



# **AI Transformation in Ontario:** *Impacts, Challenges, and Opportunities for Technicians and Technologists*

## About OACETT

The Ontario Association of Certified Engineering Technicians and Technologists (OACETT) is a non-profit, self-governing regulatory body and professional association of over 21,000 members.

OACETT is Ontario's independent certifying body for engineering and applied science technicians and technologists confers the certifications C.Tech. (Certified Technician) and C.E.T. (Certified Engineering Technologist). These certifications are recognized across the province by employers and other engineering professionals.

OACETT promotes the interests of engineering and applied science technicians and technologists in industry, educational institutions, the public and government. OACETT was incorporated in 1962 and legislated under the Statutes of Ontario by the *OACETT Act* of 1984. The Act established OACETT as a self-governing body with right to title for its members. The provincial legislature passed the *OACETT Act* of 1998, a revised act that includes a description of work for technicians and technologists.

### Contributions

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## 1. Executive Summary

Ontario has a significant opportunity to place itself at the forefront of the quickly emerging artificial intelligence (“AI”) transformation. With a thriving AI ecosystem, Ontario is home to over 400 AI companies, industry leaders, and world-renowned institutions such as the Vector Institute.

The Ontario Association of Certified Engineering Technicians and Technologists (“OACETT”) presents this report, which provides an overview of anticipated impacts of AI on engineering technicians and technologists. It also outlines key recommendations for policymakers to foster growth in Ontario. Through this report, OACETT aims to provide guidance on using and shaping AI for the engineering technology profession, making it more resilient, innovative and inclusive.

As a foundation for this report, OACETT held an Artificial Intelligence Summit titled "*The Rise of AI and its Impact on the Engineering Technology Profession*" (“AI Summit”) at Humber College's Barrett Centre for Innovation on Tuesday, April 9<sup>th</sup>, 2024. The AI Summit brought together 85 industry leaders from companies, colleges, and government for a full day of sessions to identify potential labour market challenges due to AI, ethical concerns and gaps in policy and governance. The event sought to spark conversation regarding what the development of generative AI means for the engineering technology profession and what guardrails are necessary. This document captures the essence of the summit’s deliberations and discussions, serving as a foundational guidance document offering strategic direction for OACETT, its membership and governmental and regulatory authorities. The emerging themes and topics from the AI Summit are supplemented with further secondary research for this report.

The morning portion of the AI Summit consisted of a keynote speaker and panel sessions discussing the potential impact of AI on the engineering technology profession from the perspective of industry, government, and post-secondary educational institutions. In contrast, the afternoon portion of the summit focused on developing AI strategy. The session featured a closed-door interactive strategy session where attendees were grouped by table, providing feedback on key strategic questions concerning the labour market, ethics, policy, and governance challenges introduced by AI.

The takeaways from this session were as follows:

- **Labour Market Evolution and Upskilling.** AI is transforming the job landscape by automating routine tasks, necessitating significant upskilling and reskilling for engineering technicians and technologists to adapt to new roles that prioritize complex and creative skills.
- **Ethical Considerations and Responsible AI Use.** The integration of AI brings ethical challenges such as bias and accountability, requiring engineering technicians and technologists to adopt ethical frameworks and design principles to mitigate these risks.

- **Policy and Governance Gaps.** Clear and balanced regulations are essential for AI governance, with industry input and risk-based approaches ensuring guidelines are effective and adaptable to technological advancements.

Following the AI Summit, OACETT has identified some key approaches that members, the Ontario Government, and OACETT itself could consider to effectively navigate the evolving AI landscape as it relates to engineering technology.

First, members should embrace opportunities for upskilling and integrate AI into existing workflows to remain competitive in the shifting labor market. Second, members should seek to develop an understanding of fundamental AI ethical principles and frameworks to ensure responsible decision-making. Finally, members should develop some awareness about AI regulatory developments and emerging standards to support the ethical and compliant development, deployment and use of AI.

To support engineering technicians and technologists, the Government of Ontario could provide funding and resources for upskilling and AI innovation, ensure engineering technicians and technologists have adequate representation in regulatory discussions, offer clear and practical regulatory guidance, and introduce AI development, deployment and use as a core component of college programs.

OACETT itself will explore proposed actions that may include developing continuing professional development (“CPD”) courses on AI and facilitating upskilling workshops, promoting the advancement of AI and balanced AI regulation, promoting diversity and inclusion within the profession to address bias in AI systems, sharing information about technology-specific AI tools and applications, and updating the Code of Ethics to include principles and best practices for the development, deployment and use of AI.

Through implementing these recommendations, OACETT aims to support its members through the AI transformation, equipping them with the skills and knowledge necessary to navigate the evolving AI landscape.

## 2. Background

### 2.1. The AI Industry in Ontario

AI, in broad terms, refers to machines capable of performing tasks that emulate human behaviour across diverse contexts. In 2017, Canada emerged as an early global leader in AI, developing the first national strategy on AI.<sup>1</sup> The strategy aimed to transform Canada's strong record on AI research into a driver of the Canadian economy and to become a world leader in AI. This national strategy was bolstered by significant investment in AI, much of it in Ontario.

Ontario, and more specifically the Toronto-Kitchener-Waterloo region, has established itself as an emerging artificial intelligence hub with leading artificial intelligence research, development and companies. For instance, the University of Toronto is home to the "godfather of AI" Geoffrey Hinton. The research record of AI at the university has translated into internationally recognized AI companies such as Waabi and Cohere.<sup>2</sup> Ontario is also home to the Vector Institute, an independent not-for profit corporation launched as part of the federal government's national strategy in 2017. The Vector Institute is a pillar of Ontario's AI ecosystem, leading the province's efforts to build AI-based innovation, growth and productivity.

Given the concentration of AI research and development, it is unsurprising that Ontario has by far the highest proportion of AI companies (62%), developers (53%) and users (48%) in Canada.<sup>3</sup> For instance, more than half of new AI companies founded in Canada in 2022-2023 were founded in Ontario.<sup>4</sup> Ontario stands to gain economically from the continuously growing AI industry. Invest Ontario reports venture capital investment in Ontario's AI reached \$1.16 billion in 2022, reflecting the immense potential for growth and innovation in the province.<sup>5</sup>

The engineering technicians and technologists in Ontario play a large role in spurring on this transformation. While at the same time, these roles have begun to see a large shift and reshaping in the industry as AI augments the engineering technology workforce demands across the province.

### 2.2. AI Summit Overview

Recognizing the dramatic shift taking place, OACETT proudly hosted its AI Summit to concentrate on how this unprecedented transformation will affect engineering technicians

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<sup>1</sup> Government of Canada, "Pan-Canadian Artificial Intelligence Strategy", online: <[Pan-Canadian Artificial Intelligence Strategy](#)>.

<sup>2</sup> Nina Uzunović, "Toronto emerges as an AI hub aiming to compete with Silicon Valley" (21 October 2023), online: *The Varsity* <<https://thevarsity.ca/2023/10/21/toronto-emerges-as-an-ai-hub-aiming-to-compete-with-silicon-valley/>> .

<sup>3</sup> Deloitte, "Impact and opportunities: Canada's AI ecosystem – 2023" (2023) online: (pdf) <<https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/press-releases/ca-national-ai-report-2023-aoda-en.pdf>>.

<sup>4</sup> *Ibid.*

<sup>5</sup> Invest Ontario, "Artificial Intelligence and Connectivity" (26 June 2024) online: <<https://www.investontario.ca/ai-connectivity>>.

and technologists to figure out how best to guide its members through this transformation. The AI Summit consisted of two components, the morning session focused on understanding the issues, while the afternoon session was focused on brainstorming strategy.

The morning session was kicked-off by Andrew Au, managing partner at Intercept and a global thought leader on digital transformation, who delivered the opening keynote. His presentation focused on the broader role of AI in accelerating digital transformation, highlighting the transformative possibilities of generative AI while also noting the issues that these systems raise. A panel session then brought together leaders, innovators and external stakeholders consisting of Joe Armstrong, President and CEO, Eraii Consulting Incorporated, Francis Syms, Associate Dean, Faculty of Applied Science and Technology (FAST), Humber Polytechnic, Micheal Mooney, C.E.T., President, OACETT and Stephanie Oldfield, Director of Digital and Data Policy, Ministry of Public and Business Service Delivery and Procurement. The panel showcased a range of issues and perspectives on how AI is re-shaping engineering technology fields, adapting to the societal impacts of AI, challenges with traditional problem-solving approaches and AI's complex ethical dilemmas.

In contrast, the strategy sessions in the afternoon were focused on gathering as much input from the attendees as possible through engagement in a closed-door meeting with experts. Within each strategy session, a succinct presentation was given to introduce the topic, followed by discussions. On AI's impact on labour, Vahid Haeri, IT Manager, BGC Engineering, discussed the impact of AI across various departments at engineering firms, highlighting the need for re-skilling to be able to integrate AI effectively into workflows. On ethics, OACETT president Micheal Mooney, C.E.T., advocated for the need for a balanced approach that allows both the utilization of AI's capabilities while safeguarding ethical standards and societal values. Finally, Sam Ip, Partner, Technology, Osler, Hoskin, Harcourt LLP provided an environmental scan on AI governance and regulations in Canada, with a particular focus on the *Artificial Intelligence and Data Act (AIDA, Part 3 of Bill C-27)*. The analysis below reflects the presentations and discussions that took place throughout these strategy sessions, in addition to a follow-up survey which was sent to OACETT members.

### **3. The Impact of the AI Transformation on Engineering Technicians and Technologists**

The rapid growth of AI in Ontario is not only transforming the landscape of AI research and development but also reshaping the roles and responsibilities of engineering technicians and technologists.

In summarizing the three-afternoon brainstorming sessions and the survey that received 65 responses from OACETT members, this report focuses on: (1) labour market challenges due to AI; (2) how the AI transformation is affecting the ethical considerations of engineering technicians and technologists; and (3) how engineering technicians and technologists can contend with changing and evolving guidelines and regulatory frameworks.

#### **3.1. Labour Market Evolution: How AI is reshaping job landscapes and preparing to adapt**

##### **Discussion questions:**

AI is transforming the labour market by eliminating and creating new opportunities simultaneously. To understand possible labour market concerns, we asked participants:

1. How is artificial intelligence expected to transform the roles and responsibilities of engineering technicians and technologists in the next decade?
2. What are the most significant challenges and opportunities AI presents to engineering technicians and technologists in terms of employment and job quality?
3. What specific skills and knowledge will engineering technicians and technologists need to acquire to stay relevant and competitive in an AI-driven work environment?
4. How can educational institutions and professional associations adapt their curriculum or programs to better prepare students or members for the integration of AI in their fields?

##### **What we learned from speaker Vahid Haeri:**

As AI begins to make its way into the workplace it is quickly transforming the environment for engineering technicians and technologists. Its projected impact on the labour market is undeniable and we are already beginning to witness the early stages of this transformation.

For engineering technicians and technologists, the introduction of artificial intelligence into the workplace is more likely to augment and change jobs rather than replace the work of engineering technicians and technologists in their entirety. This shift is not about replacing humans with machines, but rather about leveraging the strengths of AI to achieve better outcomes. The question thus becomes, how can engineering technicians and technologists best adapt to the changes in the industry?

### **What we heard from participants:**

The use of AI introduces the potential to automate many routine and repetitive tasks, allowing engineering technicians and technologists to focus on more complex and creative aspects of their work. However, this change raises concerns about job displacement and the need for upskilling and re-skilling of engineering technicians and technologists. These new roles will also require adapting current college curriculum to meet new industry demands.

#### *(a) Increased Efficiency*

AI will shorten the time required to solve engineering problems, augmenting the way engineering technicians and technologists work. This will help individual engineering technicians and technologists become much more efficient in their job, taking away some of the manual, administrative and repetitive tasks. The increased efficiency will allow engineering technicians and technologists to focus on value-added critical tasks.

For instance, when AI handles the bulk of data analysis and pattern recognition, technicians and technologists can spend more time on interpreting the results, making informed decisions, and communicating their findings to clients and stakeholders.

Nonetheless, it is imperative for engineering technicians and technologists to understand the basics of engineering and the tasks which they seek to automate through maintaining a solid grasp of the fundamental principles. It is important for engineering technicians and technologists to be able to sense-check AI results, ensuring outputs are accurate and reliable. Without this core knowledge, there would be a significant gap in the oversight and validation of automated AI processes.

#### *(b) Upskilling and New Roles*

As Vahid Haeri's presentation aptly highlighted - AI technologies won't replace your job, but someone who knows how to use AI, with the same credentials, diplomas or degrees as you, will. This is why upskilling is essential to ensure the engineering technology workforce can adapt to the changing job environment of AI.

There is a pressing need for training on how to use AI and on AI policy compliance to ensure that engineering technicians and technologists are equipped with the knowledge to effectively leverage and use AI tools. Awareness training on available AI tools and how to use them is essential to upskilling the engineering technology workforce. Proper training on how to use AI tools, such as generating prompts effectively when using generative AI tools, is also crucial.

Further, while the advent of AI is expected to lead to the loss of some traditional engineering technology roles, it will also create new ones. The changing engineering technology labour market will prioritize skills such as design principles (UI/UX), prompt engineering, database modeling, problem-solving, and critical thinking. These new roles will require engineering technicians and technologists to acquire a diverse set of skills that go beyond traditional knowledge. For example, understanding user experience design will become crucial as AI

systems are integrated into various applications, requiring engineering technology professionals to ensure that these systems are user-friendly and effective.

*(c) Adapting post-secondary education*

Colleges need to look to adapting their curriculum to ensure that new engineering technicians and technologists have the skill sets they need to thrive in a labour market where AI skills and application will be in demand.

There is no need to drastically change the fundamental principles of engineering technology and applied science programs and courses. However, the approach to applying AI tools needs to be introduced into the curriculum. For example, while an electrical technician is currently needed to lay out wiring diagrams and test circuits, in the future, AI may assist or even automate much of this design process. Even if AI generates these layouts or performs some testing, an engineering technician will still be required to inspect and validate the AI's work to ensure it complies with standards and is safe for implementation. This means that the same knowledge of electrical principles is still needed, but the way the technician applies that knowledge will evolve. Learning how to integrate AI into workflows involves teaching students “AI prompt engineering” so they can effectively interact with AI tools and ensure the outputs are accurate and practical for real-world applications.

In tandem with how to use AI tools, it is essential to ensure students are taught to use these programs responsibly and ethically. This includes understanding the potential biases in AI algorithms, ensuring transparency in AI decision-making processes, and maintaining accountability for AI-driven outcomes. By incorporating these ethical considerations into engineering technology education, we can prepare future technologists to navigate the complexities of AI integration responsibly.

Further, to ensure an “AI resilient” education, it is important that post-secondary education goes beyond the fundamental principles of engineering technology and emphasizes skills such as creativity and problem solving; skills that have long been integral to the practice of engineering technology and will become increasingly important as some of the more traditional elements of the jobs become automated or adapted by the application of AI.

**3.2. Ethical Considerations: Ethical dimensions of AI implementation and its societal implications.**

**Discussion questions:**

Algorithmic bias, privacy concerns and decision-making transparency are critical AI ethical considerations that are shaping the way AI is implemented. As engineering technicians and technologists grapple with responsibility and accountability when it comes to AI, we asked participants:

1. What are the most pressing ethical dilemmas posed by AI, and how can we address them to strike a balance between innovation and safeguarding human rights, privacy and public safety?

2. How can we ensure that the decision-making processes of machines not only align with the safety standards and ethical considerations of engineering technicians and technologists but also embody the wider societal and moral values?
3. How do we ensure the data and approach that is used to train and build AI and Machine Learning models is free of bias?

**What we learned from Micheal Mooney, C.E.T.:**

As AI becomes more pervasive, engineering technicians and technologists are increasingly grappling with the ethical and societal implications of the technology. The discussions at the AI Summit highlighted several pressing ethical dilemmas posed by AI for engineering technicians and technologists, including bias, privacy, transparency, accountability, and the potential misuse of AI by political or corporate entities.

Safeguarding human safety and ensuring ethical practice has long been a key pillar of engineering technicians' and technologists' mandate. The question is, what does safeguarding human safety and ethical practice mean when using and developing AI tools and systems?

**What we heard from participants:**

By addressing these ethical dilemmas using ethical frameworks and ethical designs for AI, engineering technicians and technologists can mitigate many of the risks of AI systems through the promotion of responsible innovation.

*(a) Ethical Frameworks*

Engineering technicians and technologists often face a tension between innovation and ethical standards. A strong ethical framework should help navigate this tension by providing concrete guidance. There is a crucial need to create and share ethical guidelines that are tailored to how engineering technicians and technologists work and operate, such that they can be easily implemented into workflows.

Incoming AI regulations will dictate many best practices; however, it is unclear when these regulations will be finalized and take effect. Further, much of the regulatory guidance is not necessarily tailored directly to engineering technicians or technologists or easily implemented into workflows.

There are numerous declarations and guidelines on ethical AI, many touching on similar high-level principles; however, rarely do they provide practical guidance on how engineering technicians and technologists can incorporate those principles into their everyday practice.

Examples of AI ethical frameworks raised during the discussion include:

- [IEEE Ethically Aligned Design](#): The IEEE Ethically Aligned Design provides a comprehensive framework for the design and development of AI systems that

prioritizes ethical considerations, including transparency, accountability, fairness, and privacy.

- [The Montreal Declaration for Responsible AI](#): The Montreal Declaration offers principles and guidelines for the ethical development and deployment of AI technologies, emphasizing human rights, diversity, sustainability, and democratic participation.
- [The Asilomar AI Principles](#): The Asilomar AI Principles propose a set of guidelines for the ethical development and deployment of AI technologies, covering areas such as safety, transparency, accountability, and value alignment.

*(b) Ethical Design*

Engineering technicians and technologists need to learn how to integrate ethical design principles into the development, deployment and use of AI systems. The "ethical-by-design" approach ensures that ethical risks are identified and mitigated early on, preventing the need for reactive solutions once the system is deployed. This involves considering the potential societal impacts of AI technologies at every stage of development and implementing mechanisms to mitigate risks and ensure alignment with moral values.

Key aspects of ethical design that engineering technicians and technologists should adopt include mitigating data bias, ensuring there is a "human-in-the-loop", and prioritizing continuous evaluation and improvement.

Regarding mitigating data bias, AI systems are trained on vast datasets. As such, AI systems can perpetuate or even exacerbate biases present in the data they are trained on, leading to unfair or discriminatory outcomes. Mitigating bias is thus one of the most critical aspects of ensuring ethical AI design. To ensure that data and approaches used to train AI are free from bias, engineering technicians and technologists should ensure that datasets are diverse and representative such that they accurately reflect the demographics and characteristics of the population.

Beyond ensuring a diverse dataset, engineering technicians and technologists should employ techniques that detect and mitigate bias in the data such as bias audits, fairness metrics and adversarial testing. Further, the composition of AI development teams themselves plays a crucial role. Diverse teams, with varied perspectives and experiences, are less likely to overlook the subtleties of bias and more likely to create systems that reflect the diversity of society.

Second, when automating tasks, having a "human-in-the-loop" is essential for ensuring that AI systems do not make harmful or incorrect decisions. Thus, AI systems must be designed with human oversight and involvement, particularly for critical decisions. AI systems can often be complex and opaque, making it difficult to understand how decisions are made or to hold responsible parties accountable for errors or harmful outcomes. Designing AI systems to ensure transparency and explainability enables users to understand how decisions are made and to hold AI systems accountable for their actions. Further, AI systems should be designed to allow for human operators to monitor, intervene, or override decisions when necessary.

Finally, mechanisms for continuous evaluation and improvement should be implemented into AI systems throughout their lifecycle. After deployment, AI systems should be regularly monitored to ensure they continue to align with ethical standards and do not develop unforeseen biases or ethical issues. This requires ongoing testing, feedback loops from users, and iterative development to refine the system. Regular audits and performance reviews help maintain the integrity of the AI system, allowing engineering technicians and technologists to address any new concerns that arise as the system scales or adapts to new contexts. By embedding mechanisms for continuous monitoring, technologists can ensure that AI systems are not only safe upon release but remain so throughout their lifecycle.

### **3.3. Policy and Governance Gaps: Identify and address the evolving needs of AI governance in our profession.**

#### **Discussion questions:**

The AI regulatory and governance landscape is rapidly evolving. However, engineering technicians and technologists are too often left out of the conversation around developing best practices, standards and regulations. We asked participants:

1. How can we regulate AI without stifling innovation?
2. Do we need a code of practice?
3. If so, what should be included?
4. What are the key elements that should be included in any regulatory framework?

#### **What we heard from Sam Ip:**

Emerging standards and regulations play a significant role in shaping the work of engineering technicians and technologists. Governments and international bodies are continuing to develop new guidelines and regulatory frameworks for AI.

In Canada, there is a patchwork of different draft regulations, voluntary safeguards and guidance that currently govern or seek to govern the development, deployment and use of AI. Three notable federal regulatory developments in Canada are: the introduction of the proposed *Artificial Intelligence and Data Act*; the release of the ISED Voluntary Code of Conduct and the Treasury Board of Canada Secretariat's release of the Guidelines for Using AI.

In June 2022, Canada's federal government introduced Bill C-27, known as *The Digital Charter Implementation Act*, comprised of three sections. The first two sections aim to

reform Canada's private sector data protection law.<sup>6</sup> The third section of the Bill introduces the *Artificial Data and Intelligence Act* (AIDA), serving a dual purpose to: (1) "regulate international and interprovincial trade and commerce in artificial intelligence systems;" and (2) "prohibit certain conduct in relation to artificial intelligence systems that may result in serious harm to individuals or harm to their interests."<sup>7</sup> AIDA mirrors the EU AI Act by aiming to broadly regulate AI technologies using a prescriptive and horizontal model based on "command-and-control" regulation.

In September 2023, ISED released the Voluntary Code of Conduct on the Responsible Development and Management of Advanced Generative AI Systems in response to the emergence of general-purpose generative AI systems like ChatGPT.<sup>8</sup> The Code identifies measures for organizations to integrate into their operations for developing and managing generative AI systems, ensuring a robust and responsible AI ecosystem in Canada. These measures include adopting accountability, transparency, and risk management frameworks to promote "responsible AI."<sup>9</sup>

Finally, the Treasury Board of Canada Secretariat (TBS) introduced the Guide on the Use of Generative AI in September 2023.<sup>10</sup> This Guide provides public servants with guidelines for using AI, detailing best practices for employing generative AI. It builds on the 2019 Directive on Automated Decision Making released by TBS, which introduced guidance for the federal government's development, deployment and use of automated decision-making systems.<sup>11</sup> The guidance is notable for companies and technologists that seek to have their technologies procured by the government.

At the provincial level, Ontario has released a Framework for Trustworthy Artificial Intelligence and Principles for Ethical Use of AI that complement the Canadian federal principles and guidelines. Further, the Ontario Government recently passed Bill 194, which seeks to address both cybersecurity and regulatory issues related to the use of AI. While the Bill received Royal Assent on November 25, 2024, the Bill itself does not create any substantive requirements on AI. Rather, the Bill grants the Minister of Public and Business Service Delivery the power to make regulations with respect to: (i) requiring public sector entities to make public their use of AI systems; (ii) implementing accountability and risk assessment requirements for public entities using AI systems; and (iii) prescribing circumstances where public sector entities will be required to disclose information, or where the use of certain AI systems will be prohibited.

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<sup>6</sup> Bill C-27, An Act to enact the Consumer Privacy Protection Act, the Personal Information and Data Protection Tribunal Act and the Artificial Intelligence and Data Act and to make consequential and related amendments to other Acts, [1st Sess. 44th Parl. 2022](#) [Bill C-27].

<sup>7</sup> *Ibid* at s4.

<sup>8</sup> Innovation, Science and Economic Development Canada, "Voluntary Code of Conduct on the Responsible Development and Management of Advanced Generative AI Systems" (September 2023), online: <<https://ised-isde.canada.ca/site/ised/en/voluntary-code-conduct-responsible-development-and-management-advanced-generative-ai-systems>>.

<sup>9</sup> *Ibid*.

<sup>10</sup> Treasury Board of Canada Secretariat, "Guide on the Use of Generative AI" (September 2023), online: <<https://www.canada.ca/en/government/system/digital-government/digital-government-innovations/responsible-use-ai/guide-use-generative-ai.html>>.

<sup>11</sup> Treasury Board of Canada Secretariat, "Directive on Automated Decision-Making" (Archived 24 April 2023), online: <<https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=32746&section=html>>.

*What we heard from participants:*

Engineering technicians and technologists are eager for clear guidance from regulatory and professional bodies and support a balanced approach that regulates AI without stifling innovation. A focus should be put on involving industry stakeholders in the development of regulatory frameworks and guidelines, risk-based regulation and creating clear governance frameworks.

*(a) Industry Input*

Engineering technicians and technologists possess deep technical knowledge and practical experience with AI technologies. Industry input is invaluable to ensure that regulations are both technically feasible and aligned with the current state of the art. Since AI is rapidly developing, there is a need for government to better understand the implications of AI to create guidelines which are flexible enough to evolve with rapid technological advancements.

By involving industry stakeholders, governments can avoid the pitfalls of overregulation, which can stifle innovation and slow down technological progress. Industry input can also help identify areas where regulation is necessary to protect public interests without imposing unnecessary burdens on developers and businesses leading to more effective and realistic guidelines that address real-world challenges and opportunities.

*(b) Risk-based regulation*

Many OACETT members stated they are in favour of the adoption of risk-based regulations that focus on setting outcomes or performance standards rather than prescribing specific methods or processes. A risk-based approach is particularly effective for AI governance because AI applications vary widely in scope and complexity, making one-size-fits-all regulations impractical. A risk-tailored approach allows regulators to focus on ensuring AI systems meet key safety, ethical and performance benchmarks.

This approach also offers greater flexibility, as it does not mandate how developers must meet regulatory standards but instead emphasizes the importance of meeting certain goals— such as preventing algorithmic bias, maintaining user safety, and protecting privacy. By allowing AI developers to determine the best methods for achieving compliance, risk-based regulations foster innovation.

Regulatory frameworks should reflect Canadian values and principles, with a focus on addressing risk-based considerations. This ensures that AI regulations remain aligned with the country's ethical standards while being flexible enough to manage the wide variety of applications AI may offer.

*(c) Clear requirements*

As numerous best practice documents, guidelines, and proposals for regulatory frameworks emerge, there is a growing challenge for engineering technicians and technologists to ensure their work aligns with both current and future AI regulations. This challenge is especially pressing given that under the potentially forthcoming draft of AIDA, regulatory requirements would apply retroactively to all AI systems, meaning developers and

companies may need to ensure existing AI technologies comply with new regulations. Without clear, standardized guidelines, navigating the regulatory landscape can become overwhelming for professionals tasked with ensuring compliance.

Members posited that professional bodies such as OACETT can help ensure that engineering technicians and technologists are informed of the latest standards and guidelines by establishing guidance documents, such as this document, that can be circulated to members and external stakeholders.

#### **4. Approaches to address the changing AI landscape for Engineering Technicians and Technologists**

As highlighted throughout the AI Summit, the profession of engineering and applied science technology is on the cusp of a significant transformation, driven by the rapid advancement and integration of AI technologies. This evolution will not only reshape workflows but also introduce new opportunities and challenges for professionals in the field. To navigate this changing landscape effectively and aligned with the three topics of the AI Summit, some key approaches members could consider include: (a) seeking opportunities in a changing labour landscape; (b) navigating the ethical dimensions of AI implementation; and (c) developing awareness of AI regulatory developments and emerging international standards.

##### *(a) Seeking opportunities in a changing labour landscape*

AI is transforming the labour market by eliminating and creating new opportunities simultaneously. As highlighted in Section 3.1(a), AI can augment and enhance the work of engineering technicians and technologists by automating routine tasks, improving efficiency and accuracy, and enabling new solutions and possibilities. OACETT members should use this to their advantage by identifying and adopting AI tools and systems that can help perform tasks better, faster, or more creatively. OACETT members can also experiment with AI to generate new ideas, insights, or designs, or to solve complex or novel problems. While employees should look to integrate AI into their tasks, managers can also encourage employees to utilize AI and begin to alter roles by integrating AI into workflows.

Further, to remain competitive in the rapidly evolving job market shaped by AI, OACETT members are encouraged to actively seek opportunities for upskilling as well as learn how to work with AI. As discussed in Section 3.1(b), an AI-transformed labour market will prioritize skills such as design principles (UI/UX), prompt engineering, database modeling, problem-solving, and critical thinking. Upskilling ensures that members can adapt to new tools, technologies, and methodologies that leverage AI, enabling them to excel in their roles and contribute to innovative solutions.

As AI becomes more ubiquitous in engineering technicians' and technologists' workflows, it is important to be mindful of the limitations and risks of AI, such that AI is used responsibly. This is why staying up to date on AI regulatory developments and ensuring familiarity with AI ethical principles is imperative for responsible AI development, deployment and use.

##### *(b) Navigating the ethical dimensions of AI implementation*

AI ethical principles and frameworks serve as valuable tools for engineering technicians and technologists, helping them navigate the difficult ethical dilemmas posed by AI while balancing the necessity for both innovation and safeguarding human rights.

The core AI ethical principles that are important for engineering technicians and technologists to be familiar with include:

- **Accountability.** Engineering technicians and technologists should implement a clear risk management framework that is proportionate to the scale and impact of their activities. This includes documenting decision-making processes and maintaining records of actions pertaining to the development, deployment and use of AI systems.
- **Safety.** Engineering technicians and technologists should implement measures to ensure the safety of AI systems, including the performance of comprehensive risk assessments of reasonably foreseeable potential adverse impacts, the implementation of proportionate measures to mitigate risks of harm and making available guidance on appropriate system usage.
- **Fairness and Equity.** When developing, deploying or using an AI system, engineering technicians and technologists should assess and curate datasets used for training to manage data quality and potential biases. Further, engineering technicians and technologists should also commit to implementing diverse testing methods and measures to assess and mitigate risk of biased output prior to the release of the AI system.
- **Transparency.** Engineering technicians and technologists should ensure clear documentation on how the AI system functions, including system capabilities and limitations and the training data it uses.
- **Human oversight and monitoring.** AI systems should be designed to allow for human oversight and intervention. This means that there should be mechanisms in place for humans to monitor AI operations, intervene when necessary, and override decisions made by the AI system if required. Further, engineering technicians and technologists should ensure that a database of reported incidents that occur after deployment is maintained.
- **Validity and robustness.** Engineering technicians and technologists should ensure AI systems are rigorously tested such that they perform reliably and accurately under a variety of conditions. This includes employing adversarial testing (i.e., red teaming) to identify vulnerabilities, performing an assessment of cyber-security risks and implementing proportionate measures to mitigate risks.
- **Privacy.** AI systems should be designed with privacy and data protection in mind. This involves implementing measures to safeguard personal data, ensuring compliance with relevant data protection regulations (such as The [Personal Information Protection and Electronic Documents Act](#) ), and being transparent about data usage practices.

These principles are often put in practice through an “ethical-by-design” approach, discussed in Section 3.2(b).

Further, built upon these principles are ethical frameworks which provide more concrete guidance for engineering technicians and technologists as they deploy, develop and use AI. Some of these frameworks were raised throughout the AI Summit, and discussed in Section

3.2(a), such as the [IEEE Ethically Aligned Design](#), [The Montreal Declaration for Responsible AI](#) and the [Asilomar AI Principles](#). OACETT further encourages members to familiarize themselves with the [Digital Governance Council Standard of Ethical Design for AI](#) which draws from similar core AI ethical principles.

*(c) Developing awareness of AI regulatory developments and emerging international standards*

OACETT members should develop some awareness of ongoing AI regulatory developments, as engineering technicians and technologists are ultimately responsible for operationalizing regulatory guidance. In Canada, the regulatory landscape for AI is still in flux, characterized by a patchwork of draft regulations, voluntary safeguards, and guidelines at both the federal and provincial levels. As discussed in Section 3.3, none of these proposed regulations have been formalized into clear requirements, creating uncertainty for professionals navigating the development, deployment and use of AI.

Amidst this legal uncertainty, OACETT members can look to emerging international governance standards as proxies for future regulation. Key governance standards include a plethora of ISO standards that have been developed with the participation of the Standards Council of Canada including, [ISO/IEC 42001:2023 Artificial Intelligence-Management system](#) and others including, [NIST's AI Risk Management Framework](#), the [Digital Governance Council's Ethical Use of Artificial Intelligence by Small and Medium Organizations \(CAN/CIOSC 101:2019\)](#), the [Digital Governance Council's Baseline Requirements for Vendors Offering AI/ML Lifecycle Solutions to Financial Institutions \(DGSI/WA 126: 2023\)](#) and [ISED's Voluntary Code of Conduct for AI](#). These frameworks emphasize consistent themes, which are likely to underpin both Canadian regulations and broader international standards.

The key themes in these frameworks include:

- **Risk-Based Approach.** AI systems should be assessed and categorized according to their potential impact, with higher-risk applications subject to stricter oversight and safeguards.
- **Governance and Accountability.** Clear lines of responsibility, comprehensive documentation, and transparency are essential for ensuring trust and proper management of AI systems.
- **Human Oversight.** AI should be designed to enhance, not replace, human decision-making, particularly in applications that involve safety, equity, or significant societal impacts.
- **Ethical Design.** Bias prevention, fairness, and inclusivity must be central to the development and implementation of AI systems to ensure they serve all individuals equitably.

By aligning their practices with these emerging standards, OACETT members can navigate the current regulatory ambiguity with confidence and contribute to the development of safe, transparent, and socially beneficial AI systems.

## **5. Recommendations to Support Engineering Technicians and Technologists through the AI Transformation**

### **5.1. Recommendations for the Government of Ontario**

To maintain Ontario's global leadership in AI and emerging technologies the Government of Ontario should seek to support engineering technicians and technologists as the profession transitions to reflect the changing technological landscape. This includes: (a) funding for upskilling and AI innovation; (b) ensuring engineering technicians and technologists have adequate representation in regulatory discussions; (c) providing clear, workable and proportionate regulatory guidance; and (d) fostering AI literacy through enhanced college curricula.

#### *(a) Funding for upskilling and AI innovation*

The Government of Ontario can leverage government funding and grant programs to help engineering technicians and technologists enhance their skills and adapt to current technological demands. This could include providing incentives for companies to innovate with AI or offering financial support to post-secondary institutions to develop AI focused courses and curriculum. These financial supports lead to growth in Ontario's AI ecosystem by incentivizing AI development, deployment and use, preparing the future workforce for AI focused jobs, and reducing financial barriers for both large and small organizations looking to innovate.

#### *(b) Adequate representation in AI regulatory discussions and working groups*

The Government of Ontario should ensure engineering technicians and technologists have a seat at the table when making regulatory decisions, especially regarding any forthcoming AI regulations. Engineering technicians and technologists possess essential, firsthand insights into the practical applications and challenges associated with AI and other emerging technologies. Including them in regulatory discussions and working groups helps to create regulation that protects public interests while also fosters innovation and growth in the AI field.

#### *(c) Provide clear, workable and proportionate regulatory guidance*

Clear, workable, and proportionate regulatory guidance is essential for spurring growth and innovation within the AI field and labour market. The Government of Ontario should make guidance clear for engineering technicians and technologists to reduce friction and uncertainty when engineering technicians and technologists look to integrate the guidance into their workflows. Where there is legal uncertainty, the government could create regulatory safe harbours that would offer protection against uncertain legal risks, encouraging more investment and participation in developing the AI field in Ontario.

*(d) AI Curriculum in College programs*

AI curriculum should be introduced into college programs and embedded in each engineering technology and applied science discipline. To prepare the next generation of engineering technicians and technologists for a future where AI plays an integral role across industries, Ontario's colleges should embed AI-focused coursework within each engineering technology curriculum that would ensure that all graduates have a foundational understanding of AI. Such curriculum enhancements would not only improve career readiness but also ensure Ontario's workforce remains competitive and versatile in a technology-driven world.

## **5.2. Future OACETT Actions**

In tandem, OACETT will continue to work with its members to fully support the profession as it shifts to incorporate the changing landscape. This may include: (a) developing CPD courses on AI and facilitating upskilling workshops for critical AI skills; (b) promoting the advancement of AI and AI regulation; (c) promoting diversity in the field; and (d) updating the Code of Ethics and Rules of Professional Conduct Guidelines to encompass AI development, deployment and use.

*(a) Develop CPD courses on AI and facilitate upskilling workshops for critical AI skills*

OACETT will explore equipping its members with the knowledge and skills needed to thrive in an AI-driven future by offering AI focused CPD courses and upskilling workshops that prioritize the skills highlighted in Section 3.2(b). Courses could include the potential creation of an "AI in Tech" designation to recognize members who have developed specialized expertise in applying AI responsibly. Additionally, OACETT could explore opportunities to facilitate a culture of innovation by sponsoring or facilitating AI-focused hackathons that could offer members hands-on opportunities to hone their skills in relation to AI development, deployment and use. These initiatives may include establishing learning partnerships with industry leaders.

*(b) Promote the advancement of AI and AI regulation*

OACETT will strive to promote the advancement of AI and balanced AI regulation. OACETT hopes to work closely with government bodies, including but not limited to the Ontario Government, to ensure that policies protect public interests while also foster innovation through clear, risk-based, interoperable and workable regulatory frameworks and guidance. Collaboration with government bodies will allow OACETT to advocate for regulatory frameworks that are balanced, implementable, and aligned with industry realities.

At the same time, OACETT will strive to provide its members with ongoing access to AI-related resources.

*(c) Promote greater diversity in the field*

To address bias in AI systems and promote more equitable outcomes, OACETT recognizes the importance of fostering diversity among those developing, deploying and using these

technologies. A diverse subset of professionals brings a broader range of perspectives and experiences to AI systems, reducing the risk of biased or inequitable outcomes. OACETT will strive to utilize its Diversity, Equity and Inclusion Committee to further enhance this effort.

*(d) Update the Code of Ethics and Rules of Professional Conduct Guidelines to encompass AI development, deployment and use.*

OACETT will explore undertaking efforts to review and update its [Code of Ethics and Rules of Professional Conduct](#) (the “Code of Ethics”) as it applies to AI. To ensure members understand how to apply the Code of Ethics to AI use-cases, a supplemental guidance document may be prepared. This document would assist members with navigating the ethical and professional complexities of working with AI to ensure they know how to comply with their professional responsibilities.<sup>12</sup>

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<sup>12</sup> On November 22-23, 2024, the Board of Directors approved the following addition to the Rules of Professional Conduct as recommended by the Registration and Professional Practice Committee: “Members must ensure Artificial Intelligence (AI) tools are being used in an ethical and responsible manner, staying accountable for their results, protecting against bias, ensuring privacy, and committing to ongoing competency in AI technologies, while meeting the same expectations with respect to safety of the public.”

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