Views of Canadians on Artificial Intelligence

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Executive Summary

1. Background and objectives

The Public Awareness Working Group was launched June 12th, 2020 as a working group of the Government of Canada's Advisory Council on AI. With a mandate to examine avenues to boost public awareness and foster trust in AI, the group is undertaking a three-track plan of work:

1) Launch a national survey to capture and assess the feelings and interests of Canadians towards AI and AI systems;
2) Lead online deliberations in model established by the Montreal Declaration for the Responsible Development of AI; and
3) Produce a co-developed final report integrating the information gathered in parts one and two.

The culmination of this work will be presented to the AI Advisory Council in a final report that will provide evidence-based recommendations for sustained public awareness efforts undertaken by the Government of Canada moving forward.

The following report focuses on the findings of the pan-Canadian survey designed to capture and assess the feelings and interests of Canadians towards AI and AI systems.

The findings are based on the results of a 12-minute online survey, conducted by Nanos research, designed to be reflective of the Canadian population. The survey had three objectives:

1) Assessing AI Literacy – to understand familiarity with AI in Canada, including its use and impacts;

2) Identifying areas of 'hope' in relation to AI; and,

3) Identifying areas of 'fear' in relation to AI.

The intent of the latter two objectives was to build on areas with little consensus to develop case studies for the AI Deliberations (consultations) that followed this research. The AI Deliberations were conducted online and were open to all Canadians and Canadian residents, over 18 years, in April 2021.

2. Methodology

Nanos Research was retained by Innovation, Science and Economic Development Canada (ISEDC) to conduct a quantitative survey, reflective of the Canadian population. In this survey, 1,222 Canadians, 18 years of age or older, drawn from a non-probability panel, were surveyed between November 23rd to 24th, 2020.

The sample captured the demographics of gender (limited to male/female binary), age, and geography. The results were statistically weighted by age, gender and region using Statistics Canada Census information. In addition to age, gender, and geography, demographic information on education, income and ethnocultural identity was collected, however the responses were not achieved in sufficient numbers to impact the final results.

The survey achieved the following distributions:

Demographic Group	Actual Unweighted	Actual Weighted*
Men	597	588
Women	623	612
18-34 years	382	330
35-54 years	478	409
55+ years	362	463
Atlantic	124	80
Quebec	304	281
Ontario	370	461
Saskatchewan/Manitoba	120	81
Alberta	121	139
British Columbia	183	160
Total Population	*1222*	*1202*

* Results are weighted by age and gender to the 2016 Census data, and the sample is geographically stratified to ensure a distribution across all regions of Canada.

As an online survey is a non-probability sample, no margin of sampling error is reported. More information about the methodology for this survey is included in Appendix A. A full description of the sample distribution across all demographics (age, gender, geography, education, income, and ethnocultural identity) is also included in Appendix A.

3. Cost of research

The cost of this research was $ 24,374.10 (HST included)

4. Key findings

The findings of this research can be summarized as follows:

Familiarity with AI and its capabilities

- In terms of self-reported AI literacy, almost three quarters of surveyed Canadians identified themselves as being familiar to somewhat familiar with AI.

- Canadians are two and a half times more likely to say they are familiar or somewhat familiar with AI than to say that they are somewhat not familiar or not familiar.

- Self-reported familiarity was highest amongst men, younger adults aged 18-34, and residents of Ontario.

- Canadians most frequently say they heard of AI through the news and internet, with only 4.9% and 4.6% of respondents reporting having heard of AI through school or work, respectively.

- On average, Canadians correctly distinguish whether a technology uses AI 4.2 out of six times.

- On average Canadians can correctly identify whether AI can perform a task for 7.0 out of 11 assessed capabilities.

- When asked to assess the current capabilities of AI, Canadians are—correctly so—least likely to think that AI can feel emotion and behave as humans do in social settings.

- Canadians most frequently rate the problem-solving capabilities of AI as very good or good, while rating its ability to make ethical decisions in a particular context as poor or very poor.

- Canadians most frequently think that their browsing history, web activity and Google data are being collected by AI, followed by personal information including age and face, as well as their shopping habits and purchase history.

Future impact of AI and views on its development

- Canadians are nearly seven times more likely to say that the impact of AI on Canada will be very positive rather than very negative, while they are four times more likely to say that the impact on themselves will be very positive rather than very negative.

- Residents of Saskatchewan and Manitoba, women and older Canadians give lower positivity ratings to the impact of AI on them personally in the next five years.

- Similarly, residents of Saskatchewan and Manitoba are also less likely to rate the impact of AI on Canada as positive compared with other respondents.

- A strong majority of Canadians say human involvement is required in a variety of aspects related to AI development.

- Nearly nine in ten Canadians think human involvement is important for AI enabled systems and that a computer's decision-making ability is limited by how they are programmed; indeed, more than two in three think that AI has the potential to cause harm to society.

- When asked to offer open-ended responses identifying a future use of AI, Canadians most frequently think AI will be used to assist in automated, repetitive work, followed by work conducted in the medical field, including diagnostics, and, finally, to assist in self driving vehicles.

Perception of the Impact of AI on life in Canada

- Canadians most frequently say they expect the impact of AI on all aspects of life in Canada will be positive. They are most likely to express concern about the impact of AI

on law enforcement and labour.

- When asked to consider the impact of AI over the next five years, most Canadians expect AI will have a positive impact on the manufacturing, transportation and banking sectors. In contrast, few believe that AI will have a positive impact on arts and culture, or on law enforcement sectors.

- Again, looking to the next five years, Canadians most frequently express concern about the impact of AI on law enforcement and the labour force sectors, while most frequently indicating they are not concerned about the impact of AI on arts and culture, agriculture and manufacturing sectors.
- Across all sectors assessed in the survey, Canadians did not identify a single field in which the perceived future impact of AI would be overall negative.

  Canadians' attribution of the lowest positive score to the impact on arts and culture sector, combined with their lack of concern about a negative impact on this sector, poses an interesting dilemma that will be explored in the public deliberations following this research.

Future views on AI in Canada

- Canadians are most frequently hopeful that AI will make life easier and improve productivity and are most frequently concerned about AI causing job losses.

- Canadians most frequently say they are hopeful that AI will make life easier by improving productivity and reducing errors, followed by generating improvements in the medical field and health.

- Canadians are most concerned about job loss and AI replacing humans, followed by privacy, privacy security and hacking and losing control of the AI and malfunction.

- Canadians most frequently think governments and academic organizations should take the lead on developing AI solutions.

- Overwhelmingly, when prompted, respondents to the survey identified an interest in learning more about AI.

Political neutrality certification

I hereby certify as a senior officer of Nanos Research that the deliverables fully comply with the Government of Canada political neutrality requirements outlined in the Communications Policy of the Government of Canada, and Procedures for Planning and Contracting Public Opinion Research. Specifically, the deliverables do not include information on electoral voting intentions, political party preferences, standings with the electorate, or ratings of the performance of a political party or its leaders.

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Introduction

1. Background

From smartphone applications that can understand human speech to self-driving cars, artificial intelligence (AI) is changing the ways in which people interact with each other, live and work. AI has the potential to help us solve some of the most difficult challenges we face, create jobs, increase growth across all industries and improve the lives of all Canadians.

The Government of Canada Advisory Council on Artificial Intelligence's mandate is to help ensure Canadians are prepared for upcoming technological changes that will have societal and economic effects, therefore propelling a push to fill knowledge gaps on AI, informed digital decision-making, and uphold values of inclusivity and diversity so that all Canadians can participate in and benefit from the digital economy. In support of this mandate, in early 2020, the Council launched the Public Awareness Working Group with the responsibility of engaging Canadians in a dialogue on Artificial Intelligence (AI) and identifying methods for sustained and effective public awareness. To that end, they undertook the work of conducting a pan-Canadian survey to baseline Canadians' AI Literacy, as well as their current impressions of artificial intelligence, (both positive and negative) in their daily lives, health and work.

Beyond providing a snapshot of Canadian's perceptions of AI and its impacts on their lives, this research, will help inform the next steps of the Advisory Council's deliberations on AI and will help develop future policy and programming related to the strategic use and development of AI in Canadian society, health, education, training, support for business, fears, concerns and regulations.

2. Research rationale and objectives

This study was designed to gather current public opinion on the public perception of AI in Canada. The research will be used to support the AI Advisory Council's mandate which is to advise the Government of Canada on how "best to build on Canada's AI strengths, identify opportunities to create economic growth that benefits all Canadians and ensure that AI advancements reflect Canadian values". To establish an evidence-based standard of the current public perception of AI and its development, with the goal of better grounding the Canadian discourse in a measured understanding of the technology, its potential uses, and its associated risks.

The current study examined three main themes:

1) *Assessing AI Literacy:* Establish a baseline of Canadians' familiarity with AI, its capabilities, limitations and uses, as well as its potential, strengths and limitations. Concepts tested include the use of AI in human design and machine learning and basic digital literacy.

2) *Assessing Perceptions on AI's Potential, Areas of Hope and Opportunity:* Identify the areas in which Canadians see the greatest potential and benefit from AI technologies – to them personally, in their lives and work, and to society as a whole.

3) *Identifying Areas of Concern, Fear or Challenge:* Identify issues and areas of concern or fear Canadians may hold related to AI, including issues affecting related to privacy, identity, security and work.

Through conducting this research, the activities of the Public Awareness Working Group serve to help fulfill the Government of Canada's international and national commitments. This research contributes to Canada's commitment to advance the goals laid out in the Canada-France Statement on Artificial Intelligence— that is, of fostering innovation while building trust in digital societies and economies and promoting a human-centric approach to AI grounded in human rights, inclusion, diversity, transparency, and openness, sustainability and economic growth.

3. Report

The report begins with an executive summary outlining key findings and conclusions, followed by a detailed analysis of the results. A detailed description of the methodology used to conduct this research is presented in Appendix A. The research instruments are presented in Appendix B.

Detailed findings

For the purpose of the survey, AI was defined for participants as follows:

"AI is the set of computer techniques that enable a machine (e.g. a computer or mobile telephone) to perform tasks that typically require intelligence, such as reasoning or learning."

Respondents' answers to the following questions were measured against an answer key, presented in full in pre-established Appendix B of this report.

I.   Assessment of Canadian AI literacy
1. Familiarity with AI and its capabilities

General familiarity

In terms of self-reported AI Literacy, almost three-quarters of surveyed Canadians (73%) identified themselves as familiar to somewhat familiar with AI. When asked to rate their familiarity with AI, self-reported familiarity was highest amongst men, younger individuals aged 18 to 34, and residents of Ontario. Amongst assessed demographics, respondents from Quebec reported the lowest familiarity at 55.3%, identifying themselves as familiar or somewhat familiar with AI.

Familiarity with Artificial Intelligence

*Demographic Group	Level of Self-assessed familiarity (%) *			
	Familiar	Somewhat familiar	Somewhat not familiar	Not familiar
Total Population (n= 1202)	21.1	51.4	19.5	8.0
Men (n=588)	28.0	51.6	16.1	4.3
Women (n=612)	14.5	51.2	22.8	11.5
18-34 years (n=330)	33.4	47.0	13.3	6.3
35-54 years (n=409)	20.1	58.4	15.7	5.7
55+ years (n=463)	13.2	48.3	27.3	11.1
Atlantic (n=80)	18.2	54.4	17.9	9.4
Quebec (n=281)	16.8	38.5	31.2	13.4
Ontario (n=461)	23.4	57.8	13.5	5.3
Saskatchewan/Manitoba (n=81)	21.0	54.2	18.0	6.8
Alberta (n=139)	21.7	54.3	16.5	7.5
British Columbia (n=160)	23.1	50.2	20.4	6.3

Q1. Are you familiar, somewhat familiar, somewhat not familiar or not familiar with AI?

*Throughout the report, unless otherwise stated, data are weighted to the true population proportion.
**Throughout the report, unless otherwise stated, numbers may not add up to 100 dues to rounding.

Those who reported that they were familiar or somewhat familiar with AI, were directed to an open-ended response to assess where they heard about AI. When asked to identify where they received their initial exposure to learning about AI, respondents most frequently said they learned of AI through the news (20.7%), internet (19.5%), and television/documentaries programming (13.3%), with only 4.9% and 4.6% of respondents reporting having heard of AI through school or work respectively.

Where Canadians Learned About AI

	Response Category	Percent Frequency (n=868)
Top Responses	News	20.7
	Internet	19.5
	Television/Documentaries	13.3
	Movies/Science	8.9
	Through AI Applications	5.8
	School	4.9
	Work	4.6

Q2. Where did you hear about AI? [OPEN]

Assessing AI's current capabilities

The absence of robust exposure to AI through education or work-training programs does not mean the information they are receiving has left Canadians in the dark on current AI applications.

Promisingly, the self-assessed familiarity seems to reflect a growing knowledge of AI and its capabilities as, on average, Canadians were successful at correctly identifying whether AI can perform a task for 7 of 11 tested capabilities.

Following the provision of the common definition of AI employed for this survey, respondents were asked to check all that apply from the following list of 11 proposed 'capabilities' that AI is able to perform at this time:

- Learn from data to increase understanding **(69%)**
- Perform video surveillance **(68%)**
- Interpret speech **(66%)**
- Play games **(65%)**
- Interpret images **(61%)**
- Replace humans doing dangerous tasks **(58%)**
- Help solve business problems **(54%)**
- Think logically **(43%)**
- Compose music **(41%)**
- Behave as humans do in social settings **(18%)**
- Feel emotion **(5%)**

With the exception of behaving like a human in social settings and feeling emotion, AI is currently capable of performing all of the tasks to some degree. Encouragingly, Canadians were least likely to falsely identify these two tasks as within AI's current skillset.

Furthermore, Canadian's were also able to correctly distinguish whether a technology uses AI an average of 4.2 out of six times amongst the below list of technologies—all of which are AI-enabled:

- Virtual assistant (i.e. Siri, Alexa, etc.) **(80%)**
- Online virtual assistant (i.e. Chat bot, etc.) **(73%)**
- Image/search recognition **(67%)**
- Predictive search terms (i.e. predictions of what you are looking for based on popular search terms, etc.) **(62%)**
- Recommender systems (i.e. online shopping, Netflix, etc.) **(60%)**
- Email spam filters **(52%)**

Of the total respondents (n=1218), only 11% selected 'unsure' with an additional 1% selecting that none of the presented technologies use AI. Residents of Quebec, men, and those aged 55 years and older most frequently correctly identified that the technologies use AI.

Across all assessed demographics, when Canadians were asked to assess prompts specifically regarding the capabilities of AI to solve different problem-types, Canadians most frequently rated the ability of AI to recognize the differences between images as very good or good, while rating AI's ability to make ethical decisions in a particular context as poor or very poor.

AI problem solving Capabilities

Assessed competency	*Frequency in percentages of skillset selection					
	Very good	Good	Average	Poor	Very poor	Unsure
Recognizing the differences between images	30.5	35.7	20.8	3.1	1.6	8.3
Making decisions in a rapidly changing environment	12.6	32.5	28.4	9.4	4.1	12.9
Making an ethical decision in a particular context	4.5	14.4	26.2	20.9	18.4	15.6
Identifying the influence of human bias	6.8	20.8	29.5	15.7	9.4	17.8

Q8. For the list of possible problems below, please indicate whether you believe the problem is one where AI does a very good, good, average, poor or very poor job. [RANDOMIZE]

However, one example of competency with which Canadian's seemed to struggle is with whether AI has the ability to identify the influence of human bias. Only one in four respondents correctly identified AI's capability of identifying human bias as very poor or poor, with 28% of responses selecting the AI's ability to do so as being very good or good. This may stem from a lack of clarity surrounding the use of the term bias, the source of the bias, and/or the task the respondent is assuming the AI is completing. For example, popular reporting has identified AI as a possible solution for mitigating bias in job candidate assessments which may create a misconception or confusion around AI mitigating versus identifying bias.

Interestingly, Canadians overall demonstrated the least confidence in assessing the role and operationalization of ethics as it relates to the use and development of AI technologies. When provided with the prompt, "people who develop AI do so in an ethical manner", while 48% of respondents agreed or strongly agreed with this statement, 29% of those surveyed identified that they were "unsure".

This gap in comfort with assessing questions of ethics is further reinforced when comparing the results to the prompt, "Computers can be programmed to make ethical decisions". When asked to assess their level of agreement with a series of statements on the capabilities of AI, 42% of respondents replied to this prompt in the affirmative, with 38% and 19% responding negatively and "unsure", respectively.

Agreement with statements related to AI

Statement of Capabilities	Frequency in percentages of selection				
	Agree	Somewhat agree	Somewhat disagree	Disagree	Unsure
Human involvement is important for AI-enabled systems	47.4	41.0	3.5	1.1	7.1
Computers` decision-making ability is limited by how they are programmed	43.1	43.8	4.9	2.1	6.1
AI has the potential to cause harm to society	25.3	43.8	12.3	4.8	13.8
People who develop AI do so in an ethical manner	11.7	36.5	15.7	7.4	28.7
Computers can be programmed to make ethical decisions	10.0	32.3	21.3	17.4	19.0
Computers can think just like humans do	5.0	21.2	25.9	39.8	8.1

Q11. Do you agree, somewhat agree, somewhat disagree or disagree with each of the following? [RANDOMIZE]

Of the six prompts assessing the veracity of statements about AI's capabilities, the two examples referring to ethics produced the highest proportion of "unsure" responses, as well as the most moderate splits between proportion of Canadians rating the statements positively versus negatively. This may reflect a gap in the popular literacy around ethics and how to define or assess ethics as it pertains to AI development and applications.

Yet, when comparing consolidated response averages, respondents on average placed greater confidence in the human developers of AI to act ethically than they did in the ability for computers to make ethical decisions. This gap was most pronounced amongst residents of Saskatchewan and Manitoba, women, and those 18 to 34 years of age.

Agreement with statements related to AI - Ethics statements

Demographic Assessed	Frequency in percentages of selection				
	Agree	Somewhat agree	Somewhat disagree	Disagree	Unsure
People who develop AI do so in an ethical manner					
Total population (n=1198)	**11.7**	**36.5**	**15.7**	**7.4**	**28.7**
Men (n=586)	12.7	41.4	15.5	7.3	23.1
Women (n=611)	10.7	31.9	15.7	7.5	34.2
18-34 years (n=329)	13.6	41.9	14.9	7.4	22.1
35-54 years (n=409)	12.3	37.5	16.1	8.8	25.3
55+ years (n=460)	9.8	31.7	15.8	6.5	36.5
Atlantic (n=80)	17.0	30.8	13.2	6.2	32.7
Quebec (280)	12.4	40.3	12.5	4.7	30.1
Ontario (n=460)	10.2	35.9	18.2	9.7	26.2
Saskatchewan/Manitoba (n=81)	9.5	38.4	16.5	8.9	26.7
Alberta (n=138)	11.6	38.9	18.9	6.0	24.6
British Columbia (n=160)	13.4	31.3	12.3	6.7	36.3
Computers can be programmed to make ethical decisions					
Total population (n=1197)	**10.0**	**32.3**	**21.3**	**17.4**	**19.0**
Men (n=585)	12.3	37.3	21.6	15.3	13.6
Women (n=610)	8.0	27.3	21.0	19.5	24.2
18-34 years (n=328)	11.6	35.2	26.2	12.9	14.2
35-54 years (n=409)	12.1	32.3	19.8	16.1	19.7
55+ years (n=460)	7.0	30.4	19.1	21.7	21.8
Atlantic (n=79)	12.3	33.4	19.3	17.8	17.2
Quebec (n=280)	10.0	35.7	17.8	15.7	20.7
Ontario (n=459)	9.0	34.6	22.1	17.5	16.8
Saskatchewan/Manitoba (n=81)	7.8	25.8	21.2	23.1	22.0
Alberta (n=138)	10.8	30.6	24.5	17.8	16.3
British Columbia (n=160)	12.3	24.0	23.1	16.5	24.1

Q11. Do you agree, somewhat agree, somewhat disagree or disagree with each of the following? [RANDOMIZE]

Data literacy

Finally, turning to the broader topic of data literacy, when provided an open-ended prompt to identify where Canadians believe their data is being collected, respondents most frequently believe that their browsing history, web activity and Google data are being collected by AI, followed by personal information including age and face, as well as their shopping habits and purchase history.

Data collected during daily activities

	Response Category	Percent Frequency (n=1121)
Top Responses	Browsing history, web activity, and Google data	36.9
	Personal information like age, face	15.5
	Shopping habits/purchase history	14.8
	Location	5.8
	Nothing	3.1
	Everything is being collected	2.9
	Unsure	11.2

Q20. As you may know, AI uses data to learn in order to make decisions and recommendations. Thinking about your daily activities, what data are most commonly collected about you? [Open]

II. Canadian perceptions of Artificial Intelligence
1. Future impact of AI and views on its development

Five-year outlook

Reporting on how they perceive the impact of AI overall, Canadians are nearly seven times more likely to say that the impact of AI on Canada as a whole will be very positive rather than very negative, while they are four times more likely to say that the impact on themselves will be very positive rather than very negative. In assessing the perceptions Canadians have of AI and how it will impact their daily lives, respondents were asked to consider questions in both the abstract "future" of AI development, as well as in a defined medium-term outlook of five years in the future.

Impact of AI over the next five years

Subject of assessment	Assessment of impact (scale of 0-10)			
	Very positive (7-10)	Neutral (4-6)	Very negative (0-3	Unsure
Canada as a whole	47.1	34.4	6.7	11.8
You personally	38.6	36.3	10.1	14.9

Q5. On a scale from 0, very negative to 10, very positive, how would you rate the impact of AI on the following in the next five years? [RANDOMIZE]

Breaking down the five-year outlook by demographic, when asked to reflect on the outlook of the impact AI will have on both Canada and Canadians, residents of Saskatchewan and Manitoba, women, and older Canadians gave marginally lower positivity ratings to the impact of AI on them personally. Of these groups, only residents of Saskatchewan and Manitoba are less

likely to rate the impact of AI on Canada as positive. However, these deviations between the lower scoring demographics and the mean ratings were by a point or less on a 10-point scale.

Impact of AI over the next five years- by demographic

Demographic Assessed	Assessment of impact (scale of 0-10)			
	Very positive (7-10)	Neutral (4-6)	Very negative (0-3)	Unsure
Canada as a whole				
Total population (n=1194)	**47.1**	**34.4**	**6.7**	**11.8**
Men (n=585)	52.6	33.2	5.5	8.8
Women (n=607)	41.6	35.5	8.1	14.7
18-34 years (n=329)	54.0	33.2	5.7	7.2
35-54 years (n=407)	46.2	35.5	6.9	11.4
55+ years (n=459)	42.9	34.1	7.5	15.5
Atlantic (n=79)	41.1	37.3	6.1	15.6
Quebec (n=280)	59.8	27.7	6.7	12.2
Ontario (n=460)	45.3	38.9	6.5	9.1
Saskatchewan/Manitoba (n=81)	37.9	36.0	12.3	13.6
Alberta (n=136)	49.7	32.0	6.4	12.0
British Columbia (n=158)	46.5	32.1	5.6	15.7
You personally				
Total population (n=1180)	**38.6**	**36.3**	**10.1**	**14.9**
Men (n=577)	44.4	37.5	9.0	9.3
Women (n=601)	33.1	35.3	11.2	20.4
18-34 years (n=325)	47.3	34.0	8.4	10.2
35-54 years (n=405)	39.6	38.2	9.0	13.4
55+ years (n=449)	31.6	36.2	13.4	19.8
Atlantic (n=77)	34.1	45.1	4.0	16.9
Quebec (n=280)	43.7	34.3	7.6	14.5
Ontario (n=451)	37.8	36.2	12.7	13.3
Saskatchewan/Manitoba (n=78)	27.8	38.6	12.1	21.5
Alberta (n=138)	41.9	36.5	9.5	12.0
British Columbia (n=156)	37.0	34.4	9.6	19.0

Q5. On a scale from 0, very negative to 10, very positive, how would you rate the impact of AI on the following in the next five years? [RANDOMIZE]

Views on AI development

When asked to identify a general future use of AI, Canadians most frequently identified that AI will likely be used in automated, repetitive work (particularly in the home, in customer service

and in factory work), followed by the medical field, including diagnostics, and in self-driving vehicles.

Possible future uses of AI

	Response Category	Percent Frequency (n=980)
Top Responses	Automating repetitive jobs and tasks (at home, customer service, factory work)	17.3
	Medical field/diagnostics	14.0
	Self-driving vehicles	13.0
	Predictive data analysis and forecasting for research and decision making	9.2
	Performing dangerous work, including military and space exploration	7.6
	Replacing humans/take over/do everything	6.1
	Unsure	9.5

Q4. If you can, please describe one possible future use of AI? [OPEN]

The results are not surprising given many of the current conscious consumer interactions with AI-enabled devices occur through customer service bots (chat-bots) and smart-devices, it is likely that these uses are front of mind for respondents when asked to consider where AI may be used in the general sense. And, when taking into consideration the vectors through which Canadian's report learning about AI, the elevation of awareness in news media and popular internet coverage of AI applications with respect to automating repetitive work, medical applications and self-driving vehicles, the reflection of these popular applications in the open-ended responses by those surveyed appears to have some correlation.

Human involvement in AI

Reflecting on the nature of where humans should play a role in the development and deployment of AI, a strong majority of Canadians say human involvement is required in a variety of aspects related to AI development. Close to nine in ten Canadians indicated they believe humans have a role in all steps of AI development; the results hold consistent across all assessed demographics when asked to select between options of human involvement being required, not required, or an unsure response.

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Requirement of human involvement in AI

Subject of assessment	Percent frequency of response selection		
	Required	Not required	Unsure
Humans have a role in designing AI	90.8	3.5	5.6
Humans have a role in testing and validating AI	89.4	4.2	6.4
Humans have a role in building AI	88.9	4.9	6.1

Q12. For each of the following do you believe that human involvement is required or not required?

2. Perception of the impact of AI on life in Canada- five-year outlook

Perceived assessment of impact of AI on aspects of life in Canada

Asked to look at the development of AI over the next five years, Canadians most frequently predicted AI having a positive impact on the manufacturing, transportation and banking sectors, and allocated the lowest positive impact scores to the arts and culture and law enforcement sectors. Of interesting note, while the overall positive impact scores for the latter two sectors were the lowest amongst those assessed, they not only did not fall below a "neutral" score for assessed impact (4-6 on a scale of 10), but included a significant shift towards respondents identifying a "neutral" or "unsure" versus specifically negative ratings.

Impact of AI on life in Canada in the next five years

Sector Assessed	Percent frequency, Assessment of impact (scale of 0-10)			
	Positive (7-10)	Neutral (4-6)	Negative (0-3)	Unsure
Manufacturing	65.0	20.3	6.5	8.3
Transportation	55.7	26.8	7.0	10.5
Banking & finance	54.5	27.5	7.6	10.3
Health care	54.3	26.1	9.0	10.5
Agriculture	51.6	28.9	7.1	12.5
Energy & natural resources	48.9	28.5	6.0	16.7
Emergency response services	49.3	28.2	8.3	14.2
Education	48.4	30.7	9.0	11.8
Customs and border control	47.5	26.7	10.6	15.1
Retail	46.8	32.4	9.1	11.8
Community services	37.9	34.7	10.9	16.6
Media	38.3	33.9	12.1	15.8
Labour and workforce	42.0	32.7	15.6	9.8
Law enforcement	37.0	32.4	15.4	15.2
Art & culture	26.1	39.1	18.3	16.6

Q13. On a scale from 0, very negative to 10, very positive, how would you rate the impact of AI on the following aspects of life in Canada in the next five years? [RANDOMIZE]

Degree of concern regarding negative outcomes of AI on life in Canada

When asked to evaluate the same sectors based on how concerned they were about the negative impacts of AI in this space, respondents most frequently expressed concern about the impact of AI on law enforcement and the labour force sectors. Most respondents indicated they were not concerned about the impact of AI on the arts and culture, agriculture and manufacturing sectors.

Concern about outcomes of AI on aspects of life in Canada

Sector Assessed	Percent frequency, Assessment of concern (scale of 0-10)			
	Concerned (7-10)	Average (4-6)	Not concerned (0-3)	Unsure
Manufacturing	31.4	32.9	27.5	8.1
Transportation	36.3	33.9	21.8	8.1
Banking & finance	39.2	32.0	21.6	8.2
Health care	42.5	29.4	20.0	8.0
Agriculture	27.4	34.1	27.7	10.9
Energy & natural resources	32.5	32.6	24.2	10.8
Emergency response services	42.4	29.9	18.0	9.8
Education	37.8	31.6	21.2	9.3
Customs and border control	40.1	31.2	19.5	9.2
Retail	29.4	35.7	26.0	8.9
Community services	31.1	34.7	22.3	11.9
Media	33.8	33.5	22.0	10.6
Labour and workforce	45.1	31.1	16.7	7.3
Law enforcement	48.4	28.4	14.1	9.2
Art & culture	25.5	31.5	31.1	11.9

Q14. On a scale from 0, not at all concerned to 10, very concerned, how would you rate your concern about the possible negative outcomes from the use of AI in the following aspects of life in Canada? [RANDOMIZE]

That respondents gave the lowest positive score to AI's impact on the arts and culture sector, combined with the most neutral (least concerned) score, poses an interesting dilemma that warrants further exploration When proceeding to the deliberations stage of the groups work it will additionally be worth exploring to what extend the assessed levels of concern and impact of AI across different sectors stem from lack of confidence in AI applications being "market ready" within these fields. As current rates of AI adoption amongst Canadian firms are low relative to other OECD nations, the five-year timeline of the question prompt may play a role in how significantly respondents believe AI will be present in these sectors within Canada.

3. Final views on Artificial Intelligence in Canada

In exploring further into the areas Canadians self-identified hopes and concerns for AI, respondents most frequently say they are hopeful that AI will make life easier by improving productivity and reducing errors (32.9%), followed by generating improvements in the medical field and health (16.3%).

Hopes about potential impact of AI

	Response Category	Percent Frequency (n=1134)
Top Responses	Make life easier/improve productivity/reduce errors	32.9
	Improvements in medical field/health	16.3
	Nothing helpful	9.7
	Improve safety, reduce dangerous work	6.2
	Autonomous driving/transportation	5.2
	Unsure	8.6

Q17. Thinking of the potential impact of AI in the next few years, what are you most hopeful about? [OPEN]

However, despite this tentative optimism, nearly two-thirds of Canadians responded as believing that AI has the potential to cause harm to society, again recalling that a strong majority of Canadians firmly saying human involvement is required in all aspects related to AI development.

Potential for AI to cause harm to society

Démographique Group	Frequency in percentages of selection				
	Agree	Somewhat agree	Somewhat disagree	Disagree	Unsure
Total Population (n= 1196)	*25.3*	*43.8*	*12.3*	*4.8*	*13.8*
Men (n=586)	28.1	44.3	13.6	4.4	9.6
Women (n=609)	22.5	43.4	11.1	5.1	17.9
18-34 (n=327)	26.7	49.1	11.4	3.6	9.2
35-54 (n=409)	25.2	42.5	14.1	5.4	12.8
55+ (n=459)	24.4	41.3	11.4	5.0	17.9
Atlantic (n=79)	28.4	37.2	13.2	5.1	16.2
Quebec (n=279)	14.3	43.2	19.6	8.4	14.6
Ontario (n=460)	27.1	48.1	9.9	3.6	11.2
SK/MB (n=81)	23.9	48.5	14.0	1.3	12.4
Alberta (n=138)	32.8	36.0	11.6	3.3	16.3
British Columbia (n=159)	32.2	40.1	5.8	4.7	17.2

*Q11. Do you agree, somewhat agree, somewhat disagree or disagree with each of the following? **AI has the potential to cause harm to society***

To a similar open-ended prompt regarding areas of concern, Canadians identified that they are most concerned about job loss and AI replacing humans, followed by privacy, security, hacking and losing control of the AI/malfunction.

Concerns about potential impact of AI

	Response Category	Percent Frequency (n=1143)
Top Responses	Job loss/replacing humans	29.9
	Privacy and security concerns/hacking	14.4
	Losing control over AI/malfunction	11.9
	Wrong programming and inputs leading to biased decisions and ethics concerns	8.2
	Depending too much on AI, losing human touch and critical thinking	7.6
	Misuse/use for nefarious purposes	7.0
	No concerns	5.8

Q18. Thinking of the potential impact of AI in the next few years, what are you most concerned about? [OPEN]

Reflecting these concerns, Canadians most frequently think governments and academic organizations should take the lead on developing AI solutions with over half ranking these two providers as their first choice.

Who should take the lead on developing AI solutions?

Institution	Rank 1 (n=1222)	Rank 2 (n=935)	Rank 3 (n=867)	Rank 4 (n=802)
Governments	25.3	19.1	22.9	26.3
Academic organizations	25.2	29.9	23.5	11.6
Private corporations	17.5	18.4	21.6	34.7
Publicly funded organizations	11.1	32.6	31.9	19.6
No preference on who leads	9.0	-	-	5.9
Unsure	11.9	-	-	2.0

Q16. Please rank who you think should take the lead on developing AI solutions, where 1 is who you think should be the most important lead, 2 the second most important lead and so on.

Perhaps unsurprisingly, when considering the growing prominence and importance of AI in the public discourse, respondents to the survey overwhelmingly identified an interest in learning more about AI. Nearly three-quarters of Canadians surveyed stated that they were at least somewhat interested in learning more about the subject, with men and residents of Ontario reporting the highest proportion of interest.

Interest in learning more about AI

Demographic Assessed	Frequency in percentages of selection				
	Interested	Somewhat interested	Somewhat not interested	Not interested	Unsure
Total population (n=1196)	*27.1*	*46.2*	*11.1*	*10.2*	*5.4*
Men (n=586)	34.6	46.3	8.0	6.4	4.7
Women (n=608)	20.1	46.1	14.2	13.6	6.0
18-34 years (n=327)	27.0	47.8	12.7	7.0	5.6
35-54 years (n=408)	24.9	47.9	10.7	10.7	5.8
55+ years (n=461)	29.3	43.6	10.3	11.9	4.9
Atlantic (n=79)	26.1	43.2	9.4	14.5	6.8
Quebec (n=281)	23.3	46.2	14.2	11.8	4.5
Ontario (n=457)	31.5	45.5	9.3	10.1	3.6
Saskatchewan/Manitoba (n=80)	20.6	46.5	9.5	13.7	9.7
Alberta (n=139)	25.5	46.7	14.5	6.8	6.4
British Columbia (n=160)	26.7	49.2	9.6	6.4	8.2

Q19. Are you interested, somewhat interested, somewhat not interested or not interested in learning more about AI?

Appendix A: Methodology

This research consisted of an online survey of 1,222 Canadians adults 18 and over. Survey respondents were selected from registered members of an online panel, and captured standards of demographics, namely age, gender, region, education, and income. The fieldwork and surveys were conducted in both French and English. Because the samples used in online panel surveys are based on self-selection and are not a random probability sample, no formal estimates of sampling error can be calculated. Although opt-in panels are not random probability samples, online surveys can be used for general population surveys provided they are well designed and employ a large, well-maintained panel.

Sample design and weighting

Nanos Research conducted an online survey of 1,222 Canadians, aged 18 and older, who are members of an online panel. The survey was conducted from November 23 to 25, 2020. Responses were weighted by age, gender, and region to ensure the sample is reflective of these populations according to the most recently available Census information.

The survey achieved the following distributions:

Demographic Group	Actual Unweighted	Actual Weighted*
Men	597	588
Women	623	612
18-34 years	382	330
35-54 years	478	409
55+ years	362	463
Atlantic	124	80
Quebec	304	281
Ontario	370	461
Saskatchewan/Manitoba	120	81
Alberta	121	139
British Columbia	183	160
Total Population	*1222*	*1202*

Questionnaire design

A 12-minute questionnaire was designed by Nanos based on content priorities provided by ISED. Any limitations ensuing from lack of AI literacy were addressed in the development of the survey instrument, through the drafting of clear comprehensible questions, avoiding the use of jargon. This survey was designed to ensure that the data it collected could be used to inform

future discussions and consultations with marginalized groups and those with a lower level of digital literacy.

The final survey questionnaire is included in Appendix B.

Fieldwork

The survey was conducted by Nanos using a secure, fully featured web-based survey environment. All respondents were offered the opportunity to complete the surveys in their official language of choice. All research work was conducted in accordance with the Standards for the Conduct of Government of Canada Public Opinion Research – Online Surveys and recognized industry standards, as well as applicable federal legislation (Personal Information Protection and Electronic Documents Act, or PIPEDA).

The data from this survey are statistically weighted to ensure the sample is as reflective of the Canadian population as possible, in accordance with the most recently available Statistics Canada census information.

Respondent profile

The following table presents the weighted distribution of survey participants by key demographic and other variables.

Demographic indicator	Total sample
Age	**1202**
18-34 years	330
35-54 years	409
55+ years	463
Gender	**1202**
Male	588
Female	612
Other	2
Region	**1202**
Atlantic	80
Quebec	281
Ontario	461
Saskatchewan/Manitoba	81
Alberta	139
British Columbia	160
Education	**1195**
Some high school	26
Completed high school	203
Some college or university	192
Completed college	274
Completed university	364
Completed graduate studies	131
Refuse	5
Household income	**1200**
Under $20,000	78
$20,000 to just under $40,000	187
$40,000 to just under $60,000	197
$60,000 to just under $80,000	190
$80,000 to just under $100,000	189
$100,000 to just under $120,000	103
$120,000 to just under $150,000	98
$150,000 and above	85

Refuse	73
Ethnocultural Identity	**1201**
Racialized	283
Non-racialized	884
Refuse	34
Language of Survey	
English	
French	

Appendix B: Quantitative research instrument

Client: 2020-1703 ISEDC
Field: Nanos Canada, n= 1,200 Canadians. Online non-probability survey.
Length: 12 minutes

INTRODUCTION
Thank you for your interest in participating in this short 12-minute research survey. Nanos Research has been hired to administer this online survey to gather Canadians' views on Artificial Intelligence (AI) on behalf of the Government of Canada.

Your participation is voluntary and your responses to this survey will be kept entirely anonymous and confidential. Any information you provide will be administered in accordance with the *Privacy Act and Access to Information Act* and other applicable privacy laws. Protecting the health and economic well-being of Canadians during the COVID-19 pandemic is a priority for the Government of Canada. At the same time, the Government of Canada continues to operate in order to serve Canadians and deliver on its mandate. The results to surveys such as this one helps the Government of Canada continue to deliver and improve its work.

This project has been registered with the Canadian Research and Insights Council (CRIC). Thank you, in advance, for sharing your time.

Si vous préférez répondre au sondage en français, veuillez cliquer sur français.

A. Are you 18 years of age or older?
  ☐ Yes ☐ No (Terminate – not qualified)

B. Do you or does anyone in your immediate family, work in any of the following occupations?
  ☐ Market research firm (Terminate – not qualified)
  ☐ TV, radio or news media (Terminate – not qualified)
  ☐ Advertising company (Terminate – not qualified)

For the purposes of the survey AI will refer to Artificial Intelligence.

1. Are you familiar, somewhat familiar, somewhat not familiar or not familiar with AI?
  Familiar ....1 [Continue to Q2]
  Somewhat familiar ....2 [Continue to Q2]
  Somewhat not familiar ....3 [Skip to Q3]
  Not familiar ....4 [Skip to Q3]

2. [If YES] Where did you hear about AI? [OPEN]

AI is the set of computer techniques that enable a machine (e.g. a computer or mobile telephone) to perform tasks that typically require intelligence, such as reasoning or learning.

3. What do you think AI can do at this time? (Check all that apply) [RANDOMIZE]
  Play games 1
  Perform video surveillance 2
  Replace humans doing dangerous tasks 3
  Feel emotion 4
  Behave as humans do in social settings 5
  Think logically 6

Help solve business problems 7
Interpret speech 8
Interpret images 9
Learn from data to increase understanding 10
Compose music 11
Unsure 77

4. If you can, please describe one possible future use of AI? [OPEN]

On a scale from 0, very negative to 10, very positive, how would you rate the impact of AI on the following in the next five years? [RANDOMIZE]
    5. You personally
    6. Canada as a whole
    Score ____
    Unsure …….....………………………….77

For the list of possible problems below, please indicate whether you believe the problem is one where AI does a very good, good, average, poor or very poor job. [RANDOMIZE]
7. Recognizing the differences between images
8. Making decisions in a rapidly changing environment
9. Making an ethical decision in a particular context
10. Identifying the influence of human bias
    Very good 1
    Good …..2
    Average 3
    Poor 4
    Very poor 5
    Unsure …….....………………………….77

Do you agree, somewhat agree, somewhat disagree or disagree with each of the following? [RANDOMIZE]
11. People who develop AI do so in an ethical manner.
12. AI has the potential to cause harm to society
13. Human involvement is important for AI-enabled systems
14. Computers can think just like humans do
15. Computers' decision-making ability is limited by how they are programmed
16. Computers can be programmed to make ethical decisions.
    Agree …..1
    Somewhat agree 2
    Somewhat disagree 3
    Disagree 4
    Unsure …….....………………………….77

For each of the following do you believe that human involvement is required or not required?
17. Humans have a role in designing AI
18. Humans have a role in building AI
19. Humans have a role in testing and validating AI
    Required …….....………………………..1
    Not required 2
    Unsure …….....………………………….77

On a scale from 0, very negative to 10, very positive, how would you rate the impact of AI on the following aspects of life in Canada in the next five years? [RANDOMIZE]
    20. Emergency response services
    21. Law enforcement

22. Customs and border control
23. Education
24. Community services
25. Retail
26. Health care
27. Transportation
28. Media
29. Banking & Finance
30. Arts & Culture
31. Energy & Natural Resources
32. Manufacturing
33. Agriculture
34. Labour and workforce
Score____
Unsure ……..…………………………77

On a scale from 0, not at all concerned to 10, very concerned, how would you rate your concern about the possible negative outcomes from the use of AI in the following aspects of life in Canada? [RANDOMIZE]
35. Emergency response services
36. Law enforcement
37. Customs and border control
38. Education
39. Community services
40. Retail
41. Health care
42. Transportation
43. Media
44. Banking & Finance
45. Arts & Culture
46. Energy & Natural Resources
47. Manufacturing
48. Agriculture
49. Labour and workforce
Score____
Unsure ……..…………………………77

50. Which of the following technologies use AI? (Check all that apply) [RANDOMIZE]
Email spam filters ……………………………………………………………….. 1
Predictive search terms (i.e. predictions of what you are looking for based on popular search terms, etc.) …………………………………………… 2
Virtual assistant (i.e. Siri, Alexa, etc.) ………………………………………….. 3
Online virtual assistant (i.e. Chat Bot, etc.) …………………………………… 4
Recommender systems (i.e. online shopping, Netflix, etc.) ……………… 5
Image search/recognition …………………………………………………….. 6
None use AI ……..……………………………………………………………….. 9 [ANCHOR, EXCLUSIVE]
Unsure ……..……………………………………………………………………. 77 [ANCHOR, EXCLUSIVE]

51. Please rank who you think should take the lead on developing AI solutions, where 1 is who you think should be the most important lead, 2 the second most important lead and so on.
RANK
Governments ………………………………………………… ___
Private Corporations ………………………………………. ___

```
Publicly-funded organizations .................................... ___
Academic organizations ............................................ ___
No preference on who leads ..................................... ___ [EXCLUSIVE]
Unsure ……..…................................................... ___ [EXCLUSIVE]
```

52. Thinking of the potential impact of AI in the next few years, what are you most hopeful about? [OPEN]

53. Thinking of the potential impact of AI in the next few years, what are you most concerned about? [OPEN]

54. Are you interested, somewhat interested, somewhat not interested or not interested in learning more about AI?

```
Interested ........................................1
Somewhat interested ......................2
Somewhat not interested ................3
Not interested ................................4
Unsure …….....................................77
```

55. As you may know, AI uses data to learn in order to make decisions and recommendations. Thinking about your daily activities, what data are most commonly collected about you? [Open]

```
Response _____
Unsure …….............................................................................................. 77
```

56. As of today, AI is capable of: [Select all that apply]

```
Performing one specific task .............................................................. 1
Performing any variety of tasks required of it (much like a human) .............. 2
Performing a few specific tasks simultaneously ........................................... 3
None of the above ........................................................................... 4
Unsure …….....................................................................................  77
```

57. Do you have any other comments you would like to share about AI?

Our last few questions will help us group your responses and to ensure we have input form a diverse group of people in Canada. Your responses will be kept entirely anonymous. You may choose to skip any questions that you would prefer not to answer.

58. In what year were you born? ____

59. Which of the following categories best describes your household income, that is, the income from all people living at your residence?

```
Under $20,000 ……............................1
$20,000 to just under $40,000 ….......2
$40,000 to just under $60,000 ….......3
$60,000 to just under $80,000 ….......4
$80,000 to just under $100,000 ......5
$100,000 to just under $120,000 ....6
$120,000 to just under $150,000 ....7
$150,000 and above .......................8
Prefer not to answer .......................99 [Unprompted]
```

60. Which of the following is the highest level of education you have achieved?

```
Some high school ............................1
Completed high school ....................2
Some college or university ..............3
Completed college ..........................4
```

Completed university 5
Completed graduate studies 6
Refuse/No Answer..........................99

61. For verification purposes only, please enter the first three digits of your postal code: ___

62. Gender [OPEN]

63. With which of the following do you best identify yourself? [RANDOMIZE]
White ….……….………………………………………………………………………… 1
South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.) ……………….…… 2
Chinese ….……….…………………………………………………………………… 3
Black …………………………………………………………………………………… 4
Filipino …….……………………………………………………………………………… 5
Latin American ………………………………………………………………………… 6
Arab ……………………………………………………………………………………… 7
Southeast Asian (e.g., Vietnamese, Cambodian, Laotian, Thai, etc.) ……… 8
West Asian (e.g., Iranian, Afghan, etc.) …………………………………………… 9
Korean ……………………………………………………………………………… 10
Japanese …………………………………………………………………………… 11
First Nations, Metis or Inuk ……………………………………………………… 12
Other — specify …………………………………………………………………… 20
Prefer not to say ………………………………………………………………… 77

Thank you very much for your time.

Answer key- knowledge assessment questions (correct answers highlighted)

3. What do you think AI can do at this time? (Check all that apply) [RANDOMIZE]
Play games …………………………………………………………………………………**1**
Perform video surveillance …………………………………………………….…………**2**
Replace humans doing dangerous tasks ….…………………………………………**3**
Feel emotion …………………………………………………………………………………… 4
Behave as humans do in social settings ………………………………………………… 5
Think logically ………………………………………………………………………………**6**
Help solve business problems ……………………………………………………………**7**
Interpret speech ……………………………………………………………………………**8**
Interpret images ……………………………………………………………………………**9**
Learn from data to increase understanding ……………………………………………**10**
Compose music …………………………………………………………………………… 11
Unsure ….……………………………………………………………………………… 77

For the list of possible problems below, please indicate whether you believe the problem is one where AI does a very good, good, average, poor or very poor job. [RANDOMIZE]
7. Recognizing the differences between images **[good/average]**
8. Making decisions in a rapidly changing environment **[good]**
9. Making an ethical decision in a particular context **[poor/very poor]**
10. Identifying the influence of human bias **[very poor]**

Do you agree, somewhat agree, somewhat disagree or disagree with each of the following? [RANDOMIZE]
14. Computers can think just like humans do **[disagree]**
15. Computers' decision-making ability is limited by how they are programmed **[agree]**
16. Computers can be programmed to make ethical decisions. **[somewhat agree/somewhat disagree/disagree]**

50. Which of the following technologies use AI? (Check all that apply) [RANDOMIZE]

    Email spam filters **1**

    Predictive search terms (i.e. predictions of what you are looking for based on popular search terms, etc.) **2**

    Virtual assistant (i.e. Siri, Alexa, etc.) **3**

    Online virtual assistant (i.e. Chat Bot, etc.) **4**

    Recommender systems (i.e. online shopping, Netflix, etc.) **5**

    Image search/recognition **6**

    None use AI 9

    Unsure 77

56. As of today, AI is capable of: [Select all that apply]

    Performing one specific task **1**

    Performing any variety of tasks required of it (much like a human) 2

    Performing a few specific tasks simultaneously **3**

    None of the above 4

    Unsure 77

For each of the following do you believe that human involvement is required or not required?

    17. Humans have a role in designing AI **[Required]**

    18. Humans have a role in building AI **[Required]**

    19. Humans have a role in testing and validating AI **[Required]**