aims to instigate and contribute to that shift by placing the public at the center of decision-making. Inspired by the foundational work of Ahmad and Christakis, the study adopts Technology Assessment (TA) as its key concept. TA offers a comprehensive lens to examine both the short- and long-term impacts of technology, particularly in relation to its interaction with broader social systems. In particular, this project explores the feasibility of involving the public in TA by designing a policy deliberation process called Participatory toward Anticipatory (PtA) adopting participatory Technology Assessment (pTA). This process emphasizes the need for deliberative and anticipatory engagement with citizens as part of shaping technological futures.

Although TA has been institutionalized in many European countries and recently revitalized in the United States through the Government Accountability Office (GAO), Canada currently lacks a designated public agency like the GAO to systematically carry out TA. The application of TA is distributed across several agencies and organizations. Therefore, this study examines TA and TA-like activities in the Canadian context to better understand how participatory approaches might be developed and sustained.

The central research question guiding this inquiry is:

“How could a participatory Technology Assessment (pTA) process be developed in Canada to involve the public in the decision-making process for technology developments?”

To support this overarching question, the study also explores a set of following sub-questions to support the development of a pTA process that is not only theoretically grounded but also practically applicable within Canada's unique institutional and policy landscape.

- What existing Technology Assessment (TA) and TA-Like activities exist in Canada?
- How is the public currently engaged in these mechanisms?
- What are the key challenges and opportunities for conducting participatory Technology Assessment (pTA) in Canada?
- How can the public participate meaningfully in the decision-making process for technology policy development?
- To what extent are individuals willing to participate, and what costs (e.g., time, effort) are they willing to bear?
- What are the challenges and opportunities for public participation in technology-related decision-making, particularly in the context of emerging technologies such as AI?

POSITIONALITY STATEMENT

Before moving forward with the methodology, it is essential to present the following positionality statement to ensure transparency and highlight how my background, experiences, and perspectives shape this research process.

" I am a researcher from Myanmar, a country shaped by decades of civil war, military rule, and complex political transitions. My professional and academic journey cannot be separated from these lived realities. I was raised and educated in a Buddhist society that values compassion, reflection, and humility. Although I no longer identify as Buddhist, these values continue to shape my worldview and research approach—especially the sense of interconnectedness and responsibility to others.

Currently, I am pursuing a Master's in the Strategic Foresight and Innovation program at OCAD University, where I am learning about systemic design and foresight. This academic journey has deepened my commitment to reimagining the intersection of technology, power, and civic participation. I remain connected to the systemic design community in Toronto and am actively engaged with the global Technology Assessment (TA) community, including conversations with key figures in the field. These experiences have helped me explore how systemic thinking can be applied to today's technological and societal challenges.

With a background in public administration and governance, I have long been interested in how technology shapes and is shaped by power and civic life. During Myanmar's brief democratic opening, I worked with political prisoners, civil society leaders, and international scholars on capacity-building for opposition figures, military officers, and ethnic community leaders. Now, as a Burmese researcher living in Canada, I hold a dual positionality. I am both an insider to the realities of a developing, postcolonial society, and an outsider engaging with democratic institutions in the Global North. I carry a deep commitment to Myanmar's future, while also wanting this research to speak meaningfully to the Canadian context.

My background has made me critical of the idea that models developed in wealthier nations can be applied everywhere without care or adaptation. At the same time, I believe Canada has an opportunity to lead in developing more participatory and anticipatory approaches to technology governance.

This study, then, is more than an academic project. It is a political and ethical commitment. I believe those most affected by technological change, especially those who have historically been excluded, must be engaged early and meaningfully in shaping the futures we build. Through this work, I hope to contribute to a more inclusive, grounded, and democratic approach to technology governancea."

KEY CONCEPTS

"**Technology Assessment** is a scientific, interactive, and communicative process which aims to contribute to the formation of public and political opinion on societal aspects of science and technology." (Bütschi et al., 2004, p. 14).

"**Participatory Technology Assessment (pTA)** refers to a set of methods and processes that actively involve members of the public and other non-expert stakeholders in evaluating the societal, ethical, and policy implications of emerging technologies. Unlike traditional TA, which is typically expert-driven, pTA emphasizes inclusive dialogue and deliberation to democratize technological decision-making and align innovation with public values and concerns."

Joss and Bellucci (2002)

"**TA-Like Activities** range from research into the relationship between Science, Technology and Society (STS), to more project-oriented consultancy in environmental issues, such as the Environmental Impact Assessment (EIA)."

TA-Like Activities involve Responsible Research and Innovation (RRI), Foresight, Environmental Impact Assessment and Social Impact Assessment (EIA/SIA), and Health Technology Assessment (HTA).

(Hennen et al., 2023)

The Systemic Journey

To investigate how participatory Technology Assessment (pTA) could take shape within the Canadian context, this research adopts Systemic Design (Jones & Ael, 2022) as its core mixed-methods research methodology. Systemic Design integrates systems thinking with design practice and enables a transdisciplinary approach to address complex societal challenges. As a mixed-methods approach, the Systemic Design methodology draws upon both qualitative and quantitative methods. It allows the combination of desk research, stakeholder interviews, participatory design activities, and systems modeling. As such, the research can explore not only the current landscape of Technology Assessment (TA) in Canada but also co-develop alternative future pathways with key stakeholders.

Systemic Design also facilitates the interplay between participatory design, design research, and systems theory modeling. Participatory design ensures that diverse stakeholder perspectives, including those often excluded from policy-making are meaningfully engaged, in shaping the problem space and possible interventions. Design research supports the lived experiences of participants through iterative prototyping, stakeholder engagement, and framing exercises. Finally, Systems theory modeling, including methods like influence mapping and causal loop diagrams, helps structure complex social dynamics and identify leverage points for institutional or policy change.

Although the full System Design methodology has seven phases, this research focused primarily on the five earlier phases that are framing, listening, understanding, envisioning and exploring the possibility space. These stages provided the necessary foundation to explore current practices and propose context-sensitive approaches to participatory TA in Canada. Future work may extend into the final phases: planning the Change Process and Fostering the Transition, to operationalize and sustain systemic interventions.

METHODOLOGY

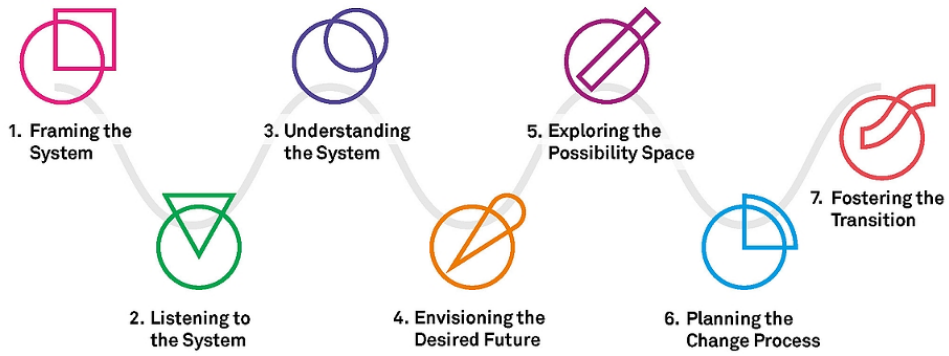


Figure (1.1) Systemic Design Journey (Jones & Ael, 2022)

Framing the System

In this initial phase, the project conducted **desk research and a comprehensive literature review** to understand both historical and current Technology Assessment (TA) activities in Canada. This stage revealed the important legacy of the Science Council of Canada (SCC), which functioned as a de facto TA institution during the 1980s. Identifying the roles and contributions of the Science Council helped inform the mapping of current institutions that share similar mandates and functions. This phase also **served as groundwork for the next step** by identifying key experts for interviews and selecting conferences relevant to Canada's science and technology policy landscape.

Listening the System

This phase focused on engaging with what remains of a Technology Assessment (TA) and TA-Like Activities in Canada. To better understand this landscape, the research employed a mixed-methods approach that combined qualitative and quantitative data collection. **Five in-depth interviews** were conducted with experts directly involved in Canada's Technology Assessment (TA) and TA-like activities. The participants were selected from institutions engaged in implementing TA-like practices, such as Health Technology Assessment (HTA) and foresight. Each interview offered insights into the historical legacies, institutional gaps,

and future possibilities for TA in the country. In parallel, the research team participated in **the Canadian Science Policy Conference (CSPC) 2024 as an observation**. CSPC is a key national forum where multidisciplinary dialogue on science, technology, and innovation (STI) policy takes place. This engagement as an observational method helped to surface relevant discourses and networks shaping the current policy context. To broaden the inquiry beyond expert views, **a public engagement survey** was also conducted in this step. It gathered responses **from 70 individuals** across four major provinces—Ontario, Quebec, British Columbia, and Alberta.

Understanding the System

This phase synthesized findings using both thematic analysis (for qualitative data) and descriptive statistical analysis (for survey data). The **qualitative data collected through in-depth interviews were transformed into key insights**. These insights, including an understanding of the past and present TA landscape in Canada, as well as the challenges and opportunities of employing participatory TA (pTA), helped inform the development of a draft policy deliberation process called the Participatory toward Anticipatory (PtA) Process. Additionally, **the analysis of the Public Participation Survey contributed to the creation of a prototype for the PtA policy deliberation process**. Although the original plan was to create a game-based engagement tool, findings from this "Understanding the System" phase led to a pivot. Instead of a game, a social media–style format was adopted, as it offers a more accessible, interactive, and culturally recognizable approach to public engagement.

Envisioning and Exploring

In this research, two Systemic Design phases: Envisioning Desired Futures and Exploring the Possibility Space, were operationalized through the execution of the full PtA prototype testing process. A total of 30 participants opted in to join the prototype testing. Of these, **18 participated in the first step of the process, and 12 took part in the second step. The final step of the PtA process is Co-lab session lasting 2 hours, where 6 participants co-developed insights through facilitated systemic dialogue.** The Co-lab session exemplify the Structured Dialogic Design (SDD) used in the PtA process. It facilitates collaborative, multi-stakeholder dialogue around complex social issues. The session was facilitated

through a dialogic software Logosofia and played a central role in enabling participants to collectively explore future pathways for inclusive and anticipatory technology governance in Canada.

Through these engagements, including the remote activities in Steps 1 and 2 of the prototyping phase and the final Co-Lab session, the two Systemic Design phases of Envisioning Desired Futures and Exploring the Possibility Space were meaningfuslly addressed. Participants contributed to envisioning future directions for participatory technology assessment by reflecting on their values, needs, and expectations at each stage of the prototype. Their input not only shaped the insights gathered but also informed how public engagement might be designed in the future. Additionally, these phases enabled participants to give direct feedback on the design of the PtA process itself. By incorporating their experiences and perspectives, the prototype created a space that allowed multiple future possibilities to emerge, an essential function of the possibility space in systemic design.

STRUCTURE OF THE REPORT

The structure of the report follows the steps of the project.

Chapter 1 **introduces the Participatory toward Anticipatory (PtA) project**. It explains the context and rationale, outlines the primary and secondary research questions, presents the researcher's positionality statement, and describes key concepts and the Systemic Design methodology used throughout the research.

Chapter 2 focuses on **understanding Technology Assessment (TA)**. It provides an overview of TA and Participatory Technology Assessment (pTA), followed by a discussion of past and present TA and TA-like activities in Canada. This includes an examination of the Science Council of Canada (SCC) as the dominant TA initiative in the past, and a discussion of Health Technology Assessment (HTA) and Foresight as prominent TA-like activities today.

Chapter 3 discusses the **challenges and opportunities for Participatory Technology Assessment (pTA)** to take root in Canada. The key challenges identified include: (1) the TA function being placed under executive authority or the authority of Governor-in-Council, (2) the government's shift from "Make" to "Buy," which encourages the rise of the private sector in technology policymaking, (3) Canada's dependency on the United States, and (4) the dominance of Evidence-Based Policy Making (EBPM). The chapter also highlights several opportunities: (1) Canada's readiness for participatory approaches as evidenced by two successful case studies, (2) Canada's closer relationship with Europe, and (3) the emerging shift from EBPM to mission-driven policymaking.

Chapter 4 presents **key considerations in designing a new Pariticipatory toward Anticipatory (PtA) process**, using pTA as its main theoretical foundation. It begins by examining the role of public participation in decision-making, supported by Causal Layered Analysis to unpack its underlying rationales. It then presents findings from the Public Participation Survey, challenging typical assumptions about the role of the public. The chapter continues by discussing additional survey results that inform the design of the PtA process and concludes with an overview of Structured Dialogic Design (SDD) as the methodological foundation for the PtA process.

Chapter 5 provides a **detailed explanation of the new Participatory toward Anticipatory (PtA) process**. It outlines each step, from (1) Recruitment to (7) Final Report and Response from the Proposed Entity.

Chapter 6 is dedicated to **the prototyping of the PtA process**. It describes the prototyping phase, how it was adapted due to the constraints during prototyping process, and summarizes the key results. The chapter then discusses the limitations, lessons learned, and concludes with reflections on the way forward, including future possibilities and requirements for further development and implementation.

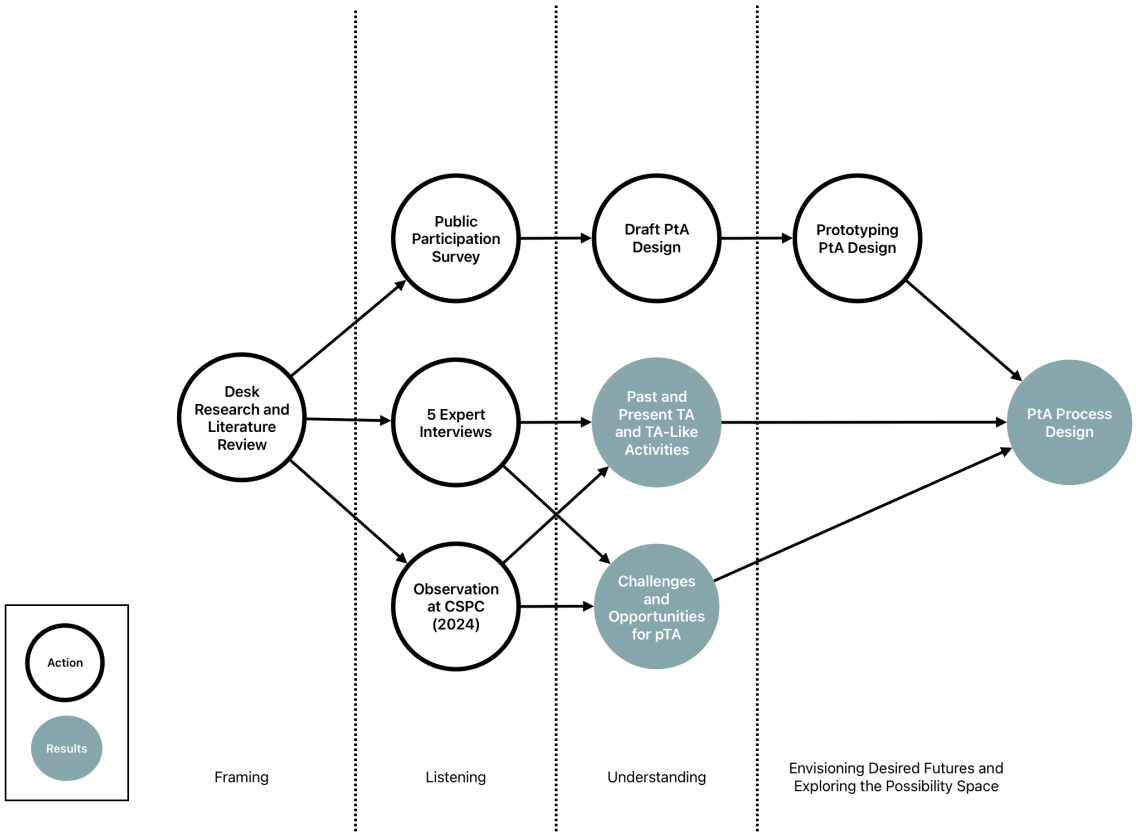


Figure (1.2) Process and Structure of Participatory toward Anticipatory (PtA) Project

CHAPTER 2

Technology Assessment (TA) and TA-like Activities in Canada

TA AND TA-LIKE ACTIVITIES

SUMMARY

Chapter 2 focuses on understanding Technology Assessment (TA). It provides an overview of TA and Participatory Technology Assessment (pTA), followed by a discussion of past and present TA and TA-like activities in Canada. This includes an examination of the Science Council of Canada (SCC) as the dominant TA initiative in the past, and a discussion of Health Technology Assessment (HTA) and Foresight as prominent TA-like activities today.

TECHNOLOGY ASSESSMENT (TA)

As the pace of development in new technologies continues to accelerate, there is a growing need for policy instruments that can provide guidance alongside these emerging innovations. The ideal scenario is one in which the social, environmental, ethical, and legal impacts of new technologies are considered by those most likely to be affected—before these technologies contribute to societal progress. Due to the disruptive nature of emerging technologies, this ideal scenario has drawn increasing interest from scholars. One field in which this vision is being explored is Technology Assessment (TA), as it offers a structured way to navigate the complex challenges posed by new technologies. Many scholars have examined TA as a potential solution for addressing these challenges. (Hennen, Leonhard et al., 2023; Guston & Sarewitz, 2020; Grunwald, 2009).

Technology Assessment (TA) is a process of critically reflecting on technological advancement by investigating its potential consequences. Importantly, it is not limited to technical or economic evaluations. Rather, it invites dialogue among diverse stakeholders, including civil society, policymakers, and scientists, to shape collective decisions about the role of technology in society. This approach aligns with the paradigm shift advocated in this research, which views technological development decision-making as a social phenomenon. TA can serve as a theoretical concept that facilitates a move away from top-down, expert-driven policy decisions toward a more inclusive, participatory approach that centers the public in shaping technological futures. Although there is no universally agreed-upon definition, Technology Assessment is widely recognized as:

> *"a scientific, interactive, and communicative process which aims to contribute to the formation of public and political opinion on societal aspects of science and technology"* (Bütschi et al., 2004, p. 14).

Technology Assessment (TA) has been a widely used concept since the 1970s. The United States launched the Office of Technology Assessment (OTA) during that decade, initiating international dialogue on the topic (Bimber, 1996). In the 1980s, several European countries, including France, the United Kingdom, and Germany, established national TA institutions, which later came together under the umbrella of the European Parliamentary Technology Assessment (EPTA) (Hennen et al., 2023). Although the OTA was phased out in 1995 and the discourse around TA gradually declined in North America (Vig & Paschen, 2000), Europe has continued to employ and develop TA practices (Hennen et al., 2023). Today, EPTA includes 25 member institutions. The U.S. Government Accountability Office (GAO), which took on TA responsibilities in 2002, joined EPTA as an associate member that same year (GAO, 2021). The global TA landscape has since expanded beyond Europe and North America to include East Asian countries such as Japan and South Korea, as well as Latin American countries like Mexico (Hennen et al., 2023).

PARTICIPATORY TECHNOLOGY ASSESSMENT (pTA)

To align with its objective of instigating a paradigm shift in technological choices as social choices, this research adopts Participatory Technology Assessment (pTA) as its guiding framework. Joss and Bellucci (2002) defined pTA as

> *"Participatory Technology Assessment (pTA) refers to a set of methods and processes that actively involve members of the public and other non-expert stakeholders in evaluating the societal, ethical, and policy implications of emerging technologies. Unlike traditional TA, which is typically expert-driven, pTA emphasizes inclusive dialogue and deliberation to democratize technological decision-making and align innovation with public values and concerns."* (Joss and Bellucci, 2002)

Out of several TA types, pTA is particularly suited to address the current demand for inclusive, democratic, and anticipatory governance of technology. It directly supports placing the public at the center of decision-making processes in technology development.

From the early days of TA, the participatory dimension has been one of the key areas of debate and transformation, holding potential for redefining TA's societal role. Scholars in the 1970s and 1980s emphasized the need for democratic control over technological choices in increasingly industrialized societies. Berg (1976) argued:

> *"...if it (TA) is to be supportive of our democratic ethos, then it shall have to learn to use citizen participation and stakeholder inputs constructively and without compromising itself."* (Berg, 1976)

Similarly, Harman (1976) advocated for the creation of institutional mechanisms that support meaningful citizen participation from the early stages of technological development:

> *"In general, these institutions would have two tasks... The second task is political and even more clearly calls for citizen participation in stimulating needed action. The most effective organizational forums for accomplishing these two tasks have yet to emerge through experimentation. The basic principle is to obtain effective citizen participation…"* Harman (1976)

The growing momentum around participatory practices was captured in "Technology Assessment: Creative Futures", a publication documenting discussions from the International Congress on Technology Assessment. In the "Forward" session, Governor Russell W. Peterson, former Director of the U.S. Office of Technology Assessment (OTA), highlighted the vital role of public engagement:

> *"Equally important in the new direction is citizen involvement, which can bridge the gap between factual technical analysis and value-oriented policy analysis."* (Boroush, Chen and Christakis, 1980)

Despite this early enthusiasm, the momentum of participatory TA in the United States waned after the OTA was dissolved in 1995.

However, the approach has since flourished in Europe, where participatory models are increasingly embedded in policy processes. Scholars such as Versgragt and Groenewegen (1989), Hennen (1999), and Joss and Bellucci (2002) have continued to promote participation as a central methodology within TA. Participatory TA, in essence, brings together a diverse array of societal actors; stakeholders, affected citizens, non-experts, and the general public to evaluate the implications of technological innovations (Grunwald, 2018). In its early days, participatory Technology Assessment (pTA) was regarded as a complement to traditional TA, which primarily relied on expert input rather than public engagement. A new approach centering the public was started by the European Participatory Technology Assessment (EUROPTA) project, an early initiative to implement pTA in Europe. It recommended the development of new participatory methods that expand the scope of assessment to include broader groups of social actors (Klüver et al., 2000).

In examining different modes of participation, scholars distinguish between expert-stakeholder oriented pTA and citizen/public oriented pTA. The former involves actors who are professionally or institutionally tied to the issue, often representing organized interests or specialized knowledge. These participants tend to be more articulate, organized, and strategic in their engagement. In contrast, citizen/public oriented pTA includes individuals who are typically unorganized and recruited at random. These participants are seen as more neutral and focused on the collective good, offering perspectives that are less bound by institutional agendas (Klüver et al., 2000; Grunwald, 2018). Given its emphasis on neutrality, inclusivity, and anticipatory governance, citizen/public oriented pTA offers a promising model for enabling meaningful public involvement in the assessment of emerging technologies.

THE HISTORY OF TA IN CANADA

The Science Council of Canada (SCC)

Despite its international status as a technologically advanced nation, Canada has never established a dedicated office or agency solely responsible for conducting Technology Assessment (TA). Instead, assessments have traditionally been undertaken by various government departments and agencies. Typically, these are done in relation to specific large-scale projects under their jurisdiction. While this decentralized model enabled some degree of evaluation, it lacked a cohesive structure or systemic mechanism for addressing broader societal, ethical, or long-term implications of emerging technologies.

An attempt by Canada to mitigate this institutional gap was the Science Council of Canada (SCC). The SCC was established in 1966, and operated as an advisory body to the federal government on matters related to science and technology. Although it was not formally designated as a TA institution, the SCC took on functions similar to TA. Notably, TA was first mentioned in the SCC's 1970 annual report preceding even the establishment of the U.S. Office of Technology Assessment (OTA) in 1973 (Bimber, 1996). Under the title "Technology Assessment," the Science Council outlined a call to action, emphasizing the need for systematic evaluation of technological developments and their broader societal implications. It was as captured in the following statement:

> *"It is clearly realized that all technology is not necessarily beneficial and that much technology has unforeseen and detrimental side-effects which only become apparent long after the first introduction of the new product or system. Society must take steps to see that mechanisms are devised to study the long-term implications of new technology, to weigh the costs and benefits to the extent that this is feasible, and to guard against the misapplication of technology wherever possible."* (Science Council of Canada, 1970)

The mandate of the SCC was *"to study current and emerging issues and enhance Government decision making through the provision of expert advice"* (Science Council, 1966). The SCC engaged in expert-stakeholder oriented Technology Assessment by commissioning and convening experts to produce numerous reports on science and technology issues. However, the detailed processes by which these experts were selected or how deliberations unfolded remain unclear, as only the final reports are publicly accessible and archived at the Toronto Reference Library and the University of Ottawa.

The reports produced by the SCC were categorized into three main series: Red, Green, and Other. Of these, the Green Series is most relevant to this paper's discussion on Technology Assessment (TA). While the Red Series consisted of policy statements and recommendations issued directly by the Council, and the "Other" category encompassed a small number of reports that did not fit neatly into the other two categories, the Green Series reports were distinguished by their independence and methodological approach. These were authored by external experts commissioned by the SCC to examine scientific and technological issues of special interest. These were particularly aligned with the spirit of objectivity central to TA, as the views presented in these reports did not represent the official stance of the SCC. This helped ensure the intellectual autonomy necessary for critical assessment.

The Science Council of Canada (SCC) played a central role in shaping national science and technology policy through its advocacy for "technological sovereignty", the notion that innovation should serve public interests and national autonomy. However, as Canadian science policy shifted in the 1980s and 1990s toward market-driven priorities, the SCC's interventionist stance became increasingly misaligned with federal agendas emphasizing commercialization and competitiveness (Clowater, 2010). A pivotal moment came with the Council's 1978 report "Forging the Links" (Science Council of Canada, 1978), which highlighted Canada's industrial weaknesses and sparked controversy by challenging the prevailing economic orthodoxy. This report, along with growing perceptions of the SCC as a lobbying voice for scientists, led the government to question its legitimacy as an independent advisory body (Canadian Public Policy, 1978; Ministry of Supply and Services, 1985). The erosion of political support led to drastic budget cuts (Science Council, 1985) and staff layoffs following a critical review by a government-appointed study team. Ultimately, the launch of the Federal Prosperity Initiatives and the subsequent report "Inventing Our Future" in 1992 (Steering Group on Prosperity,1992) marked a decisive shift in Canadian science policy, positioning private-sector needs over independent public advisory bodies and rendering the SCC obsolete (Government of Canada, 1991; Science Council of Canada, 1966)

During its operation, the Science Council of Canada (SCC) attempted to perform Technology Assessment (TA), but it faced several challenges in addressing the institutional gap for TA. The advisory role of the SCC was not formally embedded within the Canadian government's decision-making process, and the top-down assessments conducted by a few experts fell short in effectively applying TA. Although the SCC's reports were often produced by external experts commissioned by the Council, the processes for selecting these experts and how their deliberations unfolded were not transparent. This lack of transparency and limited stakeholder involvement may have undermined its attempt. While the SCC's efforts were valuable, its lack of institutional power and narrow stakeholder engagement ultimately hindered its ability to effectively close the TA gap in Canada.

PRESENT TA AND TA-LIKE ACTIVITIES

A Successor to the SCC: The Canadian Council of Academies (CCA)

In 2006, fourteen years after the dissolution of the Science Council of Canada (SCC), the Canadian Council of Academies (CCA) was established with a mandate similar to that of the SCC. While not identical, the CCA carries forward the SCC's core function of providing expert knowledge on science and technology issues to support informed decision-making.

> *"The purpose of the Council is to conduct assessments, by panels of independent experts, of the science that is relevant to public policy issues"* (Canadian Council of Academies, 2007)

Like the SCC, the CCA convenes experts across relevant fields to assess complex scientific and technological challenges. In this sense, it has assumed the function previously fulfilled by the SCC's "Green Series," and can be regarded as the SCC's institutional successor for TA. Also like the SCC, the CCA is primarily funded by the government. Though it was created in 2002, it formally began operations in 2005 following a $30 million grant from the government. Furthermore, both organizations share a broad scope in the topics they address, unlike most organizations that specialize in specific areas, such as Genome Canada. While the SCC produced reports on diverse topics ranging from space to health issues, the CCA similarly covers a wide range of subjects across five categories. (CCA Website, 2025).

However, a key difference sets the CCA apart from the former SCC. The CCA deliberately refrains from providing policy recommendations. Unlike the SCC, which actively

contributed to policy through its influential "Red Series," the CCA maintains a stance of neutrality. Learning from the trajectory of the SCC whose policy advocacy ultimately contributed to its dissolution, the CCA avoids direct involvement in political decision-making. Instead, it positions itself as a technical and objective scientific body. This role is clearly outlined in its mandate:

> *"…assessments do not include policy recommendations, but rather describe what is known, and what is not known, about the scientific questions before the panel, and how the scientific facts and implications are relevant to the making of public policy."* (Canadian Council of Academies, 2007)

The CCA maintains a close relationship with the Department of Innovation, Science and Economic Development (ISED), which is also its primary funder. In this regard, the CCA is essentially answerable to the ISED. However, the assessments it conducts are often commissioned by a variety of government departments beyond ISED. The CCA receives requests for assessments from federal departments and agencies, either through ISED's call for proposals or through direct requests made to the CCA. These requests become "questions" that indicate the required assessment. (See Figure (2.1) for the assessment process of the CCA.)

However, similar to the SCC, the CCA has also not been able to fill the institutional gap in Technology Assessment (TA). It intentionally avoids policy-making authority, and its recommendations are not binding for the institutions that request them. Moreover, the CCA typically responds to specific questions posed by federal departments rather than proactively conducting systemic or anticipatory assessments of emerging technologies. This reactive model limits its capacity to address the long-term social and ethical dimensions expected from a dedicated TA institution.

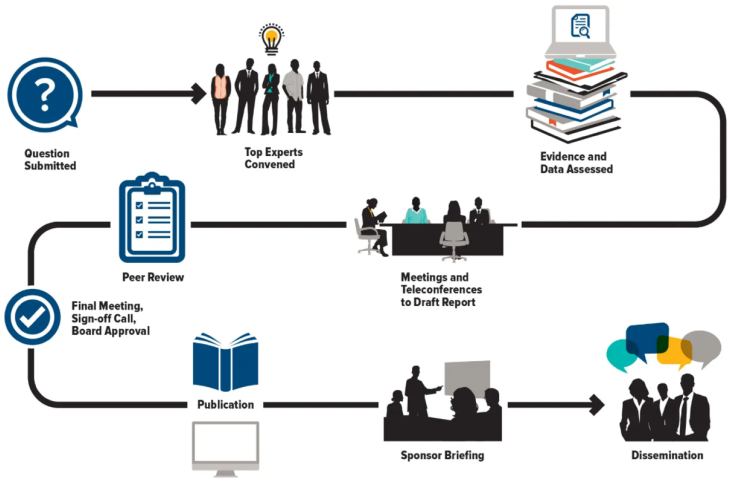


Figure (2.1) Overview of the CCA Assessment Process (CCA Website, 2025)

Exploring Other TA-like Activities

In Canada, Technology Assessment (TA) and TA-like activities can be observed across several government portfolios. While the Innovation, Science and Economic Development (ISED) portfolio most clearly resembles a traditional TA function, other federal portfolios also engage in TA-like practices that align with internationally recognized definitions. As outlined in "Technology Assessment in a Globalized World", TA-like activities span fields such as Responsible Research and Innovation (RRI), Foresight, Health Technology Assessments (HTA), and Environmental or Social Impact Assessments (Hennen et al., 2023).

> *"TA-Like Activities range from research into the relationship between Science, Technology and Society (STS), to more project-oriented consultancy in environmental issues, such as the Environmental Impact Assessment (EIA)."* (Hennen et al., 2023)

A notable example within the environmental domain is the work of the Impact Assessment Agency of Canada (IAAC), which operates under the Environment and Climate Change (ECC) portfolio. Although not a TA body per se, IAAC's environmental and social assessments reflect TA-like characteristics by convening diverse expertise and evaluating the broad implications of proposed projects. Its role illustrates how TA practices are diffused across government through a portfolio approach, even if they do not always take the form of formal technology assessment institutions.

What are Portfolios?

Portfolios, according to the Federal Government of Canada, are groups of federal organizations typically within a similar sphere of interest. These portfolios report to a Minister or to Parliament through a Minister (The Government of Canada, 2025).

Health Technology Assessment (HTA)

The Health portfolio is the most established and active sector for conducting Technology Assessment (TA)-like activities in Canada, due to the maturity and centrality of Health Technology Assessment (HTA). While the term "Technology Assessment" is not widely adopted in Canadian public policy, HTA is a familiar and well-institutionalized practice, positioning Canada among global leaders in this area (Battista et al., 2009). HTA has become a foundational mechanism for evaluating new health interventions, technologies, and drugs to inform decisions on public funding and access.

Canada's publicly funded yet decentralized health care system shapes the structure of HTA. While the Canada Health Act provides a framework of shared principles, provinces and territories maintain autonomy in organizing and delivering services. As a result, decisions about which health technologies are publicly funded are made at the provincial or territorial level. This decentralized model has led to the development of over 40 HTA organizations across the country, operating within a network that includes federal and provincial government agencies, hospitals, universities, non-profit institutions, and health authorities (Cleary, 2020).

The Canadian Drug Agency (CDA), formerly CADTH, is Canada's central Health Technology Assessment (HTA) body, originally established in 1989 as the Canadian Coordinating Office for Health Technology Assessment (CCOHTA). Rebranded in 2024, CDA now holds an expanded mandate to improve prescribing practices, enhance real-world data access, and reduce inefficiencies across Canada's drug system. (CDA, 2025) It supports the 13 public insurance plans with impartial assessments of drugs and health technologies. As demand for HTA has grown, local HTA bodies have also emerged to address context-specific needs. While provinces like Ontario, Quebec, British Columbia, and Alberta have their own HTA organizations, others rely on CDA. (Battista et al., 2009)

CDA produces various types of assessments, including Health Technology Reviews and Horizon Scanning. It collaborates with stakeholders: governments, patients, industry, and academia, and is supported by expert advisory panels like the Health Technology Expert Review Panel (HTERP). CDA also leads the pan-Canadian Health Technology Assessment Collaborative alongside regional bodies such as INESSS (Quebec), Ontario Health, and BC-HTAO. This network aims to streamline assessments, share best practices, and strengthen Canada's HTA landscape.

Foresight

Another prominent TA-like activity in Canada is foresight, which is not only used by the government but also practiced by many institutions across sectors. Gibbons and Voyer, who wrote on Technology Assessment in Canada in 1976, also highlighted the close connection between TA and future studies. According to them, future studies extend beyond operational analysis by attempting to outline the broader scenarios and consequences brought about by the application of new technologies. Jones (2017) noted that Canada's foresight capabilities in public policy have developed uniquely over time. He traced the roots of foresight practice in Canada back to 1976, with the founding of the Canadian Association for Future Studies. Since 1996, the Canadian government has supported an interministerial foresight advisory group known as the Policy Research Initiative (PRI), which later evolved into Policy Horizons, a dedicated government foresight organization (Jones, 2017; Policy Horizons Canada, 2016).

Although foresight is not housed under a single portfolio, Policy Horizons, the government's foresight agency, functions as a TA-like body similar to the Canadian Council of Academies (CCA) and the Canadian Drug Agency (CDA), providing support across government agencies and departments. Policy Horizons plays a key role in educating public servants and advocating for the use of foresight within the federal government. It equips the Government of Canada with a forward-thinking mindset to strengthen decision-making. However, the content produced by Policy Horizons is not limited to internal government use, many of its publications, such as "Foresight Training Manual" (Policy Horizons, 2016), are widely used by universities, NGOs, and consulting groups.

Foresight in Canada is a widely practiced and multifaceted activity that extends across government, academic, and private sectors. Various federal departments and agencies, such as Canada's Drug Agency and Global Affairs Canada, maintain their own foresight units or teams, conducting horizon scanning, strategic planning, and scenario development for emerging issues. Academically, foresight is actively promoted through programs like the Strategic Foresight and Innovation (SFI) program at OCAD University, McMaster University's Foresight Lab, and the Defence and Security Foresight Group at the University of Waterloo. Additionally, foresight is embraced by consultancies and non-profits, such as eCampus Ontario, Québec Net Positif, and Foresight Canada, which use it to support innovation, low-carbon transitions, and clean tech adoption. Overall, foresight is deeply embedded across Canada's public and private sectors, driving informed decision-making and forward-thinking governance.

General Actors Map of TA in Canada

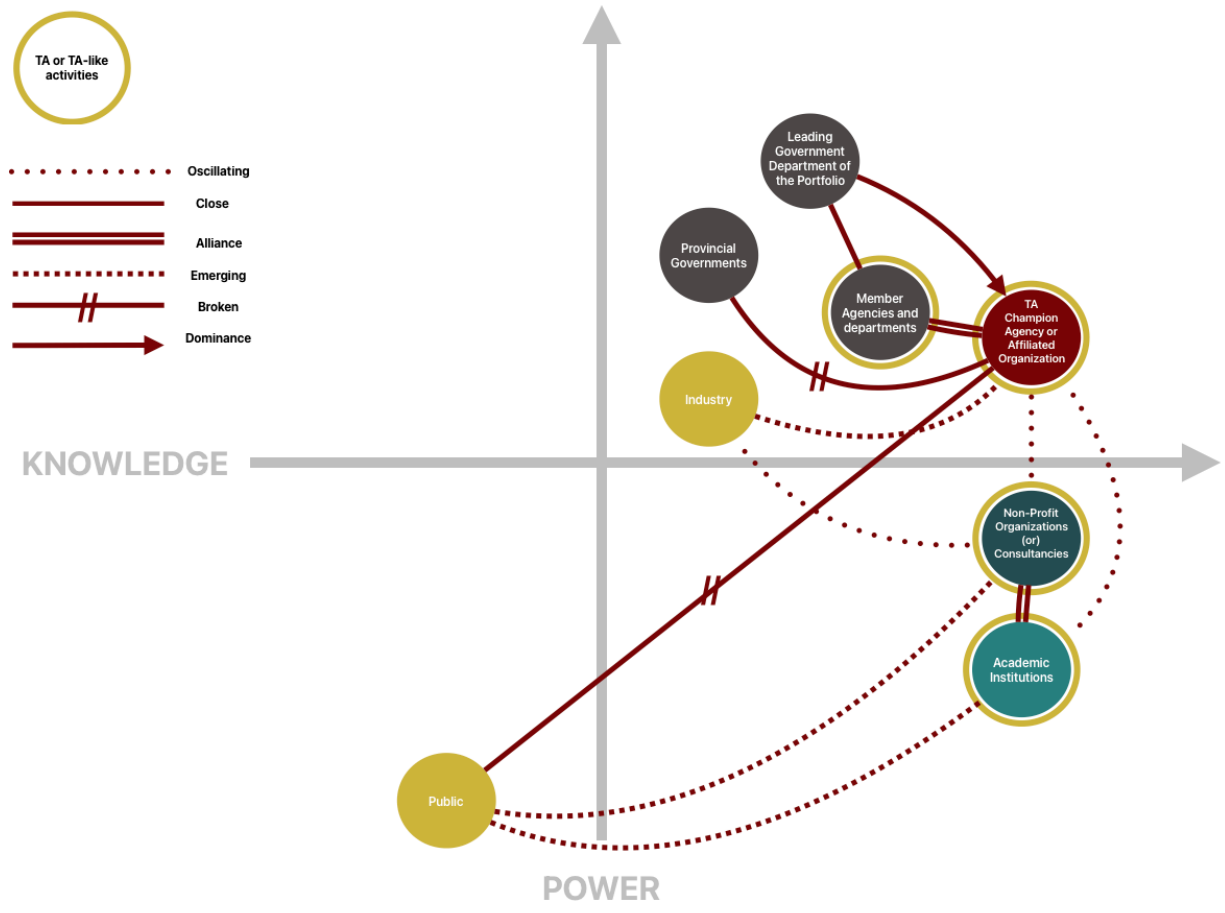


Figure (2.2) General Actors Map of Technology Assessment In Canada

The Actors Map illustrates the general patterns of interaction among stakeholders in the field of Technology Assessment (TA), with the exception of Health Technology Assessment (HTA). In general, TAs are primarily conducted by champion agencies or organizations such as the Canadian Council of Academies (CCA), the Council of Canadian Academies (CDA), and Policy Horizons Canada. However, assessments also occur within academic institutions, portfolio member agencies, non-profit organizations, and consultancies. The yellow circles on the map indicate the actors who are engaged in TA-like assessments.

The relationship between TA champion agencies and leading government departments is typically direct and dominant. These champions also form alliances with portfolio agencies that maintain close ties with federal departments. While TA champions operate independently, they often contribute to assessments beyond their immediate portfolio. Generally, they do not collaborate closely with provincial governments, as their focus tends to remain at the national level. A notable exception is the CDA, which leads HTA and maintains strong alliances with all provinces and territories. However, the relationship between TA champions and academic institutions, non-profit organizations, or consultancies is more variable. These actors may collaborate with TA champions on specific topics, but they can also diverge in their interpretations or critiques of assessment outcomes. Despite occasional disagreements, academic and non-profit institutions are often allied with TA champions on a range of technology-related issues.

The relationship between TA champions and the private sector is still emerging. As government policy increasingly promotes private sector involvement, TA champions are gradually establishing partnerships with industry experts. However, relationships between industry and non-profits are less consistent. For example, while non-profits may work with industry on projects supporting small and medium-sized enterprises (SMEs), they rarely collaborate on formal technology assessments. Similarly, although academic institutions may partner with industry on research, their assessments may not always align with industry interests. Most notably, the public is largely excluded from formal TA activities. TA champions generally do not have direct engagement with the public. However, non-profits and academic institutions that explore participatory methods may involve the public in certain initiatives. It marks an emerging area of engagement between these actors and the broader public.

CHAPTER 3

Navigating Challenges and Opportunities for Participatory Technology Assessment (pTA)

CHALLENGES AND OPPORTUNITIES

Chapter 3 discusses the challenges and opportunities for Participatory Technology Assessment (pTA) to take root in Canada. The key challenges identified include: (1) the TA function being placed under executive authority or the Governor-in-Council, (2) the government's shift from "Make" to "Buy," which encourages the rise of the private sector in technology policymaking, (3) Canada's dependency on the United States, and (4) the dominance of Evidence-Based Policy Making (EBPM). The chapter also highlights several opportunities: (1) Canada's readiness for participatory approaches as evidenced by two successful case studies, (2) Canada's growing relationship with Europe, and (3) the emerging shift from EBPM to mission-driven policymaking.

SUMMARY

Placing TA Under the Executive Authority (or) The Authority of The Governor in Council

In 1974, four years after Technology Assessment (TA) was first mentioned by the Science Council of Canada (SCC), a group of scholars led by Gibbons and Voyer conducted a study that explored the absence of a designated institution for TA in Canada. Their report highlighted key weaknesses and proposed a more comprehensive TA system. Gibbons and Voyer (1974) identified Canada's decision-making structure as the primary reason for this absence, emphasizing that TA fell under the jurisdiction of the Executive Authority which in Canadaian context is the Authority of the Governor in Council, rather than the Legislative Branch.

> *"In the Canadian context, decisions concerning expenditures on large technological projects are taken by Ministers at both the federal and provincial levels (usually with the advice of top civil servants) in Cabinet and not in Parliament. Because of this, it is perhaps more germane to ask about the effectiveness of the Executive in assessing technology before one concedes the necessity of legislation to create separate body like the Office of Technology Assessment parallel to, or at least, independent of the Executive."* (Gibbons and Voyer, 1974. Pg. 24)

CHALLENGES FOR PARTICIPATORY TA in CANADA

This allocation of decision-making power significantly shaped the structure and nature of governmental policy-making processes related to TA in Canada. Unlike the United States and Europe where TA falls under the authority of Parliament and is often carried out by an independent body that reports back to Parliament, Canada's TA was diffused within the ministeries under the Executive Branch. As a result, it served more as an administrative and procedural function within departments and agencies, rather than a comprehensive assessment process.

Gibbons and Voyer (1974) explained that Canadian decision-makers at the time viewed policymaking as a process of continuous internal interaction. They believed that TA would be ineffective if conducted by an external or parallel body, which they assumed would lack the resources and access to fully assess the magnitude and complexity of the information handled within the executive. Any such external agency, they argued, would be forced to assess technologies based on partial information, thereby introducing unnecessary delays to the execution of government policy. Consequently, rather than creating an independent TA body, Canada entrusted TA to government ministries and departments, with support from the Science Council, an arm's-length advisory body that provided short- and long-term assessments and guidance on science and technology issues.

Conducting assessments through government agencies had significant implications for democratic participation. Keith, Fisher, et al. (1976), who conducted TA studies on petroleum development programs in the Mackenzie Delta-Beaufort Sea Region and the Arctic Islands, found that these systems were disproportionately weighted in favor of the federal government and industry, at the expense of other actors such as Indigenous communities. This imbalance hindered the ability of marginalized groups to meaningfully participate in technology assessment. They observed:

> *"While government and industry have consulted with northern groups in the course of their programs, the consultation has been after the fact. This does not qualify as decentralized initiatives.' Rather than encouraging involvement, the strategies of industry and government have generated hesitancy, uncertainty, and even mistrust.*" (Keith, Fisher et.al (1976, Pg. 156)

Gibbons and Voyer (1974) also criticized the tendency of agencies to overlook the public interest and ignore important considerations. Instead, these agencies often conducted "incomplete or superficial" assessments that served their own responsibilities, focusing narrowly on technical and economic factors. In some cases, they accused agencies of committing to certain technologies despite negative consequences or the availability of better alternatives.

Today, public consultation is considered a crucial element of policymaking in Canada. Since the implementation of the Cabinet Directive on Streamlining Regulation (2007), systemic efforts have been made to ensure that stakeholders are given the opportunity to participate in open and meaningful consultations throughout the regulatory process. As of the time of this report, 889 consultations are listed on the Government of Canada's "Consulting with Canadians" platform, with 69 of them specifically related to science and technology (Government of Canada, 2025).

However, many challenges remain. Haggart and Tusikov (2023) described the federal government's consultations as 'superficial', noting that they often undermine essential aspects of the policymaking process and fail to raise public awareness or promote understanding of complex technological issues. For example, the "National Consultations on Digital and Data Transformation" emphasized only the economic impacts of data collection, excluding broader social consequences such as potential government misuse of citizens' data (Haggart and Tusikov, 2023). During the early phases of federal AI initiatives, McKelvey and MacDonald (2019) also raised concerns that public consultation processes were restricted to expert input, excluding broader public engagement. Attard-Frost, Brandusescu, and Lyons (2024) analyzed 84 AI governance initiatives in Canada to identify opportunities and challenges. Among the challenges, they found significant gaps in public participation, which contributed to public distrust.

Among the supporting organizations for government departments and agencies, Canada's two main TA and TA-like entities; the Canadian Council of Academies (CCA) and Policy Horizons, still do not have robust mechanisms for public participation. The CCA does not yet offer formal pathways for public involvement, although it publishes its reports openly. While some stakeholder consultations do take place, particularly with Indigenous communities, they are not representative of the general public. The same can be said for the foresight analysis conducted by Policy Horizons, where stakeholder engagement is typically issue-specific. The only TA-like entity that includes public representation is Canada's Drug Agency (CDA), which has one public member on its Health Technology Assessment (HTA) review committee. However, CDA also does not have a direct mechanism to consult with the broader public.

A Shift From “Make” to “Buy” and The Rise of Private Sector Influence in Tech Policy Making

Canada’s Science, Technology, and Innovation (STI) policy has historically been government-driven, particularly during the mid-20th century when Prime Minister Pierre Elliott Trudeau declared science and technology central to national competitiveness, stating that “*Canada’s capabilities in science and technology lie at the heart of our competitiveness*” (Speeches from the Throne, 1980, p. 15). Federal expenditures on research and development (R&D) increased to 1.5% of Gross National Product (GNP) under Trudeau’s leadership. Despite his intention to reduce state dominance, this expansion laid the foundation for a deeply entrenched “make” approach to STI, where the government not only funded but directly led major projects. This model intensified under the Progressive Conservative government of Brian Mulroney (1984–1993), which pushed R&D expenditures to 2.5% of GNP. It wasn’t until the Liberal administrations of Jean Chrétien and Paul Martin (1993–2006) that STI was reframed as an economic development strategy, marked by the launch of the Information Highway initiative (Industry Canada, 1996). While efforts were made to engage the private sector, the public sector remained dominant in shaping and delivering STI policy (Doern & Stoney, 2009).

A gradual shift toward a “buy” approach began to take shape in the 2000s. This was further articulated in the 2014 Conservative government’s strategy “Seizing Canada’s Moment: Moving Forward in Science, Technology and Innovation”, which emphasized leveraging the research capacity of universities and industries to foster commercialization (Government of Canada, 2014). However, the transformation reached a critical turning point when Liberal government, led by Prime Minister Justin Trudeau, was in the office. The 2017 “Innovation and Skills Plan” introduced four foundational pillars:People and Skills, Building Science and Technologies, Growing Companies, and Program Simplification, as a national blueprint for market-driven innovation (Innovation, Science and Economic Development Canada [ISED], 2017).

By 2023, Canada’s total R&D expenditures had reached $49 billion, with the private sector contributing the largest share, approximately 47%, surpassing the federal government and higher education institutions, which each accounted for 17% (Statistics Canada, 2023). This marks a structural shift where the state now serves primarily as a facilitator and funder of innovation, rather than its architect. Public funding mechanisms such as the “Strategic

Innovation Fund (SIF)" and the $15 billion "Canada Growth Fund" are designed to de-risk private investment in areas like artificial intelligence, clean technology, and quantum science (ISED, 2023a; Department of Finance Canada, 2023). The government's Pan-Canadian Artificial Intelligence Strategy (2017) and the Artificial Intelligence and Data Act (AIDA) further exemplify this focus on enabling private-sector leadership while promoting responsible AI use (ISED, 2017; Government of Canada, 2022). Meanwhile, clean tech initiatives, such as the Clean Growth Hub, the National Hydrogen Strategy, and the net-zero by 2050 commitment, demonstrate a similar emphasis on public-private collaboration to spur technological advancement (Environment and Climate Change Canada, 2023).

Despite these advancements, one crucial element remains consistently overlooked: the public. Across decades of STI policymaking, Canada has lacked mechanisms for participatory technology governance. The transition to a "buy" model has amplified the influence of private-sector actors while marginalizing democratic oversight. Canada remains without a dedicated institution for TA, independent process used in other countries to evaluate the broader societal, ethical, and long-term implications of emerging technologies (OECD, 2021). The STI ecosystem continues to be shaped from the top down, driven by government and industry agendas, with limited space for inclusive deliberation or anticipatory governance.

The Dependence on the United States

Canada relies on the United States in many areas, not only because it is the country's only neighbor but also due to its status as a global superpower. This reliance is particularly pronounced in the technology sector. According to a report from the Canadian government, 64.3% of all exports in the Information, Communication, and Technology (ICT) sector are directed to the United States. The dominant tech companies operating in Canada are also primarily U.S.-based multinational corporations. For example, in cloud services and platforms, Canada lacks large-scale domestic infrastructure providers and depends heavily on major firms such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform, which collectively hold 61% of Canada's cloud market (Piercey, 2025). While some of these companies have established data centers in provinces like Ontario and Quebec, they remain U.S.-owned and are thus subject to U.S. laws and policies. Building upon such reliance, concerns about data sovereignty have become increasingly prominent. The Government of Canada has acknowledged that storing sensitive government data with foreign-owned cloud providers could expose a significant threat to Canada. As stated in a 2020 white paper:

> *"Lack of full data sovereignty has the potential to damage the GC and third parties. Sensitive GC data could be subject to foreign laws and be disclosed to another government."* (Government of Canada, 2020)

These large tech firms have also increased their lobbying efforts in Canada's tech policy space. According to the TechLobby Report (2023), Amazon, Google, and Microsoft were the tech companies with the highest number of lobbying communications to Cabinet, Parliament, and federal departments in 2023. Their lobbying significantly influences Canada's policymaking. For instance, Microsoft effectively lobbied on Bill C-27, which includes the Consumer Privacy Protection Act, Personal Information and Data Protection Tribunal Act, and the Artificial Intelligence and Data Act. Bill C-27 introduces new data privacy legislation and regulation on the use of Artificial Intelligence. During the time the bill was being read in the House of Commons from November 2022 to April 2023, Microsoft conducted ten lobbying communications, and six of them with Members of Parliament. As a result, Bill C-27 remains under consideration at the time of this writing.

Another indicator of Canada's limited tech commercialization and its reliance on the U.S. is found in patent data. From 2023 to 2024, the Government of Canada granted over 25,000 patents, of which more than 12,000 (47%) were filed by U.S.-based applicants. In contrast, only about 11% came from Canadian applicants. Many Canadian start-ups with novel innovations are acquired by U.S. companies. According to the Institute for Mergers,

Acquisitions & Alliances (imaa), over 80% of foreign acquisitions in Canada come from U.S.-based companies.

Another factor indirectly reinforcing Canada's dependence on the U.S. is its decentralized procurement system. Canada’s interprovincial procurement restrictions make it difficult for domestic tech firms to scale nationally and become global leaders like Shopify. (CCA, 2019) Because of different provincial procurement policies, Canadian tech companies often face barriers when trying to access markets beyond their home provinces. Many provinces prefer local suppliers, which can lead to less competitive procurement processes and higher costs with less innovative outcomes. Without significant government contracts, Canadian tech companies are less motivated to invest in R&D. The Council of Canadian Innovators (CCI) has pointed out that Canada’s procurement culture fails to support an innovation-driven economy. Canadian tech firms often find it easier to sell their products internationally than within Canada itself due to these internal market barriers (Lowey, 2024).

On the other hand, multinational corporations like Google, Amazon, and Microsoft, with their vast resources and experience navigating complex markets, are better positioned to handle Canada’s fragmented procurement landscape. When Canadian institutions cannot identify a pan-Canadian company that meets procurement criteria, they often turn to these U.S.-based giants. Under the Open Government initiative, there are at least 12 records of federal contracts awarded to Amazon Web Services (AWS), ranging from just over CAD 1,000 to nearly CAD 700,000 for services across sectors such as national defense and health research. At the same time, Canada’s investment landscape also poses challenges to the Canadian companies. The CCI noted that Canadian investors are often risk-averse, preferring short-term returns. This discourages long-term innovation and leads companies to sell to U.S. companies rather than scale. Entrepreneurs are more likely to pursue modest wins "single after single" instead of striving for transformative innovation.

Canada’s strong dependence on the United States, seen in its reliance on U.S.-based tech firms for cloud infrastructure, innovation commercialization, and technology tools, has limited the growth of domestic companies and made it harder for Canadian innovations to thrive independently. This structural dependency not only constrains Canada’s technological sovereignty but also results in an uneven playing field where local firms struggle to compete with well-resourced U.S. multinationals. As a result, this dependence weakens Canada's ability to shape and enforce its own technology policies, especially those that require public involvement. When the infrastructure, platforms, and isntellectual property are largely foreign owned, it becomes increasingly difficult for the Canadian government to fully implement policies that aim to democratize innovation or ensure public accountability in technological development.

The Practice of Evidence Based Policy Making (EBPM)

Evidence-based policymaking (EBPM) is a widely practiced strategy across all levels of government in Canada. Over the decades, it has become formalized and institutionalized as a core approach in public policy development. The use of EBPM requires government departments to define measurable outcomes, performance indicators, and regular evaluations. It emphasizes tangible results for all implemented programs. Departmental Results Frameworks (DRFs), used across federal departments and agencies, consist of a department's core responsibilities, departmental results, and indicators. These frameworks are linked to a program inventory identifying the programs that contribute to each department's core mandate and results.

Although EBPM and public participation are not inherently opposed, they can often be in tension when put into practice. EBPM tends to prioritize quantitative data, expert knowledge, and experimental outcomes. In contrast, participatory policymaking often centers on qualitative data, community stories, and local or Indigenous knowledge, bringing social, emotional, cultural, and ethical dimensions into decision-making processes. Pallett (2020) has pointed out that EBPM frameworks can sideline public input by treating it merely as raw data rather than as a meaningful contribution to collective decision-making. In her article "The New Evidence-Based Policy: Public Participation Between 'Hard Evidence' and Democracy in Practice," she argues that public input is often dismissed on methodological grounds, thereby undermining its influence on policy outcomes.

When policy developments becomes overly technocratic and driven by expert rationales, it reduces the space for the public to engage with moral and ethical questions. This can lead to scenarios where decisions are made first and public consultation is treated as an afterthought. DeMenno (2019) explores these dynamics, concluding that despite the formal inclusion of public participation processes, expert-driven policymaking often reflects technocratic preferences with limited genuine influence from the public. This pattern is visible in Canada's AI governance efforts. Attard-Frost, Brandusescu, and Lyons (2024) analyzed 84 AI-related initiatives across Canada and found significant gaps in public participation. Most initiatives included little to no evidence of public involvement during the design or implementation phases. While some initiatives did engage a small, targeted group of stakeholders and published detailed outcome reports, participation was generally limited to informing rather than involving the public in decision-making processes.

In practice, EBPM suggests that policies are designed through rational, expert-led processes, but this often means unequal weighting of voices. Experts and industry stakeholders tend to wield greater influence, while public contributions may be marginalized or symbolic. McKelvey and MacDonald (2019) warned that early federal consultations on AI did not involve the public meaningfully but rather centered around expert stakeholders. EBPM's emphasis on empirical results and cost-efficiency can also create privileged access for well-resourced stakeholders, making public input less transformative. Pal (2020) offers a example from the 2016 federal consultation on electoral reform. Although cross-country consultations led a parliamentary committee to recommend a proportional representation system reflecting public input, the government ultimately abandoned the reform, citing a lack of consensus.

EBPM also encourages time-restricted processes based on policy cycles, funding timelines, and performance metrics. By contrast, participatory approaches often aim to build trust which is an outcome that cannot be achieved quickly. Meaningful public engagement also requires time to inform participants and build their capacity for participation. Without that investment, engagement risks becoming superficial, resulting in a box-ticking exercise that leaves both policymakers and technologists viewing public involvement as burdensome. These systemic tensions between EBPM and participatory policy processes make policymakers reluctant to fully embrace participatory methods. As a senior public servant interviewed for this project observed,

> "*The government is reluctant to do the proper public consultation because it brings uncertainty to the policy making"* (INT-EXP-003).

OPPORTUNITIES FOR PARTICIPATORY TA in CANADA

Canada's Readiness for Participatory Approach

Although public consultation in Canada is not without its flaws, the motivation to engage the public in policy processes is already deeply entrenched. Canada is also a global leader in recognizing Indigenous peoples, their knowledge systems, and cultural contributions. The following examples demonstrate how Canada could serve as fertile ground for participatory Technology Assessment (pTA).

Case 1: Impact of Citizen Participation on Decision-making in a Knowledge-Intensive Policy Field

In the 2011 comparative study "Impact of Citizen Participation on Decision-Making in a Knowledge-Intensive Policy Field", Canada was one of only three countries that actually implemented participatory Technology Assessment (pTA). The study examined the effects of participatory versus expert-based technology assessments across several EU and OECD countries. Using xenotransplantation policies from the 1990s and early 2000s as a case study, the project examined approaches in Austria, Denmark, Great Britain, Italy, Latvia, the Netherlands, Sweden, Switzerland, and Canada. In Canada, pTA was applied within the field of health through a participatory approach to Health Technology Assessment (HTA). The federal department, Health Canada, adopted a broad consultation strategy that included both expert assessment and public consultation, aiming to assess and mitigate the risks of xenotransplantation while enhancing the government's regulatory credibility.

This Canadian example is particularly instructive because xenotransplantation is a multidisciplinary research field involving areas such as surgery, physiology, immunology, genetics, infectious diseases, and veterinary medicine. As such, it cuts across multiple policy domains and departmental responsibilities, posing a unique challenge to both TA and pTA. Canada demonstrates how to effectively navigate this complexity. Recognizing xenotransplantation as a crosscutting, interdepartmental issue involving human health, animal welfare, and ethics, Health Canada made deliberate efforts to coordinate across departments and to integrate a new mechanism for public consultation within its organizational structure. The pTA process was meticulously planned and later evaluated. Its overall positive evaluations, along with its early integration into the ministry, contributed to long-term institutional learning, ultimately establishing public consultation as a routine tool within the department. (Griessler et al., 2011)

Case2: @Risk: How to Strengthen Risk Governance in Canada

The ongoing project led by the University of Ottawa "@Risk: How to Strengthen Risk Governance in Canada" brought together more than two dozen scholars and graduate students from diverse disciplines across eleven Canadian and U.S. universities, along with half a dozen senior practitioners from five organizations. The aim of the project was to explore how best to govern risk in the context of growing demands and justifications for democratization, in other words, to examine how public participation can be effectively integrated into risk governance. It addressed key issues related to public participation, including the importance of public trust in governance, fragmented perceptions of risk, and rising expectations for public involvement in risk-related decision-making. The project published a book in 2023 that offers not only theoretical foundations but also in-depth case studies. In the book, Canada is portrayed as a leader in public engagement, featuring case studies that highlight efforts to incorporate public participation into risk governance in sectors such as energy, genomics, and public health. In the theoretical sections, scholars examine several key concepts in risk governance, emphasizing the essential role of public participation in mitigating risks. These chapters challenge foundational assumptions that have historically undermined public involvement in governance processes.

In Part I, Beck et al. (2023) argue that risk perception is inherently subjective, shaped by motivated reasoning, the tendency to interpret information in ways that confirm existing beliefs and values. This challenges the assumption of rationality in risk governance, especially in emerging domains like artificial intelligence. Douglas (2023) further critiques the notion of value-free science, proposing the concept of inductive risk to show how values appropriately influence scientific judgment under uncertainty. She calls for science to be informed by societal and ethical ideals rather than striving for pure objectivity.

Wolbring (2023) contributes the BIAS FREE Framework (BFF), which aims to improve science and risk literacy by helping identify and address three types of bias: hierarchical (Bias H), recognition failures (Bias F), and double standards (Bias D). These theoretical contributions collectively support a more inclusive and reflexive model of risk governance.

Parts II through V present case studies demonstrating how public participation enhances risk governance across issues like childhood vaccination, water fluoridation, and pandemic response. The Ontario Vaccine Deliberation (Beck et al., 2023) illustrates how citizen engagement helped shape equitable and communicative vaccination policy. Similarly, public forums on water fluoridation gave residents space to voice ethical and health concerns, enabling policies that balanced expert advice with community values. The chapter on COVID-19 vaccine priority groups explores how consultations informed ethical decisions, despite logistical challenges and public skepticism. Together, these chapters underscore how public engagement improves the legitimacy, transparency, and responsiveness of risk-related policymaking.

These two cases show that Canada's experience with participatory Technology Assessment (pTA) is evident in both past and present practices. In the early 2000s, Health Canada addressed the complex issue of xenotransplantation through a broad public consultation process. Recognizing its ethical, scientific, and interdepartmental dimensions, the department coordinated across sectors and embedded public input into decision-making, an approach later positively evaluated and institutionalized. More recently, the "@Risk" project examined how public participation can enhance risk governance in areas like childhood vaccination, water fluoridation, and pandemic response. It challenged traditional ideas of objectivity and rationality in science and emphasized the role of public engagement in building trust and legitimacy. These two cases, spanning over two decades, show that participatory approaches are not only feasible but already embedded in Canadian policymaking. They highlight Canada's conducive environment for pTA, where public input is valued in navigating complex policy challenges and shaping socially responsive governance.

Growing Relationship with Europe

Recently, Canada is building stronger relationships with countries in Europe due to the political volatility of the United States. The Canadian Science Policy Conference (CSPC, 2024) featured several panels that underscored Canada's commitment to strengthening alliances with European countries. One notable panel, “Strategy and Influence: AI and Canada’s Science Diplomacy Future,” brought together European science diplomats and Canadian leaders to discuss international collaboration in artificial intelligence (AI) research. The panel highlighted the importance of transatlantic partnerships in advancing AI and science diplomacy. A significant development in this regard is the memorandum of understanding (MOU) signed between Canada and the Netherlands in June 2024. The MOU emphasizes collaboration on global challenges such as climate change, food security, and energy security. Furthermore, in July 2024, Canada joined Horizon Europe, the European Union's flagship research and innovation program. This association allows Canadian researchers and organizations to participate in collaborative projects on equal terms with their EU counterparts, focusing on areas like climate, energy, the digital economy, and health (Global Affairs Canada, 2024).

Canada’s efforts to strengthen its economic ties with the European Union (EU) are expected to intensify over time, especially as trade relations with the United States grow more contentious due to the imposition of tariffs by the U.S. government. In response to these protectionist measures, both Canada and the EU have expressed mutual frustration, with retaliatory tariffs signaling a significant shift away from traditional North American trade dependencies (Kwai, et al., 2025). As a strategic pivot, Canada has been deepening its partnership with the EU through the Comprehensive Economic and Trade Agreement (CETA), which has eliminated 98% of tariffs between the two regions and established more predictable and open trade channels (Global Affairs Canada, 2023). This agreement not only increases market access for Canadian and European businesses but also serves as a key component in Canada’s broader effort to diversify its trade relationships and reduce reliance on the U.S.

Canada’s growing cooperation with European countries provides a timely opportunity to adopt more structured approaches to evaluating emerging technologies, particularly through participatory Technology Assessment (pTA). Unlike traditional expert-driven models, pTA invites citizens, stakeholders, and civil society to co-create insights and shape policy around complex technological issues. This method has been widely institutionalized in Europe. For example, the Danish Board of Technology and the UK’s Sciencewise programme have long used deliberative forums, citizen panels, and scenario workshops to include the public in science and technology

policymaking. European scholars argue that participatory TA strengthens democratic legitimacy and improves decision-making by "bringing neglected perspectives to the forefront" (Stilgoe, Owen, & Macnaghten, 2014). These methods are seen not just as procedural tools but as frameworks for cultivating collective intelligence and long-term resilience. As one EU policy briefing put it: "*Public engagement in TA is not optional—it is essential for anticipatory governance*" (European Parliamentary Technology Assessment, 2020). As Canadian science policy shifts toward greater alignment with European norms, evidenced by initiatives like CETA and recent science diplomacy discussions at CSPC 2024, there is a unique opportunity to import best practices from these countries (CSPC, 2024; Global Affairs Canada, 2023).

From Evidence-Based to Mission Driven

This project observed the Canadian Science Policy Conference (CSPC) 2024 as part of the data collection method. One of the key highlights during the conference was the adoption of mission-driven policymaking. A panel titled "Building Capacity for a Mission-Driven Innovation Ecosystem in Canada" discussed strategies to enhance Canada's ability to implement mission-oriented innovation. The panel emphasized the importance of placing people and communities at the center of innovation efforts. This people-centered perspective echoes earlier conversations within Canada's science policy community. As an influential conference in Canada's science policy field, the mission-driven approach was already discussed at CSPC 2021, well before its official adoption by the Government of Canada. In a session titled "Mission-Driven Research and Innovation to Address Grand Challenges: Does Canada Have What It Takes?", panelists examined the country's readiness to adopt mission-oriented approaches.

These early discussions helped lay the foundation for addressing a long-standing issue of the tendency to operate in silos in Canadian governance (CSPC, 2024). Mission-driven policymaking focuses on solving specific, ambitious societal challenges such as achieving net-zero emissions or ensuring digital equity, through cross-sector collaboration, targeted innovation, and systemic change. It shifts the focus from siloed policy development to purposeful, goal-oriented missions that unite diverse stakeholders under a shared outcome. This mission-driven turn could therefore offer structural support from government for emerging participatory practices such as participatory Technology Assessment (pTA), making pTA a compatible and timely approach within Canada's innovation ecosystem.

This influence is clearly visible in recent federal policy initiatives, most notably in Canada's National Quantum Strategy (NQS). Since 2022, the language used in Canadian government policy documents has shifted. Instead of emphasizing "evidence," strategy papers increasingly refer to "missions." In the NQS, "mission" is a central concept. The alignment between mission-oriented principles and federal action is further demonstrated by Canada's recent research funding reforms. In June 2024, the Government of Canada announced plans to restructure its national research funding model in ways that closely align with mission-driven policymaking. The creation of a new capstone research funding

organization aims to enhance coordination across federally funded research bodies such as CIHR, NSERC, and SSHRC. The goal is to better address pressing societal challenges, like climate change, health emergencies, artificial intelligence, and mental health, by moving beyond fragmented, discipline-bound research and supporting collaborative, interdisciplinary efforts focused on complex, mission-oriented goals.

> *"This plan to modernize Canada's federal research system builds on extensive engagement carried out by the Advisory Panel on the Federal Research Support System and is informed by the panel's observation that more coordination is needed to maximize the impact of federal research support. This is especially important to advance internationally collaborative, multidisciplinary and mission-driven research"*
> (Government of Canada, 2024, para. 2).

Taken together, these developments suggest that Canada is creating fertile ground for more inclusive, participatory approaches to science and technology governance. Mission-driven policymaking provides a more enabling environment for participatory Technology Assessment (pTA) than traditional expert-led evidence-based policymaking (EBPM).

CHAPTER 4

DESIGNING A PARTICIPATORY TECHNOLOGY ASSESSMENT PROCESS

Chapter 4 presents **key considerations in designing a new Pariticipatory toward Anticipatory (PtA) process**, using pTA as its main theoretical foundation. It begins by examining the role of public participation in decision-making, supported by Causal Layered Analysis to unpack its underlying rationales. It then presents findings from the Public Participation Survey, challenging typical assumptions about the role of the public. The chapter continues by discussing additional survey results that inform the design of the PtA process and concludes with an overview of Structured Dialogic Design (SDD) as the methodological foundation for the PtA process.

SUMMARY

THE ROLE OF PUBLIC PARTICIPATION IN TECHNOLOGY DECISION MAKING

Public engagement in technology policy is often criticized for being either not meaningful or not meaningful enough to be considered inclusive decision-making (PytlikZillig & Tomkins, 2011). Traditional forms of public engagement such as surveys, legislative hearings, and public meetings fail to provide sufficient space for the public to voice their concerns. While more interactive formats like citizen juries, consensus conferences, and deliberative forums offer relatively deeper engagement (Delli Carpini, Cook, & Jacobs, 2004), they have also been critiqued for falling short of truly engaging the public in meaningful ways (Fiorino, 1990; Lewenstein & Brossard, 2006; Rowe & Frewer, 2000, 2005). In many cases, engagement occurs too late in the policy process, and the influence of public input remains ambiguous or uncertain (Wilsdon & Willis, 2004). In general, the public is often excluded both actively and passively from decision-making processes concerning the governance of technologies they regularly interact with (Sturgis, 2014). However, this lack of meaningful engagement is no longer acceptable as technological impacts becomes more complex and creates diverse social, cultural, and psychologoical effects across different geographical and regioanl contexts. There is a growing need to harness collective intelligence enabling the inclusive and responsible technology governance.

The following Causal Layered Analysis (CLA), developed by Inayatullah (1998), on the issue of public participation in technology policy highlights a problem that is more complex than it appears on the surface. At the litany level, the problem is widely acknowledged as the lack of public involvement in policymaking. However, it is essential to explore deeper to effectively address this challenge. At the systemic level, one of the root causes is the rapid pace of technological advancement. Technology is evolving faster than the public can be educated or prepared to engage meaningfully in decision-making processes. This creates a structural barrier, where opportunities for participation are outpaced by innovation itself.

This systemic constraint is further reinforced by the deeper level called “world view” meaning the widely accepted version of the world order. There are two prevailing assumptions in this level. First assumption is that scientific and technological issues are too complex for the general public to understand. And second is that it is nearly impossible to communicate these issues meaningfully to the public cause they do not have a technical background. These assumptions lead to the belief that public participation especially in technological realm is not feasible or possible. A senior retired public servant the researcher met during the Canadian Science Policy Conference noted that

> *“If researchers with deep expertise struggle to reach consensus on emerging technologiesso, how could the general public be expected to provide guidance or make informed decisions?”* (INT-EXP-005)

Finally, at the metaphorical level, deeply rooted cultural narratives and social attitudes further discourage the public engagement. A prevailing sentiment in this level is the saying “People are tending their own garden while the forest burns”. It means that people just don’t care or are too busy living their lives to get involved in technical or policy-related matters. This perception is dominant either consciuosly or unconsciously among the public and it is reinforcing the viscious cycle of excluding themselves in the policy making for technology development.

While it may not be possible to eliminate all the barriers to public participation in technology governance, this study aims to demonstrate that it is possible to navigate these challenges and begin to shift the deeply rooted myths that suggest people either do not care or are too busy to engage. Through the PtA prototyping process, this research proposes some alternative path forward.

Accordingly, the prototyping process has two main objectives:

- To demonstrate the feasibility of the PtA policy deliberation approach, particularly in its capacity to engage the public and illustrate the kinds of outcomes such engagement can create.
- To serve as a case study showing that the public is capable of contributing in thoughtful and informed ways to technology policy discussions when they are given a meaningful mechanism.

Causal Layer Analysis on Lack of Public Participation in Technology Decision Making

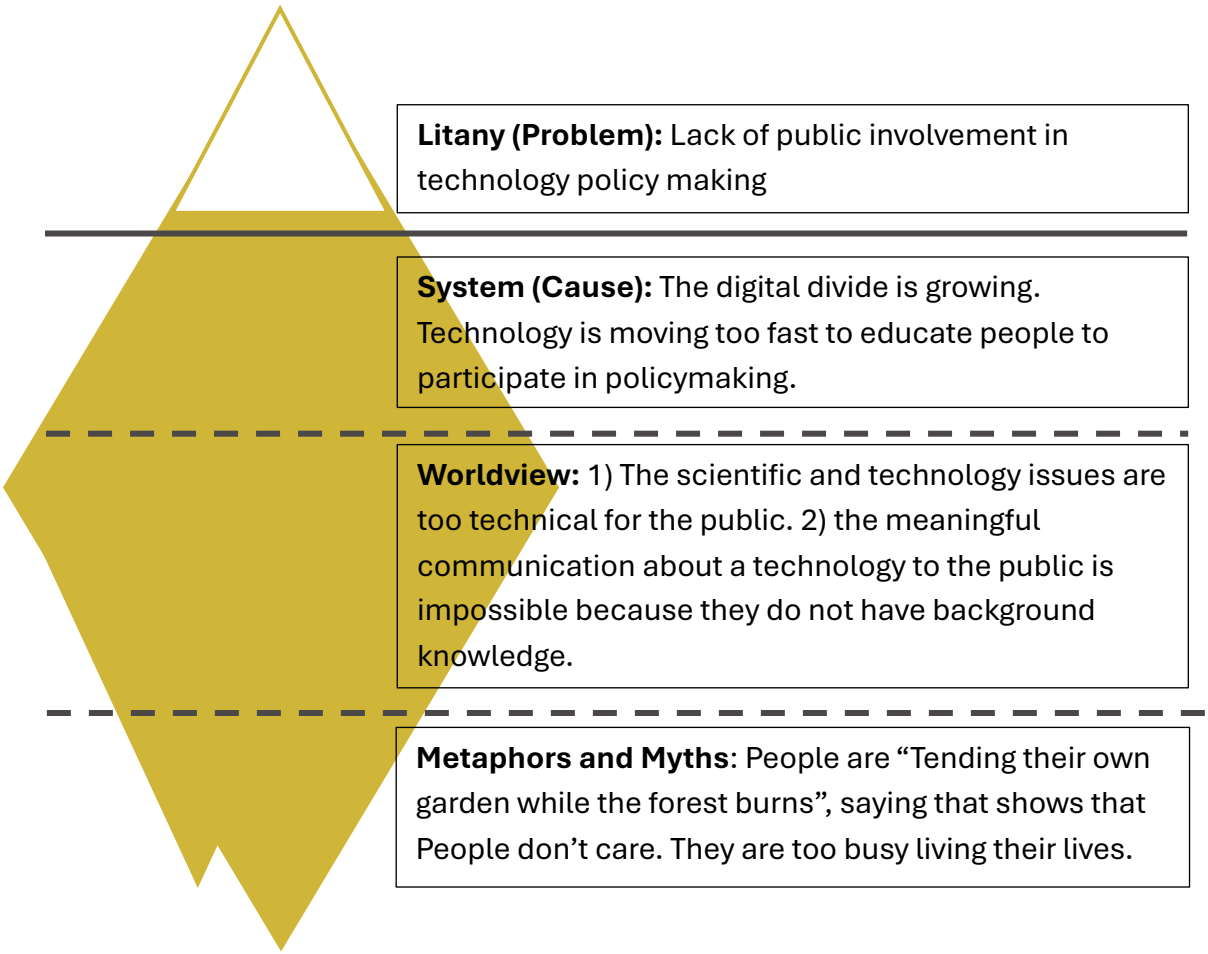


Figure (4.1) Causal Layer Analysis on Lack of Public Participation in Technology Decision Making

THE RESULTS OF PUBLIC PARTICIPATION SURVEY

Building on the Causal Layered Analysis (CLA) presented earlier which highlighted systemic, worldview, and myth-level barriers to public participation in technology policy, this section presents insights from the initial Public Participation survey. While these layers of barriers cannot be dismantled overnight, this survey seeks to demonstrate that they can be challenged and reimagined. Public Participation survey was launched to explore the public perspectives on these chanllenges and gauge general public willingness to participate in technology policy. Over a four-day period, 70 participants from Ontario, Quebec, British Columbia, and Alberta took part in the survey. It was launched only a day in each province to ensure the equal representation of the provinces although Ontario represent slightly larger sample for being the base province.

The survey findings provide responses that could challenge the barriers identified in the CLA. The collected data from the survey provide a potential resolution to a systemic barriers that assume the public cannot keep up with the pace of rapidly evolving technologies. A substantial majority of respondents, 96%, expressed interest in participating in an simulated participatory Technology Assessment (pTA) mechanism and 70% out of them stated a willingness to learn about new technologies. It suggests that the pace of technological change should not be a barrier if the public is learning, engaged and informed in these fast steps of development. Despite lacking in technical knowledge, the public can grow alongside technological innovation through incremental learning and imagining how these technologies can be used in their daily lives. With such an enthusiasm of the public to learn and be involved, the fast pace of these technologies should not be a barrier.

The survey also offers a compelling response to worldview-level barriers that frame technology policy as inherently too technical for the engagement. When asked about their preferred domains to contribute, the survey respondents indicated strong preferences for domains such as social values, cultural narratives, ethical considerations, and

philosophical questions. These responses suggest that the public is more attuned to the normative and societal dimensions of technology, dimensions that are often sidelined in expert-driven processes. Importantly, these areas do not require technical expertise to engage meaningfully. The diverse perspectives and deliberations from the daily lives of the public would be well-enough to shape and reflect the potential impacts of all emerging technolgies.

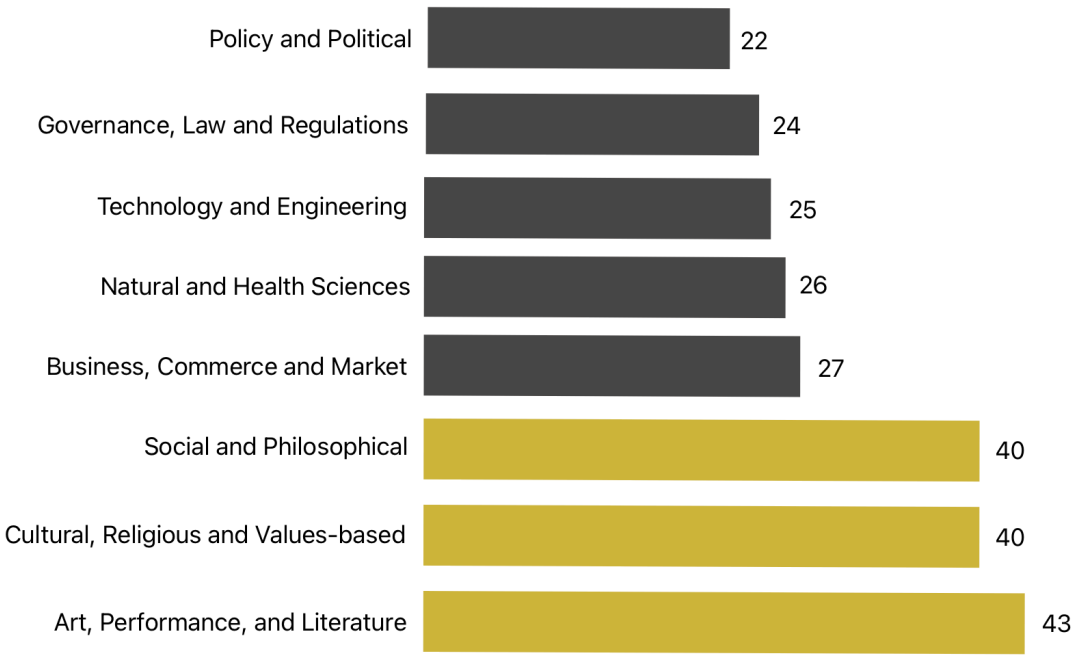


Figure (4.2) Domains Respondents Preferred to Contribute

The assumption that people are disinterested or preoccupied with personal obligations is also called into question. 63% of participants reported that technology plays a significant role in their daily routines. It suggests that the public is increasingly recognizing the deep entanglement between their personal lives and technologies. Moreover, in the survey they were asked about their adoption personalities of technology which include five types of personalities starting from the Risk Taker who would be the first to adopt new technologies to the Comfort Seeker who would adopt the technology only it is necessary for their daily routine. (See details in the text box below) 41% of respondents described themselves as “Rationalists” who seek to understand a technology’s function and reliability before they adopt it. These individuals, along with the 20% who identified themselves as “Enthusiasts”

to adopt new technologies and the 12% of "Risk-takers" who would even take risk represent a population already willing to reflect, experiment and actively be part of the technology development given the opportunities.

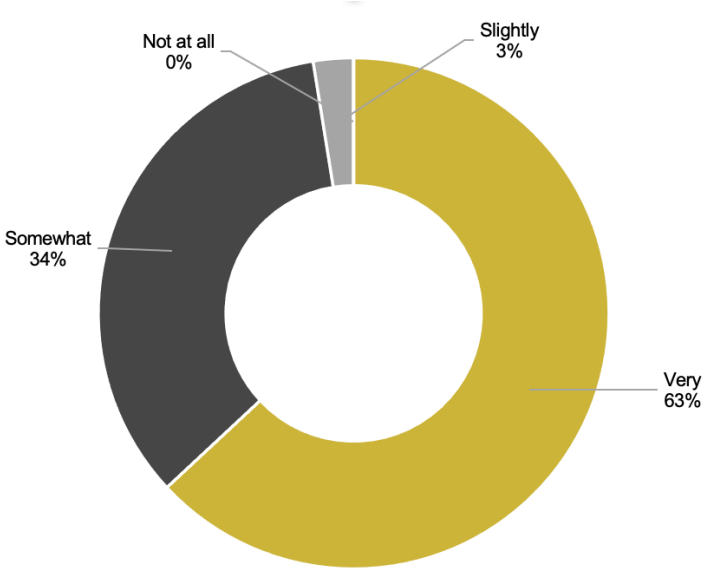


Figure (4.3) How Respondents Relate Technology to Their Daily Lives

In the survey, the participants are asked to select their types of technology adoption personalities, and these types are as follows:

- **The Risk Taker** – Always eager to try new technologies first, enjoys experimenting and exploring the unknown.
- **The Enthusiast** – Excited about new tech once it hits the market and loves sharing it with others.
- **The Rationalist** – Carefully considers new tech by reviewing details and reliability before adopting.
- **The Cautious** – Hesitant to adopt early; waits for strong evidence and widespread use before engaging.
- **The Comfort Seeker** – Prefers to adopt only when technology becomes essential and easily fits into daily life.

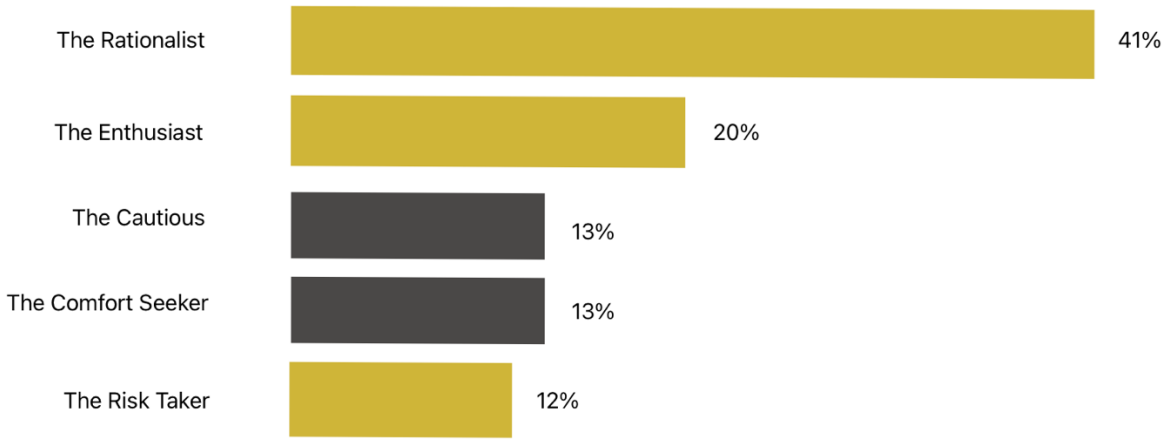


Figure (4.4) Self-Identified Personality Types in Technology Adoption

In terms of interests, respondents showed enthusiasm for a variety of emerging technologies, particularly Artificial Intelligence (AI), Internet of Things (IoT), Education Technology (EdTech), and Information and Communication Technologies (ICT). Their wide-ranging interests suggest that participatory engagement is not confined to a narrow set of issues but could be extended to many domains that intersect with their lives. Recognizing that their personal and professional trajectories are increasingly shaped by these technologies, participants appear to be motivated in contributing toward shaping all these areas of technologies in return.

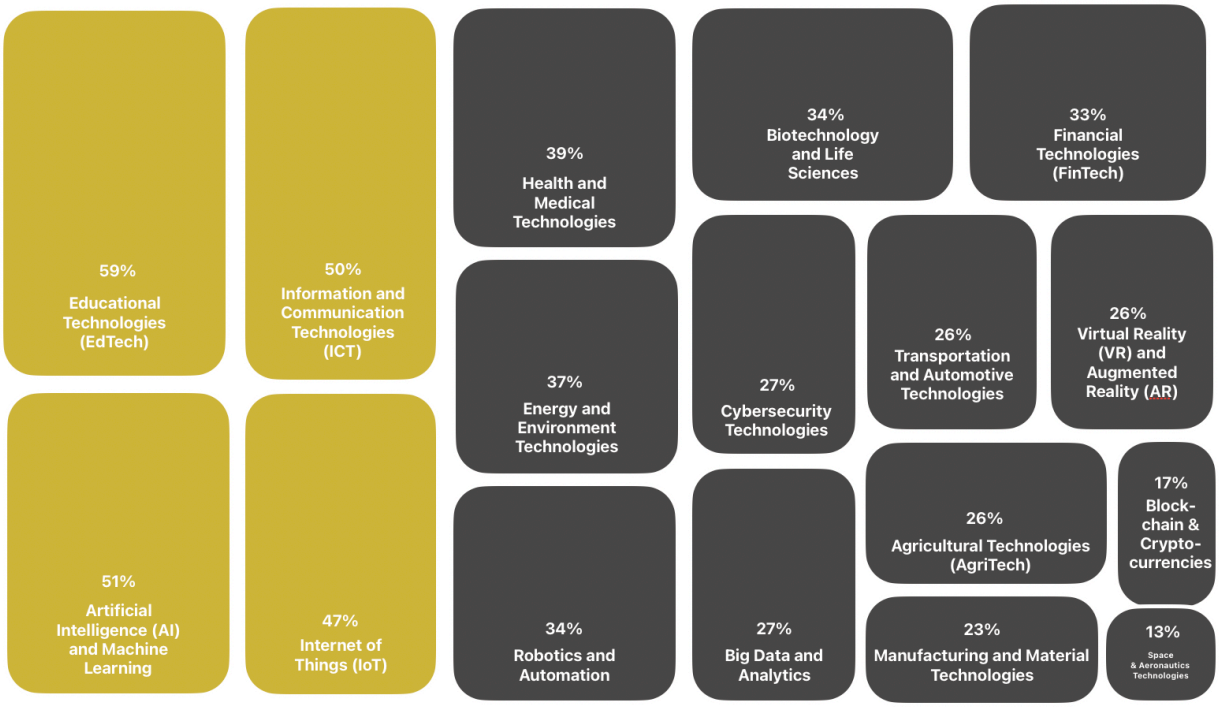


Figure (4.5) Public Interest in Different Types of Technologies

In addition, Participants' motivations for engagement were diverse but grounded in a shared concern for the broader implications of technological development. 31% of respondents cited concern for the societal, economic, or environmental impacts of technology as their primary motivation. Others expressed interest in emerging technologies (25%), the pursuit of personal or professional development (24%), and the desire to contribute to policy-making processes (20%). These findings illustrate the complex motivations that drive public participation and showed that it is informed, value-driven, and reflective of lived experiences.

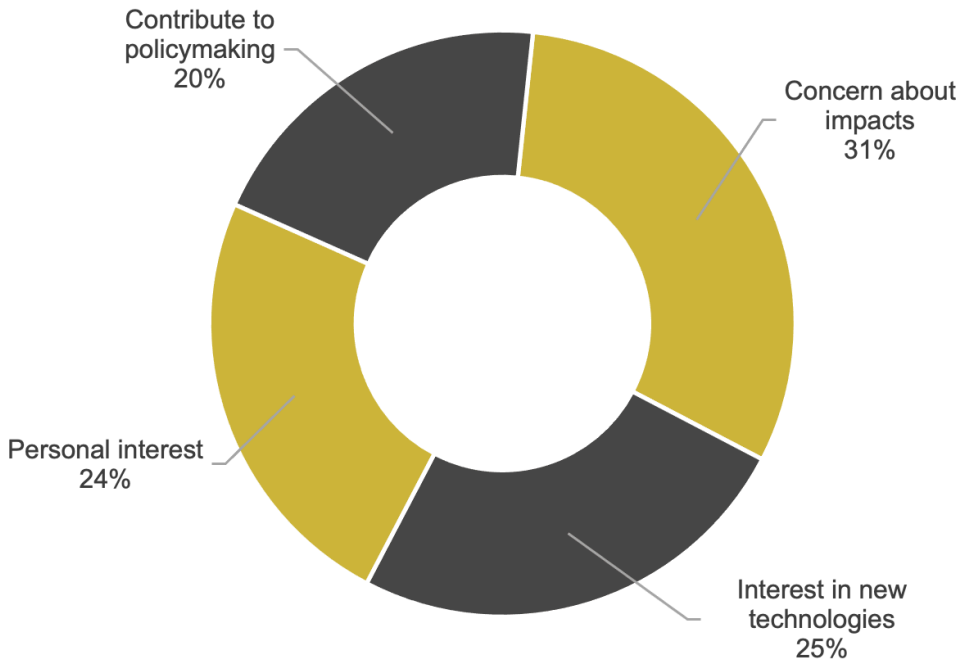


Figure (4.6) Motivations to Engage in a Simulated Participatory TA Process

However, significant barriers still remain. While participants demonstrated willingness and motivation, they also expressed reservations about sustained engagement. The most commonly cited barrier was time availability, with 44% identifying it as a constraint. Another major concern was the perceived lack of impact, 42% questioned whether their input would truly influence the policy decisions of technologies. They are also concerns about their inadequate expertise, fear of unintended consequences, and anxiety over social repercussions. These responses align closely with the challenges identified in the CLA, particularly those related to systemic and metaphorical levels. It is reaffirming that participatory mechanisms must be thoughtfully designed not only to invite public input, but also to support and sustain it meaningfully.

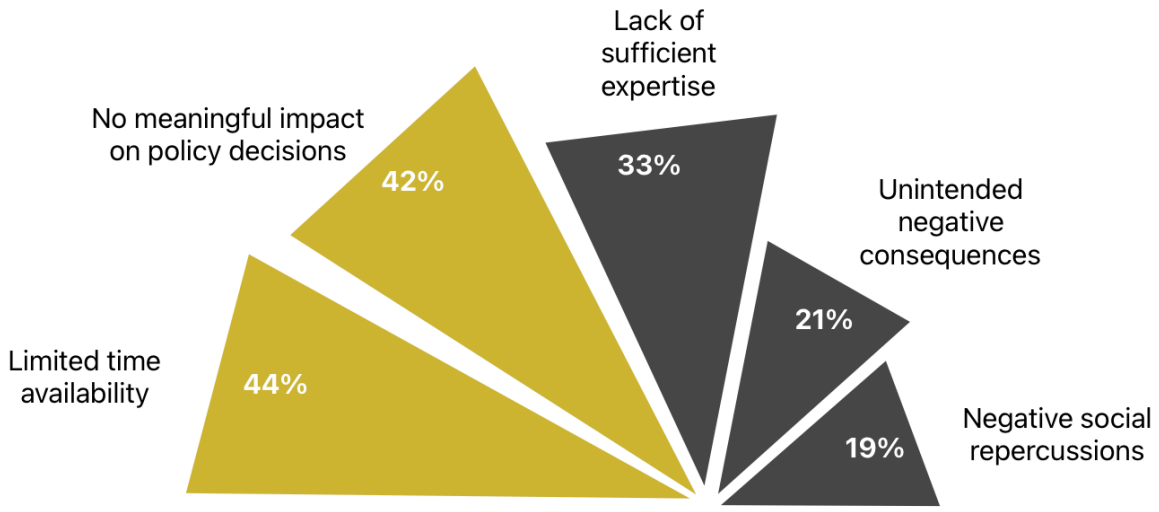


Figure (4.7) Concerns and Worries About Participating in a Simulated Participatory TA Process

DESIGNING PtA PROCESS FROM SURVEY INSIGHTS

In addition to challenging the barriers of public involvement in tech policy making, the Public Participation survey is also carried out to gauge the design elements before developing this new Participatory toward Anticipatory (PtA) process. While the results above are also considered in the designing process, the results directly related to the PtA process are as follows.

To understand their availability, the participants were given three modes of engagement: easy-going, active, and taking the lead, for the simulated participatory TA mechanism. Easy-going mode entailed spending only 5 mins of their time in a single engagement, active for 15 mins, and the leaders can select their engagement time, which is more than 15 mins. We found that 53% of the participants selected to engage for 15 minutes and above, the combination of active and lead modes of participation.

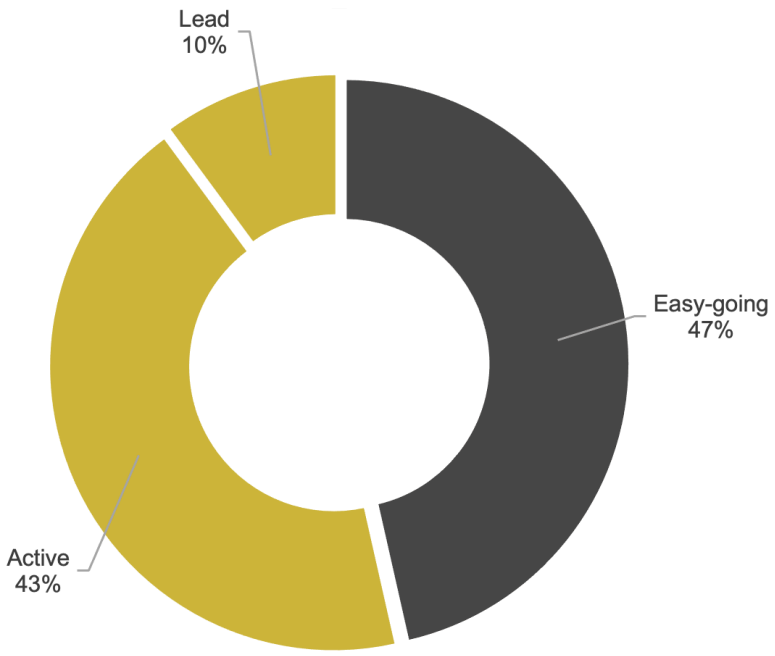


Figure (4.8) Preferred Modes of Participation

This insight was used in designing the engagement of PtA process, which could take about 15 mins if someone is considering carefully their responses. Although we found that 46% of the participants want to engage for only 5 mins, 65% of them want to engage for more than 5 mins. Therefore, the PtA process is designed with the flexibility of inputs from the participants. The engagement is designed to have both text answers and multiple choices so that people can still meaningfully contribute even without long answers. See text boxes below, which show the examples of responses from those who participated in the prototype testing. The first one shows that the type of answers that come up within a short time, and the second one presents the type of answers that could be provided after pondering to some extent.

Example (1)

What role should the government play in either preventing or supporting the impact of AI partners?What message would you like to share with the government?

" Since it's probably unlikely that the government can restrict AI partners, they should instead spread awareness about the risks of having AI partners."

(Anonymous Response, 2025)

Example (2)

What role should the government play in either preventing or supporting the impact of AI partners? What message would you like to share with the government?

"The government should make it a requirement for the tech companies to provide a detailed report on the risks of the technology and the measures they are taking against it. This report has to be independently analysed by the respective government bodies and if feasible an external analysis should be done. In the event that the technology is developed and released, the government agency (ESDC perhaps) in charge of public education should proactively and consistently inform the public on the risks that this technology might present and advice on safety measures. Regardless of the way it goes, the relevant data governance/AI safety agencies should be involved and ensure at the very least, a certain level of data privacy is assured."

(Anonymous Response, 2025)

The survey also inquired about how often participants would engage with the simulated pTA mechanism. The most popular choice was weekly engagement, with 44% of respondents preferring this option. Additionally, 18% indicated they would prefer to engage daily, while 29% chose monthly engagement. This result suggests that weekly engagement is the most suitable for the PtA process, as it aligns with the preferences of 62% of participants.

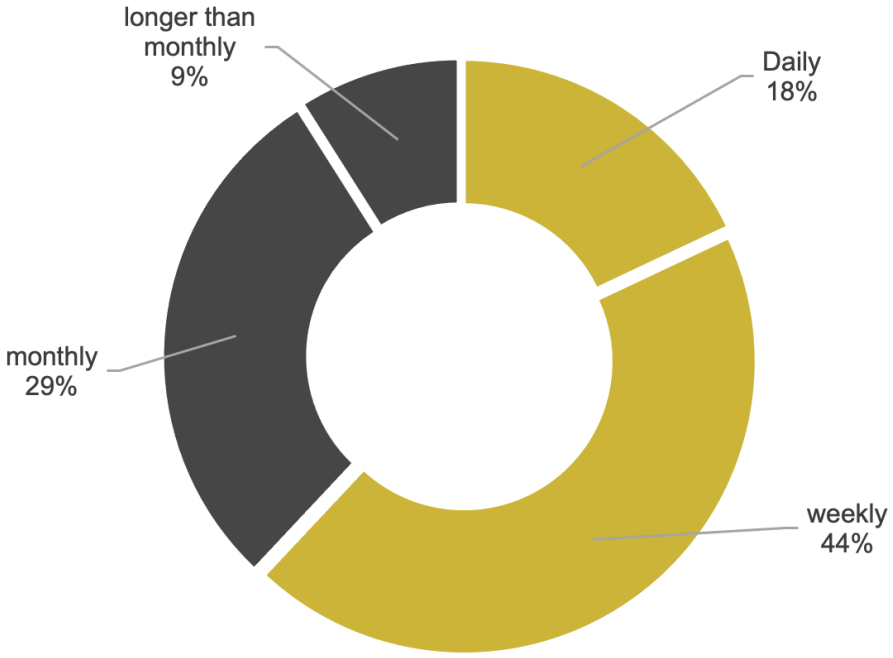


Figure (4.9) Preferred Engagement Frequency for the PtA Process

When asking to choose a style of engagement, 70% of the participants opted for the social media style post, and 48% for YouTube style video, 40% for the game, but only 38% of them for the reading resources like reports. Therefore, although this project was initiated to develop a game style engagement, it was changed to a style which could be later more conducive for creating social media post style engagements. PtA process design includes both multiple choices and text answer options. The nature of text answers mimics the comments section of the social media posts and the multiple choices for the reactions. The text answers can be either brief or a long explanation, similar to comments.

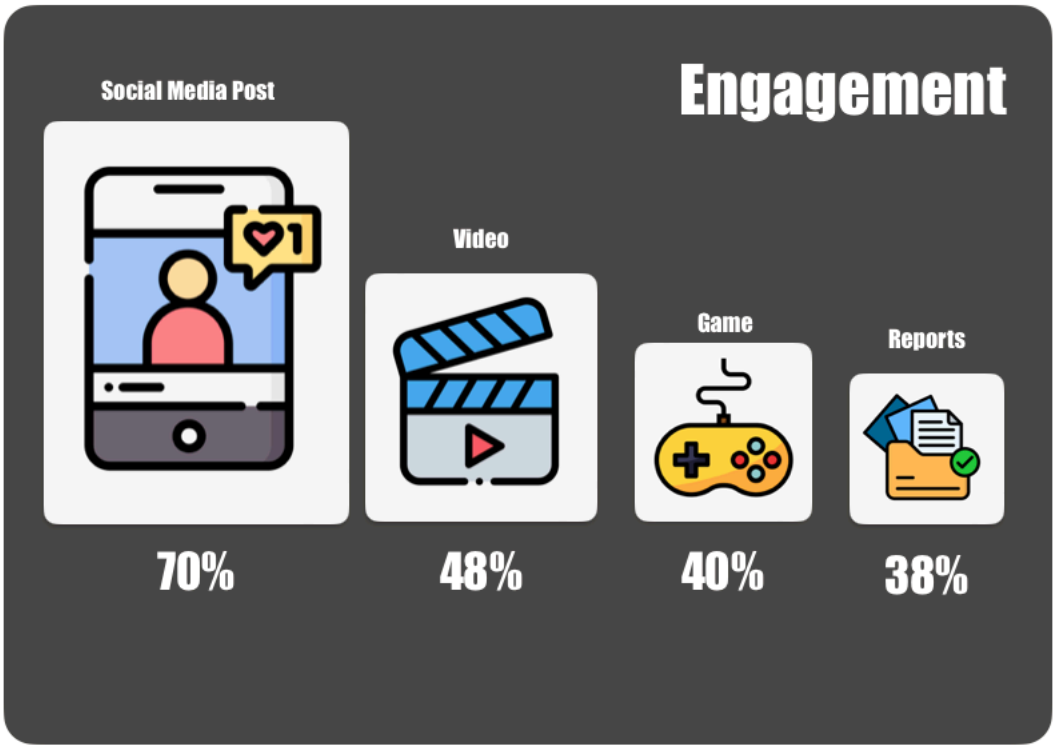


Figure (4.10) Preferred Engagement Format for the PtA Process

DIALOGIC DESIGN AS A FOUNDATIONAL CONCEPT FOR PtA

In addition to the above survey results, the PtA research used a modified process of Dialogic Design as a foundation methodology and modified it to fit with participatory Technology Assessment. In Dialogic Design, Structured Dialogic Design (SDD) is one of the most effective tools designed to engage multiple perspectives for complex issues such as the future impact of new technologies. It could tackle the wicked problems which imposes systemic challenges through the structured process of collective decision-making. SDD was originally developed from John Warfield's Interpretive Structural Modeling (ISM) algorithm and formalized through the work of Alexander Christakis and colleagues in their Interactive Management practice. It is grounded in systems theory and Third-Phase Science (de Zeeuw, 1996), and supports democratic, transparent, and inclusive processes of deliberation (Christakis & Bausch, 2006; Warfield, 1994). As a recognized Problem Structuring Method (PSM) (Midgley, 2013), SDD enables the collaborative analysis from diverse stakeholders and creates the influence maps which shows the relationships among the multifaceted aspects of a complex problem and identified the key factors as the root causes. It also aligns with the epistemological foundation of third-phase science. Third-phase science asserts that those who are affected by a system must also be part of designing that system. (De Zeeuw, 1996; Laouris & Romm, 2022) Such theoretical and practical relevance makes SDD particularly suitable for the new design of PtA process which aim to engage the public and stakeholders in assessing and supporting the social, ethical and systemic implications of emerging technologies toward the better society.

The structured nature of SDD is especially valuable in Technology Assessment (TA) as traditional expert-led models are increasingly seen as inadequate in capturing the full complexity of technological futures. The iterative stages, starting from formulating Triggering Questions (TQs) to the construction of Influence Maps, allow the participants to

engage and contribute from several different perspectives. On one hand, the structured dialogues enable the participants to discuss the deep root causes of societal challenges and empower them to identify key focus areas where improvements can be made. On the other hand, SDD provides a flexible framework for the PtA design through its modular approach in structuring the dialogue process. Such flexibility is evidenced by the numerous modified SDD versions over the past five decades. This balancing framework of SDD enables the new PtA design to incorporate divergent values, long-term consequences, and interdependencies across sectors without compromising the integrity of the engagement.

The widespread and diverse applications of SDD also reinforce its validity to the PtA design. In the field of democratic innovation, for example, Yiannis Laouris' Reinventing Democracy project used SDD to engage youth from five global regions and empowered them to articulate the deficiencies in current governance systems and envision technological reforms (Laouris & Romm, 2022). In education, SDD has helped redesign learning environments by engaging students and teachers in system-wide reflection (Laouris, 2012). In public health, it has been used to identify systemic bottlenecks and improve service delivery (Fröst, 2020). In foresight and R&D, SDD has enabled researchers to define research gaps and priorities collaboratively (Laouris et al., 2011). Its role in peacebuilding and reconciliation processes in divided societies further underscores its versatility and depth (Laouris, 2022). These cases illustrate how SDD supports long-term, transformative thinking and allows the bottom-up participant to anticipate socio-technological changes. And the use of SDD tools has extended its reach and sophistication. Platforms like Logosofia exemplify this next stage by enabling large-scale, asynchronous participation with real-time documentation and high usability. Logosofia integrates the core Interpretive Structural Modeling (ISM) logic of SDD while providing cloud-based, user-friendly interfaces that support collective learning and influence mapping across distributed contexts (Diedrich, Christakis, and Kakoulaki, 2024). These capabilities make it possible to apply SDD at scale. It is a critical feature for PtA as it will encourage the involvement of numerous stakeholders simultaneously.

CHAPTER 5

Participatory toward Anticipatory (PtA) Policy Deliberation Process Design

PtA DESIGN

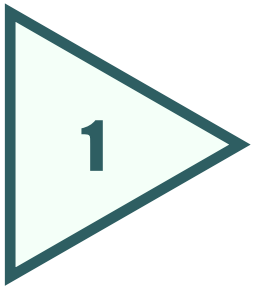
SUMMARY

Chapter 5 provides a detailed **explanation of the new Participatory toward Anticipatory (PtA) process**. It outlines each step, from (1) Recruitment to (7) Final Report and Response from the Proposed Entity.

PARTICIPATORY toward ANTICIPATORY (PtA) PROCESS DESIGN

The Participatory toward Anticipatory (PtA) process is developed as a modified version of Structured Dialogic Design (SDD) to make the participatory Technology Assessment impactful. The PtA takes leverage on the insight that online engagements, such as the public discourse on social media, lack effectiveness, though they could create prolific and significant responses from the public. The PtA process addresses this gap by providing a structured channel for these conversations to influence real-world decisions. Using Logosofia software (Laouris & Dye, 2023), PtA supports both remote and hybrid engagement formats and offers flexibility in participation while preserving coherent outcomes through a structured process. PtA incorporates storytelling and narratives to foster empathy and shared understanding in remote engagements. These elements support emotional connection, enhance perspective-taking, and deepen meaning-making and align with narrative inquiry and strategize for the future (Inayatullah, 2008). It integrates systemic tools such as STEEPV with the stakeholder engagement methodology of SDD (Christakis & Bausch, 2006) to enable collective intelligence from diverse stakeholders for discussion on complex manifestations of new technologies.

The following steps portray the step-by-step approach of the PtA process. The process is designed to be delivered as a single comprehensive online platform that combines all the necessary steps. The platform should foster the participation from the public through social media-style interactions, convenient engagement opportunities and entertaining content. However, due to time constraint, the steps outlined below represent a general framework for implementing the PtA process. This general framework also serves as a method for anyone interested in initiating participatory Technology Assessment and utilize the PtA policy deliberation process as a guiding structure.



Recruiting

As a preparatory step, the PtA process requires the recruitment of a diverse pool of participants categorized into three primary sample groups: experts, tech advocate, and public volunteers. This step aims to fulfill a critical concept in systems thinking called Requisite Variety. The principle of Requisite Variety postulates that for a system to effectively regulate itself and respond to disturbances in its environment, such as those introduced by new technologies, it must embody a sufficient range of perspectives and values, that functionally match the variety of the system itself (Ashby, 1958; Jones, 2018). In the context of PtA, the "system" refers to the policymaking and assessment processes of technologies. Therefore, the key stakeholder groups in that system should be represented in the PtA process to satisfy the Requisite Variety, as their different knowledge, values, and perspectives would make the process a robust collective sense-making or decision-making. The PtA process defines the primary three key stakeholder groups as follows.

Experts: They are Professionals with expertise in relevant technological or subject areas. To prevent conflicts of interest, they should not be employees of any tech company. They can be recruited through professional and academic networks, as well as through partner organizations. For example, the Systemic Design Association (SDA), the Canadian Council of Academies (CCA), and the Centre for International Governance Innovation (CIGI), which have assembled a diverse pool of experts could be potential partners for PtA process in Canada.

Tech-advocates: They could be both individuals and entities actively developing new technologies. This group may include, but is not limited to:

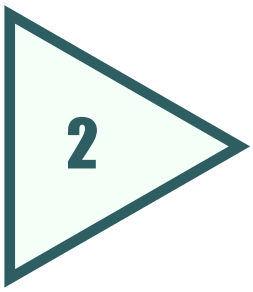
- Tech companies working to commercialize innovations
- Government bodies exploring technology for public benefit
- NGOs leveraging technology for social good
- Individual innovators researching breakthrough advancements

Tech-advocates can be recruited directly or through organizations that already have established networks from previous collaborations, such as research projects. These organizations can act as sponsors or brokers, facilitating the involvement of tech-advocates in the PtA process. PtA will leverage such existing connections to engage tech

advocates effectively. For example, the Council of Canadian Academies (CCA) has worked with various government departments and agencies, while the Centre for International Governance Innovation (CIGI) maintains a network of stakeholders, including private sector actors in the tech industry.

Public volunteers: They are Individuals interested in contributing to the PtA process. Public volunteers can be recruited primarily through diverse social media platforms, public announcement boards, and the email lists of partner organizations in order to reach a broad range of individuals from various social and professional backgrounds. The snowball sampling method should also be used to help expand the pool of participants. To ensure stakeholder diversity that reflects the Requisite Variety (Jones, 2018) of the system of concern, participant registration should include the collection of relevant data to assess key variables of interest, such as:

- Professional areas of expertise
- Interest or involvement in technology
- Technology adoption profiles
- Geographic location, education level, and sociocultural background
- Individual characteristics, including age/generation, country of origin, ethnicity, political orientation



Initiating the PtA Process

With a diverse sample of participants recruited in step 1, the PtA process moves into its initiation phase. At this stage, the process can begin in two ways. First, tech-advocates, sponsors or brokers may initiate the process by proposing a new technology to be assessed. While the definition of tech-advocates has already been provided, the terms "sponsors" and "brokers" require further explanation.

Sponsors: Sponsors are those who provide support or endorsement for a tech company's participation in the PtA process. These can include government agencies or investment firms that recognize the value of public engagement.

Brokers: Brokers are partners who work collaboratively with tech companies and help mediate their involvement in the process. They may include NGOs or universities that maintain working relationships with technology developers.

If none of the above-mentioned entities have initiated the process voluntarily, the invitations can be drafted and distributed. These invitations can be delivered to tech advocates, sponsors, and brokers either directly or through partner organizations. The letter should outline the potential benefits of participating in the PtA process unique to the recipient. For example, for NGOs and universities in the position of tech advocates, the benefits may include gathering public sentiment on technology-related issues and reinforcing their ethical responsibilities. For tech start-ups, the advantages of engaging with the PtA process can be improving their appeal to potential investors by showing it as a strategy to mitigate social risks and accelerate adoption by aligning with societal values and earning public trust. While all these specific benefits can vary according to each organization's mission and priorities, the intention of sending invitations should emphasize not only the benefit to society but also the most relevant advantages for each recipient. Alternatively, the PtA process may also be initiated independently. For example, it could the PtA team or by any interested third party with a relevant reason. The selection may be prompted by growing societal concern around an emerging technology or through proactive horizon scanning[1] that highlight frontier technologies and their anticipated impacts.

Regardless of the scenarios, the following information will be required to initiate the PtA process.

- A detailed background and a simple explanation of the technology (supporting documents are encouraged for clarity)
- Potential use cases, including the relevant industry, field, and intended audience
- A specific question to explore through the PtA process
- A clear description of the desired outcome (applicable only for outside parties initiated PtA process)
- A rationale for why a public assessment is needed

3 Developing the Framing Story

Following the initiation of the PtA process either through stakeholder proposals or the internal independent decision, the next step focuses on developing the Framing Story. It will provide guidance to the PtA process and engage with the participants through a concise and thought-provoking narrative-based context. The Framing Story should serve as a boundary to structure inquiry and reflection across different stages of the upcoming PtA process. It is the main element to foster empathy and support emotional connections among the participants and should also serve as the main driver for the participants to continue to engage in the process.

In the PtA process, the Framing Story is defined as a narrative that presents a real or fictionalized situation that captures the core dilemma, values, and context of a complex technological issue or emerging technology. It should set the emotional, social, and ethical stage for public dialogue, helping participants relate personally and critically to the topic. It is crafted to evoke empathy, stimulate reflection, and prompt meaningful engagement with the future implications of a technology or a policy decision.

A Framing Story can be characterized by the following elements.

- Personal and relatable through characters who should draws real human experiences, emotions and relations, making abstract issues more concrete
- Emotionally engaging to hook the participant and create space for deeper moral and psychological reflection
- Contextualized with a dilemma where both existed positive and negative discussions are mentioned without bias
- Reveal the layers of potential consequences in different areas to make the participants see that the impact of a technology can be multifaceted
- Create tensions which impose the participants to weigh trade-offs rather than sticking on a single view
- End with a reflective question that does not have clear answers but provoke both future implications and challenges for the issue at hand

See the following text box for an example of the Framing Story use during the prototype testing.

The Example of the Framing Story used in Prototype Testing

"You are in a somewhat tight situation. Your best friend, Daniella, has asked for your help, and you deeply care about her. You want to make sure she fully understands the potential consequences of her decision.

Daniella has approached you for advice on a difficult life choice. Here's a bit about her:

Daniella is kind and a positive thinker. In your opinion, she is sometimes quite innocent, which unfortunately makes her vulnerable to people who take advantage of her. You believe the biggest mistake of her life was falling in love with the wrong person. Her boyfriend took advantage of her love and cheated on her. Their relationship was toxic. By the time Daniella discovered his affair, they were already engaged. When she confronted him, he became angry and broke up with her. Even when she tried to apologize and get back together with him, he had already lost interest and left her. This breakup hit Daniella very hard. She had to start taking antidepressants and attending regular psychological counseling sessions.

Now, Daniella is considering having an AI boyfriend as a form of therapy and a relationship that would not hurt her. She has learned about several apps that provide such services, including AICharacter, CandyAI, Replika, and Dippy, where users train their AI partners to be their ideal companions. She has explored online communities where AI partner users share their experiences, and she finds the concept fascinating. Given her past trauma, she believes this type of relationship could be very helpful. Without manipulation and abuse, an AI partner would always be available for her, providing comfort and support 24/7.

However, Daniella also has concerns. She is unsure how far she might go with this AI relationship. What if she becomes addicted to it and isolates herself from real human connections? What if, as some have suggested, this experience leads her toward extreme feminist views, reinforcing the idea that men are unnecessary? What if the tech company behind the AI partner takes advantage of her emotions, turning her into a contributor to the emotional exploitation economy?Additionally, she is well aware of the data privacy risks. Everything she shares with her AI partner would be stored by the company, and if the company decides to use this intimate data for other purposes, she could once again find herself exploited—not by a boyfriend, but by a tech corporation.

Daniella has shared all these concerns with you. You've noticed that AI partner businesses have been booming lately. As her best friend, you want to give her the best advice possible. You have thought deeply about the future impact of AI partners, and now, you must share your perspective to help Daniella make this life-changing decision.

The Framing Story can be developed based on either the information gathered in the previous stage through proposals or collected the data through the initial inquiry process similar to the early phase of the Structured Dialogic Design (SDD) methodology. It is essential for the PtA team to conduct additional research to gain a deeper understanding of the issue. The research can involve interviews, surveys, focus groups, and background studies with relevant stakeholders who are from recruited participants or from outside networks. The Framing Story functions much like the "triggering question" in SDD, which serves to launch a systemic inquiry (Christakis & Bausch, 2006). However, in the PtA process, the Framing Story goes beyond this initial step. It continues to evolve as the inquiry progresses and more perspectives and data are gathered over time.

At the same time, the PtA team should collaborate with tech-advocates, sponsors, and brokers to better understand the context of the technology or issue. The collaboration can be started from explain the PtA process in detail. This includes explaining the specific Co-Laboratory (or CoLab") type that will be used in the process. A "Co-Lab" is a space where participants engage in structured and inclusive dialogues to explore the issue and build shared understanding (Christakis & Bausch, 2006). The PtA process endorses a specific format called the TA Co-Lab (Technology Assessment Co-Lab). This format is created to support the hybrid nature of Technology Assessment. The TA Co-Lab supports participatory technology assessment by combining foresight techniques with systemic problem-solving. It encourages participants to collaboratively imagine both desirable and undesirable futures. At the same time, it focuses on identifying current and anticipated challenges related to the technology.

Key characteristics of the TA Co-Lab include:

- Focus on both scenario exploration and challenge resolution.
- Emphasis on the societal relevance of the technology
- Has a definitive future impact or timeframe of relative concern
- Ensures trust-building and practicing ethical foresight.

The TA Co-Lab builds on elements from several existing Co-Lab types. It shares similarities with the Scenario Co-Lab as it uses future scenarios to anticipate risks and opportunities. It also aligns with the Challenge/Barriers Co-Lab in its effort to identify and address obstacles to responsible technology implementation. Conversely, it goes beyond the existing Co-Lab types by integrating long-term thinking with immediate strategy development. The TA Co-Lab session is the final step of the PtA process to meet with the participants virtually or in person. However, the engagement of the participants in the Co-Lab has already started through the Framing Story. The Framing Story outlined above

serves to prepare participants for active engagement in the Technology Assessment (TA) Co-Lab. By presenting a blend of imagined and real-world scenarios, it establishes a contextual foundation that highlights both current challenges and potential opportunities. This narrative not only identifies existing issues but also provides essential insights for participants to explore future scenarios related to the technology in question. Consequently, the Framing Story effectively initiates the TA Co-Lab process once it is shared with participants.

4 Impacts Generation

The Framing Story should be distributed along with the multiple-choice options designed to complement it. Participant can respond to the Framing Story in two ways. First, there is a response that can be answered in a long text form to provide answers to the question raised by the story. For example, the story of Dianella used in the prototype testing asked participants to suggest actions for Dianella based on the explanation of good and bad future implications for starting a relationship with an AI boyfriend. In a digital form, this long text answer option would resemble a comment function similar to the social media platforms. The story makes the issue emotional and personally engaging, and therefore, the long answer form allows the participants to respond as if they were advising a friend. This long-answer section gives participants the freedom to express their thoughts and opinions in detail. An example of a participant response from the PtA prototype testing is provided at the end of this section.

At the same time, participants are asked to respond to multiple-choice questions. These are somewhat like reactions on social media posts. These require only quick inputs that should not post a cognitive workload on the participants. However, these multiple-choice options are carefully designed to reveal critical aspects for the TA Co-Lab session. Drawing on systemic tools, these questions allow participants to specify key dimensions of the future implications of the technology they are assessing. The design supports participants in translating their emotional and intuitive responses into structured insights. Each framework offers guidance to help participants reflect on the broader future implications of the issue. Together, they provide a structure for interpreting, contextualizing, and expanding participant perspectives into actionable foresight (Miller, 2018).

Level of Impact: This multiple-choice option is designed and inspired by the hierarchical social order to understand the size of the effect imagined by the participants. This dimension of the choice helps participants to specify who is most affected by the technology or issue at hand. When the Framing Story is evoking personal relevance, this multiple choice encourages them to scale up their thinking. It allows participants to consider whether the impact they feel emotionally through the character of the Framing Story extends to a broader future where communities, social institutions, or even

civilizations are affected. This multiple-choice bridges personal emotion to systemic-level thinking.

Area of Impact (STEEPV): This multiple choice uses STEEPV as a reference model. STEEPV is a classic foresight tool to categorize domains of change. In the PtA process, it is also used to allow the participants to locate their concerns or insights within the system where the change or the impact of the technology implications they are considering would affect. For example, the Dinella story about having a relationship with AI partners might be in the area of values and social in addition to technological. It provides a multidimensional lens to pinpoint the exact areas of the future where the implications of a technology would be strongest. (Hiltunen, 2006)

Time Frame (Three Horizons): This question of multiple choice helps participants to position their insights on the time period. The emotional and personal feelings and opinions are put into the frame of time, which allows the participants to see when their worries and thoughts would potentially materialize. There are three choices for time frame provided as immediate future, near future, and distant future. These three futures are drawn from the well-known foresight framework, the Three Horizons model (Hodgson and Curry, 2008). If the Framing story sparks concerns that need immediate attention, it is representative of Horizon 1, and if they need to be prepared for the near future, it would be Horizon 2. If the worries could be the long-term impact, it would be Horizon 3. It encourages the participants to link their present emotions and ideas with future. It allows the participants to see the implications of their opinions and envision the future that would be created by the technological issue at hand.

Nature of Impact (VERGE Framework): This question uses the VERGE framework, developed by the Institute for the Future, to explore how people might interact with technology. It asks participants to reflect on the type of impacts the technology may have. Unlike STEEPV, which identifies the domain of change, the VERGE framework focuses on how people interact with technologies and the resulting consequences.

Adopting the definition of VERGE, the nature of impact is defined as follows

- Define:The impact define (redefine) new concepts, ideas, social values, attitudes, and paradigms
- Relate: The impact changes the way people organize or relate to each other, whether in family structures, business models, or governance structures.
- Connect: The impact encourages connections among people, places, and things, which can be observed in areas such as information technology, urban design, and language.

- Create: The impact influences how people create things, including goods and services, in areas such as manufacturing, art, and agriculture.
- Consume: The impact affects how people consume goods and services, shaping their preferences and consumption behavior
- Destroy: The impact destroys values and reasons for the way people live. It can be undermining of rules and norms, killing, and waste. (Institute for the Future, 2013).

All of these frameworks and their related questions provide the foundation and context for the next stage of the process, where participants will be asked to suggest specific actions.

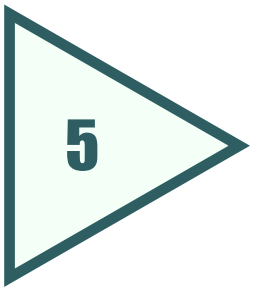
A Response to the Framing Story During Prototype Testing

"Daniella, listen to me. I understand your need to have someone there for you, I do, but the fact is, even without all the bad things that can happen with an AI boyfriend, like identity theft, data breach - everything you already know about! - an AI boyfriend can't replace the real thing. It can't provide that level of comfort you seek. And I will tell you why: it has no experience in life, it has no soul. Yeah, guys have sometimes completely crooked souls, no doubt, but they have that particularity - they have one. An AI will just tell you what you want to hear. Now that's fine for a while, but how will you break from that cycle? It will tell you you're right - is that all you want from a partner?

Whether we realize it or not, we want a partner to challenge us too - not like your last boyfriend, that guy was toxic! but we want their life experience, their quirks, their humanity, because in those moments where you need them the most, when you feel that humanity, that's what reassures you the most. That's what makes it worthwhile. AIs are empty, they are a mirror, tellign you what you want.Apart from the intellectual satisfaction of being told you're right, you will lose that validation - when you convince an ass (like all guys can be!) that you're right, when you prove your point, and all his life experience can't keep up with your intelligence. When you convince a human being that you see betetr than they do, that your logic - emotional or purely logical! - is best, there is no match with an AI. Plus if you tell me the AI will not lie to you - yes it will, Dani . It'll lie to you in a way you like, liek a guy trying to get in your pants. But an AI will never give up the preyense and show you what's inside, because there's nothing there.

So basically, you're only talking to yourself.

(Anonymous participants, PtA Prototype Testing, 2025)



Generating Desired Actions

The responses collected from the Framing Story should be analyzed through thematic analysis as it involves identifying common themes, patterns, and trends across participants' responses. Then, the results of this analysis should be shared with the participants in order for them to see the emerging consensus. By understanding how their individual contributions connect to others, participants may feel a stronger sense of belonging and confidence in the process. And the communication of results should clearly highlight the key insights describing the most mentioned future impacts of the technology being assessed. These shared insights will serve as a foundation for the next stage of participant engagement.

In this next step, participants should again be invited to engage in another activity similar to the one before. However, instead of multiple-choice reactions, they will be asked to rank the key insights in order of priority. This ranking activity helps participants reflect on which issues they consider most important. Such reflection prepares them to be ready for the following responses where they will be asked to write messages to three key stakeholder groups and suggest their actions regarding the impacts revealed by the previous step. In this stage, key stakeholders are divided into just three groups to simplify as government, technology companies, and the public. These categories are intentionally kept simple to reduce cognitive load for participants and to help gather clear and focused messages. By ranking the issues first, participants are better equipped to consider and suggest meaningful actions in their messages to these key stakeholders.

6 Clarifying Responses and TA Colab Session

Once all responses are gathered, the PtA team should analyze the collected data by summarizing the priority rankings of key insights and the actions suggested to stakeholders. In parallel, participants should be invited to join a final TA Co-Lab session, where they will engage with a triggering question designed to support the development of an influence map, a key collective output of the PtA process.

The triggering question should be crafted following SDD principles. It will be informed by the themes, concerns, and timeframes identified by participants in previous steps as an organic development of the process. In the meantime, it will also be strategically framed to help participants transition from a personal, story-centered perspective to a broader societal lens. In this way, the triggering question encourages participants to consider the wider systemic impacts of the technology. In this way, the PtA process ensure that the entire process focus on collective societal challenges rather than just on individual experiences. The standard format for the triggering question will be:

> *"In [X context], of [Y situation], what [challenges/future scenarios] will do [Z action] in the [time period]?"* (Christakis & Bausch, 2006)

The context and situation should be synthesized from key issues surfaced earlier in the PtA process, and the time frame should be guided by participants' earlier assessments of when impacts are likely to occur, following a Three Horizons perspective. The careful formulation of the triggering question provides participants with a forward-looking framework to discuss complex societal dynamics.

Participants will receive the triggering question alongside the invitation to the final Co-Lab session, allowing them to prepare responses in advance, building from both their individual reflections and the collective insights shared earlier.

- The Co-Lab can begin with a clarification session. In this session, each participant can explain their response to the triggering question. Others may ask clarification questions, but discussion will remain focused on ensuring mutual understanding, with only the original respondent answering.

- Following clarification, participants engage in a prioritization exercise, voting for the key issues they believe should be included in the influence map. Each participant will have five votes, ensuring a manageable set of issues for deep exploration. Facilitators may also add critical bridging issues if needed to maintain coherence in the influence mapping process (Laouris, 2012).
- The group can then collaboratively construct the influence map using Logosofia software, which guides participants through structured pairwise comparisons and relationship discussions between issues. Logosofia's algorithmic support ensures that the systemic influence among issues is captured accurately, producing a visual map that reveals the deep structure of the problem. To maintain rich dialogue and allow every voice to be heard, each Co-Lab session should be limited to approximately 30 participants.

This Co-Lab session represents the culmination of the PtA process. By this stage, participants will have moved from initial personal perspectives to a collectively informed societal view, equipped with structured knowledge of the issues, their priorities, and the stakeholder actions required. As a result, their engagement in the influence mapping will be both more informed and more strategic. Although Logosofia software facilitates the process, facilitators should be trained in SDD methodology to ensure quality discussions. Alternatively, a manual process for influence mapping could be employed, though it would require additional preparation and training.

7 Final Report and Response from the Proposed Entity

After the TA Co-Lab session is done, the PtA team should proceed to synthesize and interpret all the data collected throughout the process. This analysis should begin with the foundational information provided by the sponsor, broker, and advocate during the initial framing stages. Insights generated by participants should be interpreted alongside this initial context, expanding the analysis to incorporate both public perspectives and organizational priorities. Using the collected data, the PtA team should prepare a final document. It should serve as both a continuation and a conclusion to the collective journey of technology assessment. It should include:

- The summary of the data gathered throughout the process
- A visual of the influence map generated during the Co-Lab session
- A clear explanation of the influence map intended for a general audience
- Key takeaways that synthesize the major insights developed through the PtA process

Although the final report should include the actions collected during the second step of public engagement, these actions should be presented as reflections of public opinion rather than formal recommendations. The PtA process is designed to capture the collective intelligence and concerns of the public without prescribing specific courses of action. This approach is intended to create flexibility, allowing the sponsors, brokers, and particularly Tech-advocates to interpret the results and develop their own response plans in alignment with the insights provided by participants. The emphasis should remain on offering public perspectives as valuable input rather than setting fixed directives, ensuring that the responsible entities retain agency in determining the most appropriate course of action based on the engagement outcomes. Once the document is prepared, it should be formally shared with the sponsor, broker, and advocate. If clarification or adjustments are needed, the broker should serve as the main point of contact with the PtA team.

Within a month of receiving the final document, the tech-advocate (where appropriate the

sponsor and the broker) should provide a formal response. This response should outline how they intend to incorporate the outcomes of the PtA process into their future decision-making, technology development, or strategic planning. The advocate's response should be shared with all participants as a form of recognition and closure, reinforcing the principle that their engagement has contributed to shaping the future of the technology. If needed,

the PtA team should remain available to assist the advocate and broker in preparing a response that is consistent with the process values and objectives.

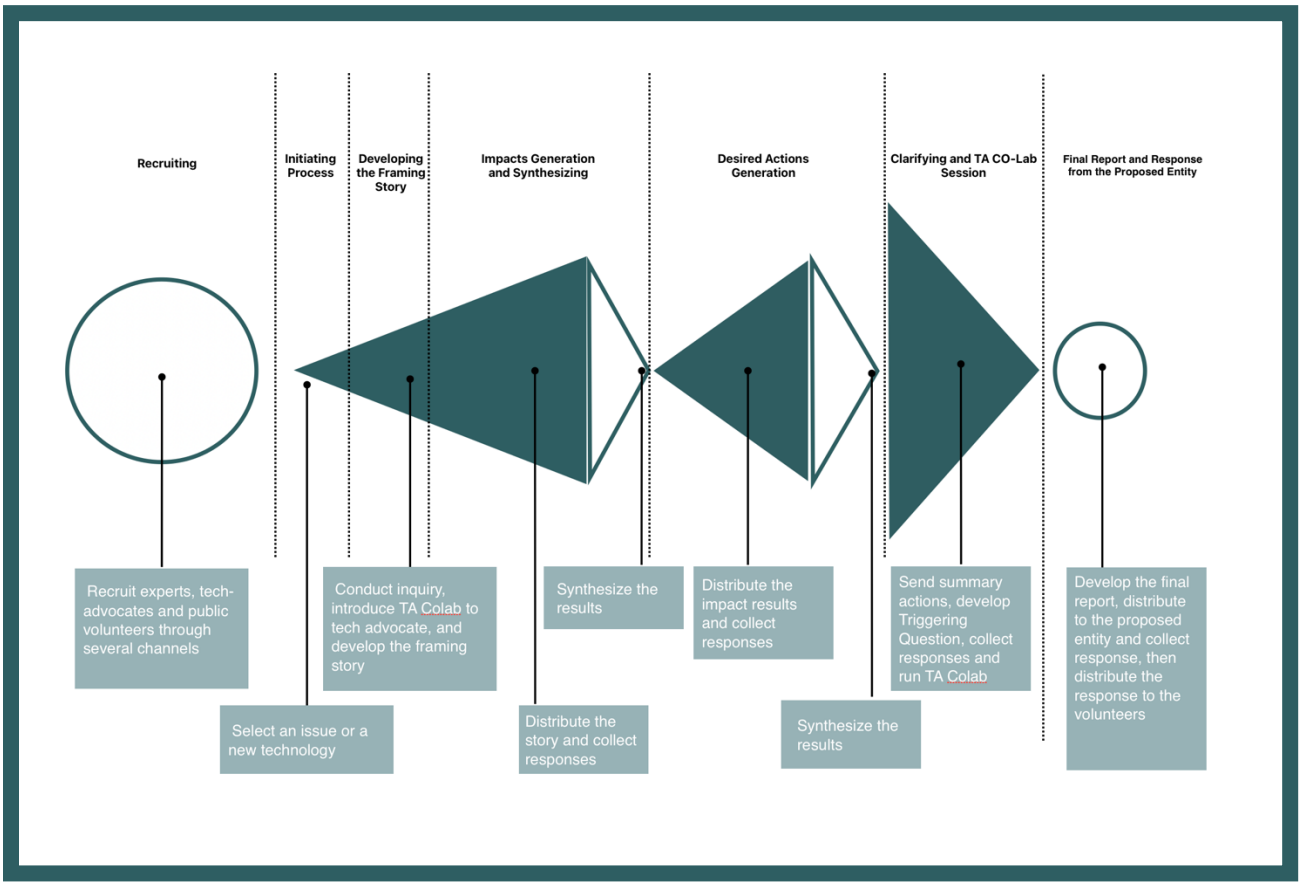


Figure (5.1) An Infographic of Participatory toward Anticipatory (PtA) Process

Step by Step PtA Process

Steps	Activities	Responsible Entities
Step 1: Recruiting	• Recruit experts, tech-advocates and public volunteers through several channels	PtA Team
Step 2: Initiating the PtA Process	• Select a technology issue or a new technology to focus on	Tech advocates, Sponsors, Brokers, PtA Team
Step 3: Developing the Framing Story	• Conduct initial Inquiry • Introduce the PtA process and TA Co-Lab to tech-advocates, sponsors and brokers • Invite experts, tech-advocates and public for participation • Develop the framing story	PtA Team
Step 4: Impacts Generation	• Distribute the framing story and collect participant responses • Synthesize the results	Volunteered Participants, PtA Team
Step 5: Generating Desired Actions	• Distribute the impact generation results to participants • Collect proposed desired actions	Volunteered Participants, PtA Team
Step 6: Clarifying Responses and Running TA Co-Lab Session	• Sent the summary of desire actions to participants • Develop and distribute Triggering Question (TQ) along with action summary • Collect responses to TQ • Conduct virtual/in-person session to develop influence map with Logosofia	Volunteered Participants, PtA Team
Step 7: Final Report and Response from the Proposed Entity	• Develop the final report • Distrute the report to the proposed entity • Collect response with the action plan • Distribute the response to the volunteered participants	PtA Team, Tech-advocates, Sponsors, Brokers

Table (5.1) Step by step PtA Process

COMPARISON BETWEEN SDD AND PtA PROCESS

Comparison between SDD and PtA Processes

No.	SDD (Christakis and Bausch (2006)	PtA Process
1	Selecting a diverse group of stakeholders using requisite variety sampling to represent the different perspectives of the issue	Participants might already be recruited to the platform before PtA process is begin and, the requisite variety will be ensured when they are registered. However, their participation is voluntary for PtA process including TA Co-Lab session.
2	Defining and formulating Triggering Question (TQ) to frame the main issue to explore collaboratively	Triggering Question is used at the final TA Co-Lab session run with the support of Logosofia. The responses are collected through the "Framing Story" which acts similar to the TQ
3	Gathering Information through research	Gathering information from tech-advocates, sponsors, and brokers in-addition to doing both secondary and primary research
4	Generating ideas individually in response to the TQ and clarifying these in group	Impact responses and desired actions are generated individually and is similar to generating ideas of SDD, but clarifying will be done collectively only at the final TA Co-Lab session
5	Clustering (optional), prioritizing and selecting ideas through voting	Clustering will be done by PtA Team, and prioritizing will be done by the participants (only for impacts) and voting for ideas will be done at the final TA Co-Lab session
6	Influence mapping or structural modeling	With the assistance from Logosofia, the influence mapping session will be done as a final step involving the participants
8	Reflection and reporting by the participants	PtA team will mainly do the reflection and reporting however the interested participants can volunteered for it

Table (5.2) Comparison between SDD and PtA Processes

CHAPTER 6

Prototyping PtA Process Design

PROTOTYPING PtA PROCESS DESIGN

SUMMARY

Chapter 6 is dedicated to the prototyping of the PtA process. It describes the prototyping phase, how it was adapted due to the constraints during prototyping process, and summarizes the key results. The chapter then discusses the limitations, lessons learned, and concludes with reflections on the way forward, including future possibilities and requirements for further development and implementation.

PtA PROCESS PROTOTYPING

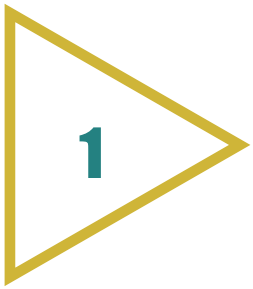
The prototype testing of the Participatory toward Anticipatory (PtA) process was conducted in three progressive stages, centering on the emerging issue of using Artificial Intelligence as romantic partners. The topic was selected due to its growing relevance in public discourse around artificial intelligence.

Objectives

As described early in this chapter, the prototype testing has two main objectives.

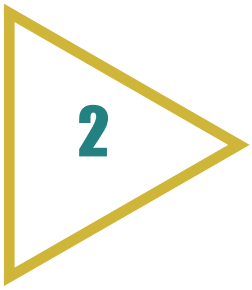
- To demonstrate the feasibility of the PtA policy deliberation approach, particularly in its capacity to engage the public and illustrate the kinds of outcomes such engagement can create.
- To serve as a case study showing that the public is capable of contributing in thoughtful and informed ways to technology policy discussions when they are given a meaningful mechanism.

The testing represents the full PtA process, except for some details that were not applicable during the prototype phase. Ideally, the PtA process would be delivered via an online platform, similar to a social media app, however, this manual prototype testing required some improvisation. In this phase, Microsoft Forms was used to facilitate remote engagement, while Microsoft Teams was employed for online interactions. Additionally, Logosofia software was utilized, as initially designed. The specifics of each step will be discussed below.



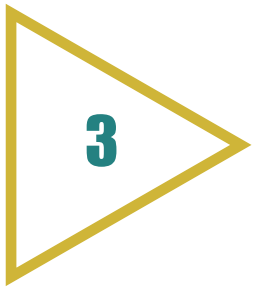
Recruiting

The prototype testing involved recruiting public volunteers through a public participation survey, rather than inviting all stakeholders, including experts and technology advocates. To maintain the anonymity of volunteers, no registration was required; however, this meant that Requisite Variety could not be ensured. Ultimately, 30 participants volunteered during the survey process, 18 of whom actively participated in the first engagement, while 12 participated in the second.



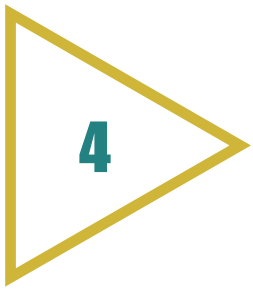
Initiating the PtA Process

Among the two methods available for initiating the PtA Process, this prototype selected the second approach, which involved analyzing trends in the technology sector. Given that AI is a trending topic and 52% of participants expressed interest in artificial intelligence, the team decided to focus on the use of AI as a romantic partner, a popular and timely issue surrounding AI, to kick off the PtA prototyping process. Because there was no designated advocate for the process, an explanation or introduction to TA Co-Lab was not provided, and collecting data from participants was not feasible.



3 Developing the Framing Story

During this step of developing the Framing Story, data was primarily gathered from secondary research due to time constraints. The narrative centered around a woman named Dineella, who has faced a toxic relationship and is now considering using AI as her romantic partner. The participants' task was to offer advice on this issue by discussing the potential positive and negative impacts. (Daniella's story was utilized as an example in the Framing Story step of the PtA design and is also available in audio format. Please follow the link for access. https://www.participatory-toward-aniticipatory.ca/daniella-s-story)



4 Impacts Generation

The Framing Story and the multiple-choice questions were sent to participants via the email addresses provided during the survey. Most participants do not want Dinella to have an AI partner, with 61% indicating this preference. Their reasons varied, presenting both positive and negative aspects. However, the negative aspects outweighed the positive ones. Many responses clustered around themes such as Unmet Emotional Needs, Data Privacy and Security, Emotional Dependency, Constant Validation Without Reality Check, Self-Isolation, Emotional Support and Safety, and Personal Growth. Among these reasons, Unmet Emotional Needs, stemming from the fact that AI is not sentient, was the most frequently cited concern.

Participants also expressed strong views on the broader implications of AI relationships. Over half believed the impact would extend to society at large, and a third anticipated effects at the scale of civilization. Few considered the impact to be limited to individual experiences. Social dynamics were identified as the primary domain of concern, with many also highlighting potential shifts in societal values and the technological landscape.

Notably, the anticipated timeline for these impacts was perceived as urgent, with 72% expecting significant developments within the next five years. The responses revealed a shared worry about how such technologies could reshape our fundamental capacity to relate—to one another and to the world—an insight underscored by the fact that "Relate" emerged as the most relevant category of impact for a majority of participants.

* Note: The size indicates the frequency.

Figure (6.1) Key Impacts Identified by Participants

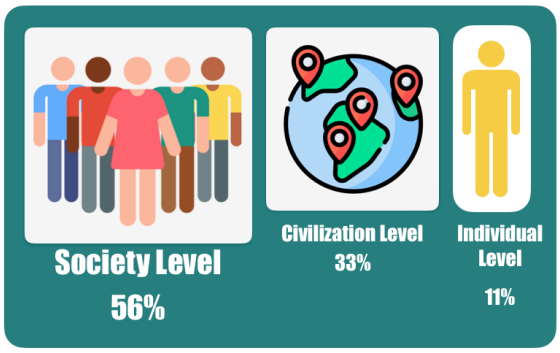


Figure (6.2) Level of Impacts

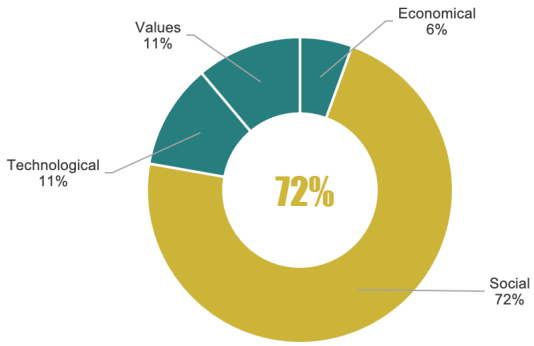


Figure (6.3) Areas of Impacts

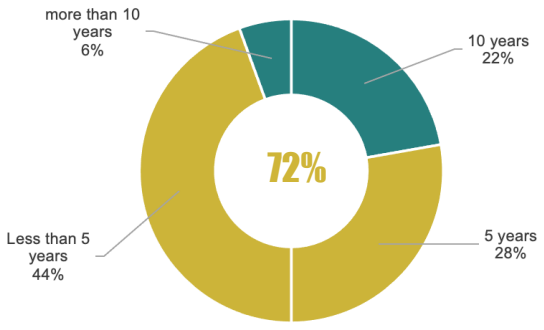


Figure (6.4) Time Frame

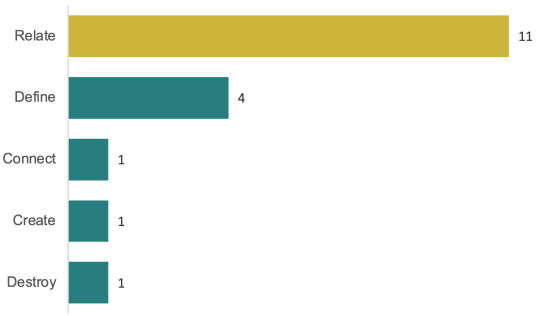


Figure (6.5) Nature of Impacts

5 Generating Desired Actions

In this stage, participants revisited the synthesized insights and reflected on potential actions or considerations related to the issue. Thirteen participants continued into this phase, helping to deepen the collective understanding and refine the framing of the problem. Before sharing their messages to the three main stakeholders; the government, technology companies, and the general public, they were asked to rank the six impacts identified in the previous stage. This served as a warm-up to help them reconnect with the earlier activity. Among the six impacts, Data Privacy and Security and Constant Validation emerged as the most prioritized concerns, while Unmet Emotional Needs was ranked the lowest. Interestingly, although many participants had previously spoken about emotional needs in their responses, they ultimately did not view it as a pressing issue. Instead, they expressed greater concern about being scammed, the misuse of their personal data, and the psychological risks of becoming trapped in personalized AI-driven “bubbles.

In the next step of the process, participants were invited to share their messages with three key stakeholder groups. When addressing the government, many emphasized the importance of regulation to ensure that the use of AI partners remains safe, ethical, and fair. Several respondents proposed limiting AI partner usage to clearly defined professional contexts, guided by strong standards and oversight. A recurring message was the call for people-centered governance—urging the government not only to protect public well-being, dignity, and rights, but also to actively involve citizens in shaping how these values are preserved in the age of AI. Additional concerns included the need to raise public awareness, enforce strict regulations on data collection and usage, hold developers accountable through the establishment of guardrails, and foster collaboration with technologists and experts for continuous monitoring and adaptive policymaking. (See Figure 6.6)

In their messages to technology companies, participants focused on two main points. First, they urged companies to refrain from developing AI with emotional capacities equivalent to those of human beings. They expressed concern that such developments could lead to unhealthy relationships between humans and AI. Second, participants

called for a human-centered approach to AI development. They emphasized that technological risks should be addressed through technological solutions that prioritize human needs, values, and well-being. Another important message was the call for greater inclusivity in the AI development process. Participants recommended that tech companies actively involve diverse stakeholders through open dialogue to ensure broader perspectives are considered in shaping AI technologies. (See Figure 6.7)

Finally, participants shared messages directed toward the general public—people like themselves. Their primary message was to encourage active participation in public forums, discussions, and other participatory processes to express their views and stay informed about the implications of AI partners. They also emphasized the importance of taking personal responsibility, cautioning against relying on quick fixes like AI partners to address emotional needs. Other messages included the importance of maintaining an open mind and considering both the potential benefits and risks of AI partners. However, some participants took a more critical stance, suggesting that people should campaign against the use of AI partners within their networks. Additionally, several participants highlighted the importance of mutual support. They stressed that friends, families, and communities should play a central role in providing emotional support to one another, reducing the perceived need for AI substitutes. (See Figure 6.8)

* Note: The size indicates the frequency.

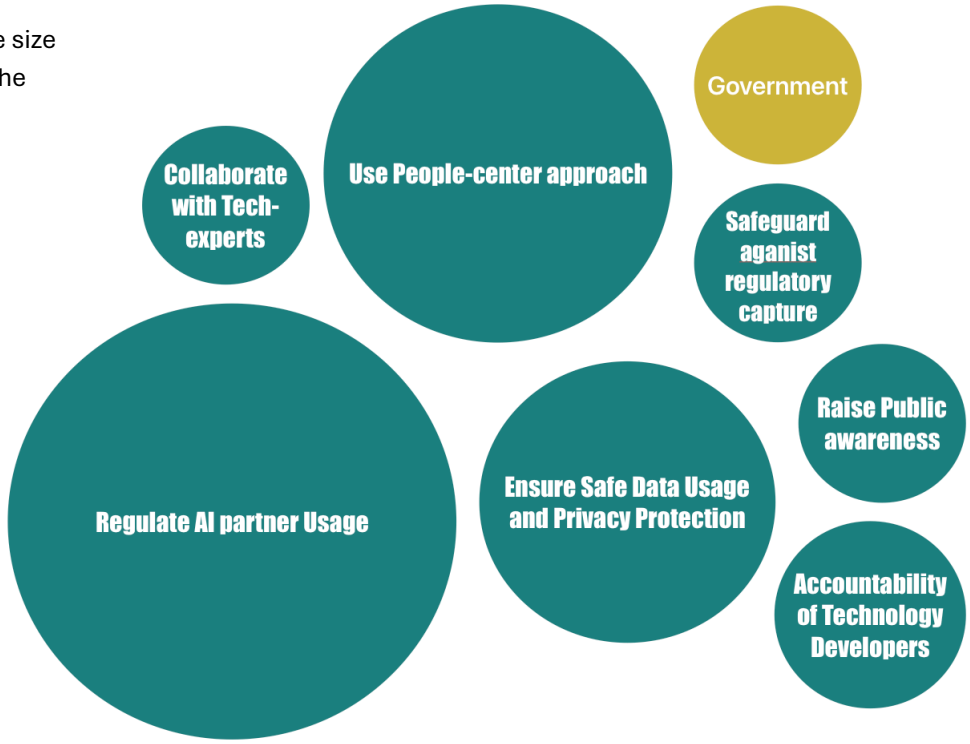


Figure (6.6) Messages from Participants to the Government

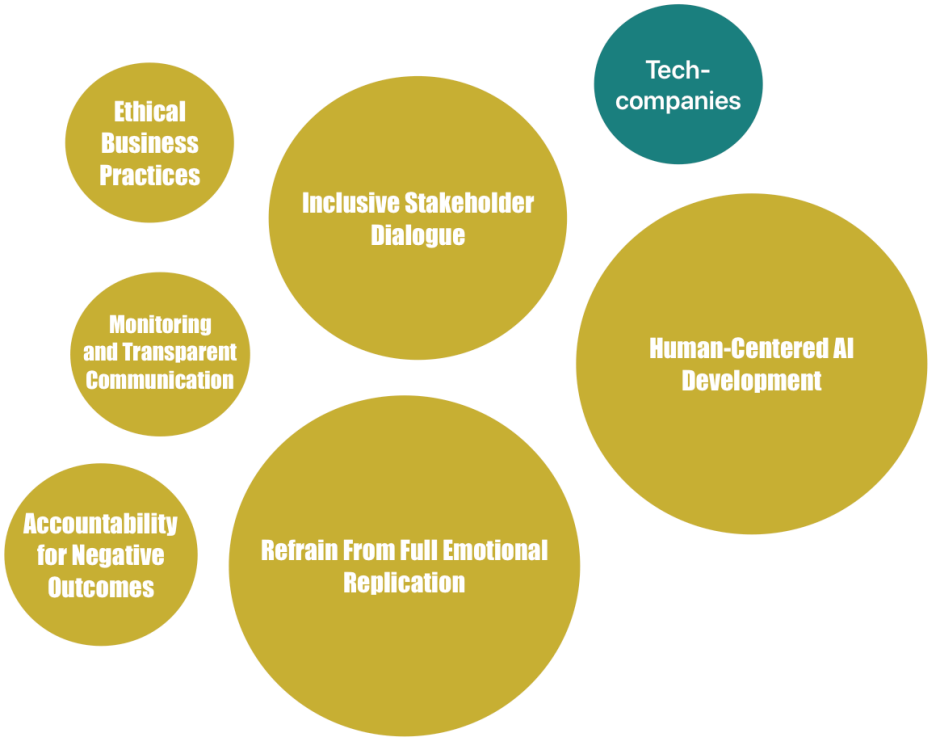


Figure (6.7) Messages from Participants to the Tech-companies

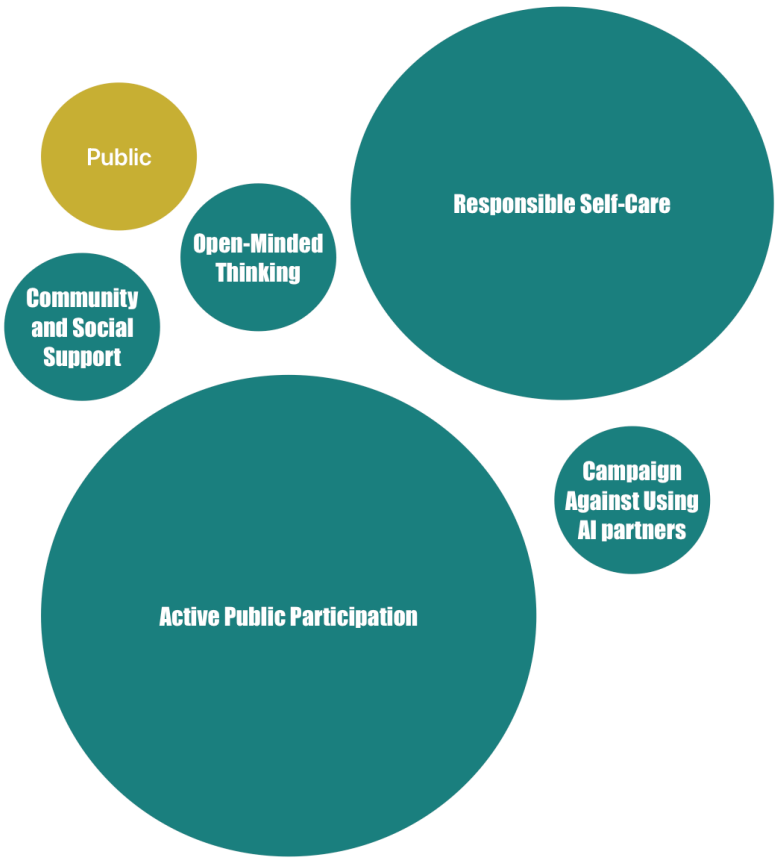


Figure (6.8) Messages from Participants to the Public

6 Clarifying Responses and TA Colab Session

The messages developed for the three key stakeholder groups were then shared back with participants as part of the final stage of the PtA process—an engagement known as the TA Co-Lab session. This final step invited participants to engage in collaborative systems thinking through an influence mapping activity guided by Dr. Peter Jones. Six participants joined this session, applying the Dialogic Design methodology to collectively identify key factors influencing the issue and explore how these factors relate to one another. The outcome was an influence map, a visual representation of the systemic dynamics shaping the adoption and use of AI partners. This session marked a significant turning point in the process, as it translated diverse individual reflections into structured public reasoning.

To anchor the discussion, a Triggering Question (TQ) was developed based on insights gathered throughout the earlier stages. This question was intentionally framed with a holistic perspective, moving beyond the narrow view of AI as romantic partners and instead considering the broader role of AI as partners in our daily lives. It reflected the evolving context built through the participants' contributions and helped guide a forward-looking, participatory exploration of shared concerns and possibilities.

> "Based on the growing use of AI as partners in our lives and work, what kinds of risks and challenges might become major threats to human wellbeing in next five years." (Triggering Question, PtA Co-Lab Session)

The Co-Lab session generated a total of 16 responses to the Triggering Question. Through a structured voting process, participants selected ten responses to include in the influence mapping exercise. These selected responses, along with their corresponding vote counts, are summarized. Following this, the group engaged in a guided and structured dialogue, beginning with clarifications and discussion of how each response related to the others. This collaborative process led to the development of an influence map, which is presented in Figure (6.9). The map captures the collective understanding of the systemic factors shaping the issue and represents a key outcome of the TA Co-Lab session.

The influence map reveals that Diminished Critical Thinking (Factor 6), which enables the Rise of Technocratic Superiority, emerges as the foundational driver behind the challenges associated with AI partners. This factor initiates a cascade of effects, beginning with (1) the erosion of trust and empathy, which contributes to polarized and extreme behaviours within society. It also leads to (3) the disruption of social order due to a decline in meaningful human interaction, and influences (7) the suppression of cultural innovation, which may then result in a societal stagnation marked by recycled norms and diminished creativity. These three outcomes are mutually reinforcing, collectively intensifying human dependency on technology and impeding emotional and cultural growth. This increasing dependence in turn contributes to (17) the development of a low-tolerance society, where social norms become rigid and exclusionary. Simultaneously, the loss of critical thinking also strongly influences (16) the exploitation of personal and biometric data. Both data exploitation and social rigidity further enable (4) the centralization of power within a few dominant tech companies. Ultimately, these interconnected factors facilitate the normalization of robot companions in society. This trajectory suggests an urgent need to reconsider and redefine not only human relationships but also emerging forms of relationality with AI entities.

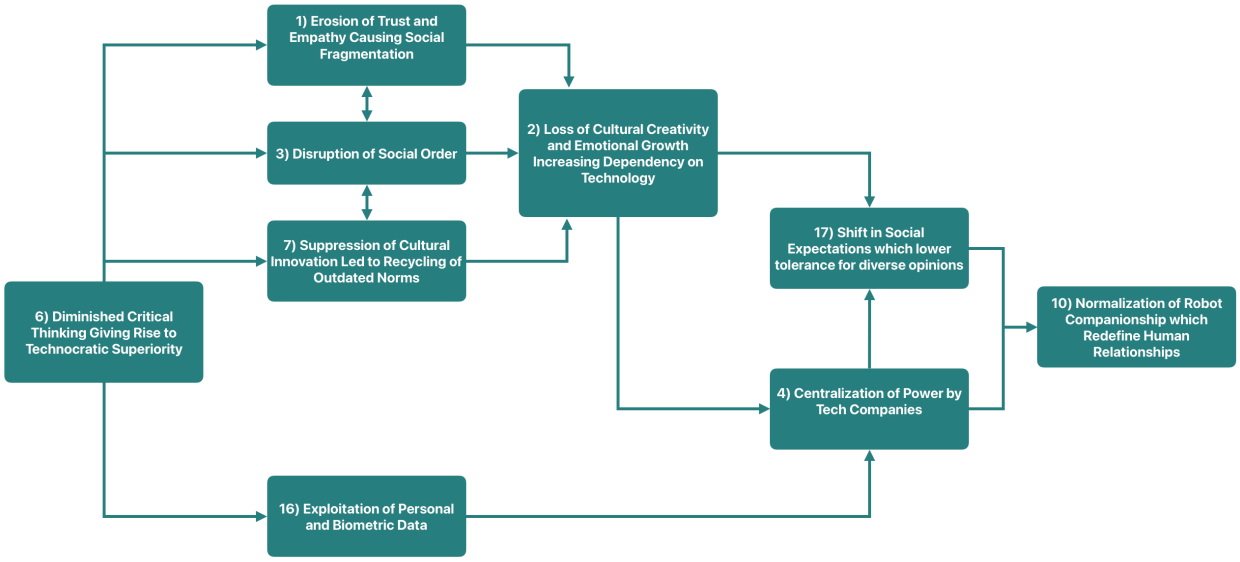


Figure (6.9) The Influence Map from the TA Co-lab Session

7 Final Report and Response from the Proposed Entity

As part of the prototype testing, this final report is integrated into the overall project report. Since there were no technology advocates, sponsors, or brokers involved, no communication with these parties was necessary, nor were any actions expected from their side.

LIMITATIONS & LESSONS LEARNED

The PtA design is still in its early stages. Several iterations are needed to refine it and ensure it effectively serves as a mechanism for bridging key stakeholder groups, particularly in representing the public's voice in technology development. During the design process, the PtA team conducted a survey to help generalize the findings. While insights from expert interviews contributed to the design, conducting in-depth interviews with members of the public could enhance the process by providing deeper, more nuanced perspectives. Without these insights, the survey—focused primarily on quantitative data—may be criticized for lacking the depth and context needed to fully understand the issue. Further engagement with the public is necessary to validate their interests, ensuring that the PtA design becomes more effective in involving people in the decision-making process for technology development.

Additionally, the data collected through the initial survey has its limitations. The survey design provided limited space for participants to respond in detail, unlike more in-depth methods. This restricted the ability of participants to fully express their preferences and opinions. Moreover, the survey represented only four provinces in Canada, with 52% of participants living in major cities. This limits the diversity of voices from communities outside major urban areas, which may not be adequately represented. While the prototype testing successfully demonstrated the potential of the PtA process, there are limitations and lessons to be learned, which should be applied to refine the process.

First, this round of testing was conducted in a semi-controlled setting, with limited scope and scale. While useful for exploring the mechanics and components of the process, such a controlled environment does not fully account for the complexities of real-world application. Factors like ensuring requisite variety during the registration process, recruiting the three main groups of participants, obtaining proposals from tech-advocates, sponsors, and brokers, and receiving responses in the final stage could introduce uncertainties that were not tested during the prototype phase. These factors could

challenge the PtA process in navigating the dynamics of stakeholders with differing agendas and power imbalances.

Furthermore, there are several areas where the PtA design needs improvement. One example is the challenge of designing a process that reduces decision fatigue and entertaining while maintaining the seriousness of action generation and the TA Co-Lab session. The initial engagement with Dinella's story was successful, with long, thoughtful responses as participants considered what they would say to their friend. However, the engagement that required participants to provide messages to the three key stakeholders; government, tech companies, and the public, did not have the same level of meaningful engagement. Some responses were thoughtful, but the structured nature of the task created more pressure than the story-based approach, which allowed for greater flexibility. Extending the story format to this step might improve engagement. For example, asking participants to communicate with imaginary representatives from these groups on behalf of Dinella could increase their investment in the task. The Co-Lab session also posed challenges due to the heavy nature of the topics discussed, which are relevant at a societal level. This complexity can lead to participant burnout. Additionally, the repeated analysis of the relationships between responses to the Triggering Question (TQ) could lead to decision fatigue and lower quality of decisions over time. The PtA process will need to balance the quality of responses with the available time of participants to achieve the best outcome in the Co-Lab session.

The results from the prototype testing demonstrate how the PtA process could function under ideal conditions with limited resources, such as time and participants. To fully showcase its effectiveness, however, the PtA process would need to be tested in live, open settings, where real-world consequences and unpredictability can be factored in. In other words, the PtA process is still in the "Lab" stage of the four stages of the Systemic Design Engagement Model—Lab, Studio, Arena, and Agora (Jones, 2018)[1]. The experiments conducted in the Lab should lead to the "Studio," where a project team collaborates on design activities. From there, the process should move to the "Arena," where co-creation with stakeholders occurs, and eventually to the "Agora," where co-creation of values and the future can take place. The PtA process will also need to incorporate new approaches relevant to the process. One such opportunity could involve using AI as a supporting and facilitation tool for the Co-Lab. (Christakis and Kakoulaki, 2025) Once these challenges and opportunities are addressed, the PtA process could be employed as a mechanism for public engagement.

A WAY FORWARD

The future direction of the PtA process remains open. It has the potential to stand alone as a process integrated into various stages of technology development. Alternatively, it could evolve into a formal requirement, supported by governments or certification bodies. While the trajectory of PtA shows promise, many challenges remain. Continued cooperation from all stakeholder groups will be essential. In the meantime, PtA aims to spark the beginning of a new paradigm—one in which the public actively shapes technology decisions and the future of society. The PtA process is grounded in the belief that people should not be passive recipients or victims of emerging technologies but rather active participants in their development and governance. One promising direction is to position PtA as more than just a facilitation tool. It could evolve into a formal mechanism within technology governance, such as a certification framework for technology companies. Governments or independent organizations could support this framework. Initially, participation in PtA could be voluntary, allowing companies to demonstrate ethical and socially responsible innovation. Over time, it could become a certification requirement before launching new technologies. This system would not only ensure that public concerns are considered but also help build trust, attract responsible investors, and promote more inclusive and democratic approaches to technological development.

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