Infrastructure Canada

AI Empowerment:

Infrastructure Canada's Ethical and Responsible Roadmap

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CDAO

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Canada

Purpose

To answer.....

...."How Infrastructure Canada uses Artificial Intelligence ethically and responsibly to improve the lives of Canadians by enabling investment in housing, infrastructure and communities"

AI Opportunities in Investment in Housing, Infrastructure and Communities

Enhance
public decisions

Improve efficiency in
service and operations

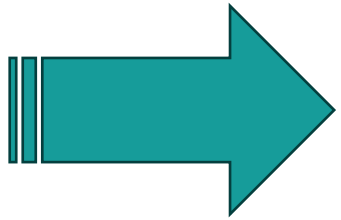
Promote open policy
development

Enhance risk
based regulations and
compliance

Move forward ethically and with confidence

With new opportunities come new risks:

- *Unethical use of data*
- *False answers or fake content*
- *Fraud and abuse*
- *Exposure of information (incl breaches)*
- *Securing public trust*
- *Poor training data*
- *IP and copyright infringements*
- *Lack of transparency and explainability*



Risk Mitigation

Government of Canada *principles and directives* for responsible use of artificial intelligence and Generative Artificial Intelligence

+

INFC's AI Framework to operationalize TBS policies

Why did we develop our own framework?

We are proposing a framework to put into place processes, procedures and safeguards now, to allow AI to grow:

Securely

Strategically

Responsibly

Flexibility to adapt to changes in the GoC landscape

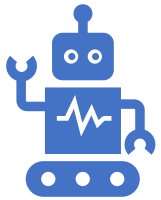
$2.4 billion in government funding to build AI capabilities and tech infrastructure

ISED Pan-Canadian AI strategy for R&D

TBS's directive on automated decision making

TBS's guidelines on generative AI

TBS's ongoing work to create an AI strategy



AI projects are designed and implemented to be used in operations

Business challenges first

Business collaborators

INFC AI Framework Scope and Principles

The Framework applies to models and systems that develop learning capabilities

The framework outlines the following principles:

- ✓ Privacy
- ✓ Security
- ✓ Quality
- ✓ Robustness
- ✓ Oversight
- ✓ Fairness
- ✓ inclusiveness
- ✓ Accountability
- ✓ Transparency
- ✓ Non-maleficence,
- ✓ Public value,
- ✓ Autonomy,
- ✓ Risk minimization, and
- ✓ Accessibility.

These principles are designed to ensure responsible and ethical use of AI.

INFC AI Framework Requirements

Example Requirements	When to be implemented
❑ **Algorithmic Impact Assessments (AIAs)**	✓ When AI projects fall under the Treasury Board Secretariat's Directive on Automated decision-Making
❑ **Notices and explanations**	✓ When AI systems can affect individuals, organizations or other INFC teams' work (determined through completing AI playbook)
❑ **Release of source code and licensing**	✓ When AI projects are deployed in production
❑ **Documentation, testing and monitoring**	✓ When AI projects are being developed, tested and deployed
❑ **AI systems inventory and AI systems risk registry**	✓ Whenever AI projects are being tested, developed and when they are implemented
❑ **Establishing a panel of experts for advisory**	✓ When HIAIS* are to be tested, developed and deployed

*HIAIS: High-Impact AI Systems

Our ethical and responsible AI roadmap

AI Framework

Data management and accessibility
INFC Data Strategy
Data Steward Community of Practice
Unified Data Platform

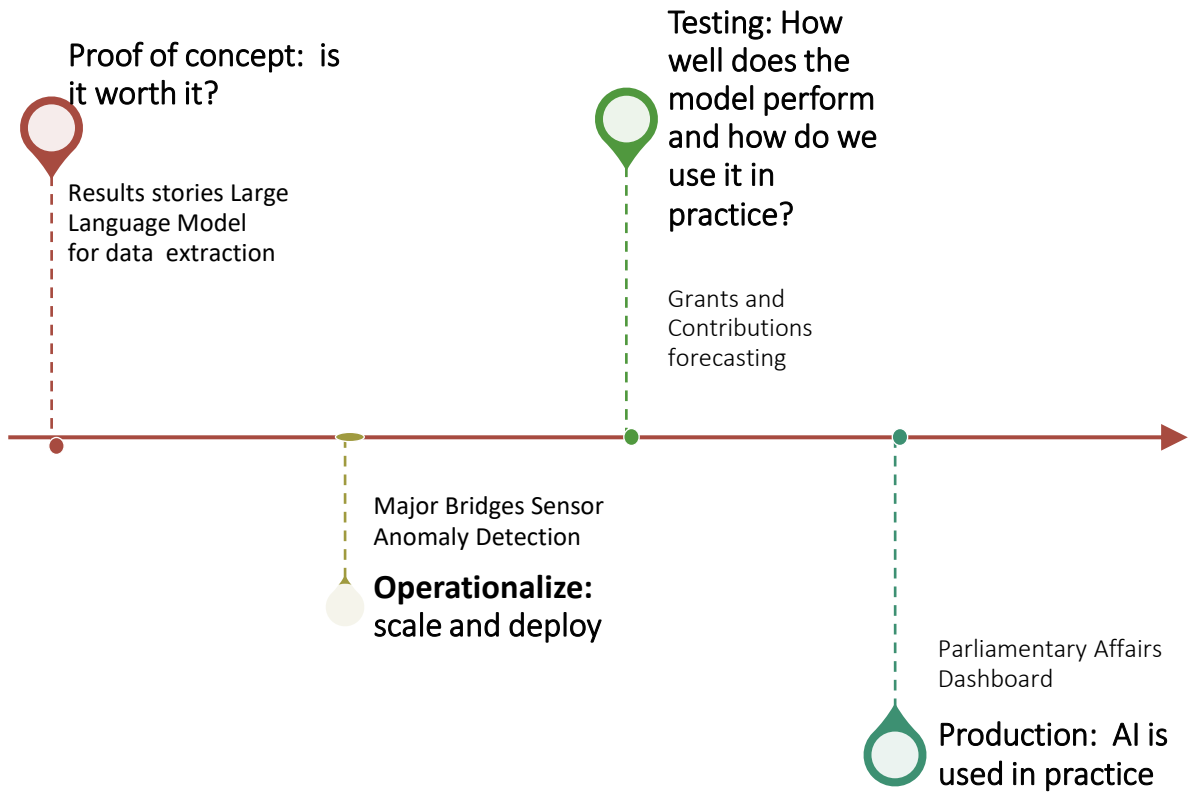
Framework Implementation tools
Checklist
Centre of Expertise

Business Challenges
Business intake process
Is AI the best solution?

AI projects

Our experience so far

- INFC has four AI projects at different stages of development.
- Each project has taught us lessons to guide future implementation and measures of success



PoC: Results Stories Large Language Model for data extraction

Business Challenge

Extract data from 25,000 project titles and descriptions to inform INFC's result stories

Current process is inefficient, time consuming and has risk of human error

Data

The Housing and Infrastructure Project Map dataset available on INFC's website

Project numbers and project descriptions for all approved and announced projects since 2016.

AI method

Large Language Model (LLM) Agents and Retrieval Augmented Generation (RAG) techniques

Fine-tuning a Large Language Model using OpenAI's API services for developers

Final product

A dataset with project outcomes and results available for Result Stories and the whole department

Framework Considerations

For public communications and storytelling

Responsible AI principles checks: Data Availability, Risk Minimization, Transparency and Explainability

Measures of success

Model implementation and running takes less time than manual tasks

Model results are more accurate than manual review results

Operationalize: Major Bridges Sensor Anomaly Detection

Business Challenge

Monitoring the health of the bridges' structural components using sensor data

Manual surveillance is complex, time consuming and at risk of human error.

Data

Hourly sensor records for over the last four years

AI method

Supervised Machine Learning

Gradient Boosting (GB) model applied to anomaly detection tasks

Final product

A dashboard with counts and trends of anomalies detected for each sensor over time

Framework Considerations

For monitoring not decision making

Principle checks for Transparency and Explainability

Documentation, testing and monitoring requirements

Results

PoC flagged additional 11.2% anomalies

Actioned review of the health of structural components and their respective sensors

Proceed to scale to all sensors

Lessons learned

Co-development with client has led to the success of the project

Client is active in labelling anomalies for supervised model training

Client makes dashboard to visualize Machine Learning results

Testing: Grants and Contributions Forecasting

Business Challenge

- Enhance financial planning and mitigation efforts
- Streamline, optimize and improve accuracy in financial resource planning

Data

- Grants and Contributions program and expenditure data from 2003 to 2024

AI method

- Random Forest performs best
- Linear regression, Gradient Boosting and X-G boost were also evaluated

Final Product

- An interactive dashboard that illustrates actual expenditures, forecast expenditures for previous, current and future years.

Framework Considerations

- For reporting not decision making
- Notice and explanations
- Documentation, testing and monitoring

Results

- Testing in 2024 financial review
- 78% increase in accuracy over manual estimates
- Outcome: fine tuning of model before deployment

Lessons learned

- Championing AI use at senior levels
- Active involvement of clients throughout the entire process
- AI is a not replacing a function but enhancing information available

Production: Parliamentary Affairs Dashboard

Business Challenge

Parliamentary Affairs Unit reads and summarizes Parliamentary committee minutes for debriefing

This activity is very time consuming

Data

Question Period transcripts

TRAN committee intervention records

Parliamentary Returns questions

AI method

ML classification is carried out where interventions are not tagged

Several techniques used for classification tasks: vectorization, scaling, Random Forest modeling

Final Product

Dashboard displaying interventions, speakers, topic frequencies and trends overtime

Framework considerations

For information not decision making

Principles check for Transparency and Explainability

Documentation, testing and monitoring requirements

Results

Accuracy of intervention classification is 80%

Lessons learned

If AI use is not widespread, the adoption is at risk

AI still struggles with qualitative analysis

Value is generated in sharing code and experiences

Summary of lessons learned

Greater success when the client is involved in the modeling, development and dashboarding process:

Sense of ownership

Vested interest in the success

No black boxes

Championing of AI use by senior managers

Adoption of AI transcends working level turnover

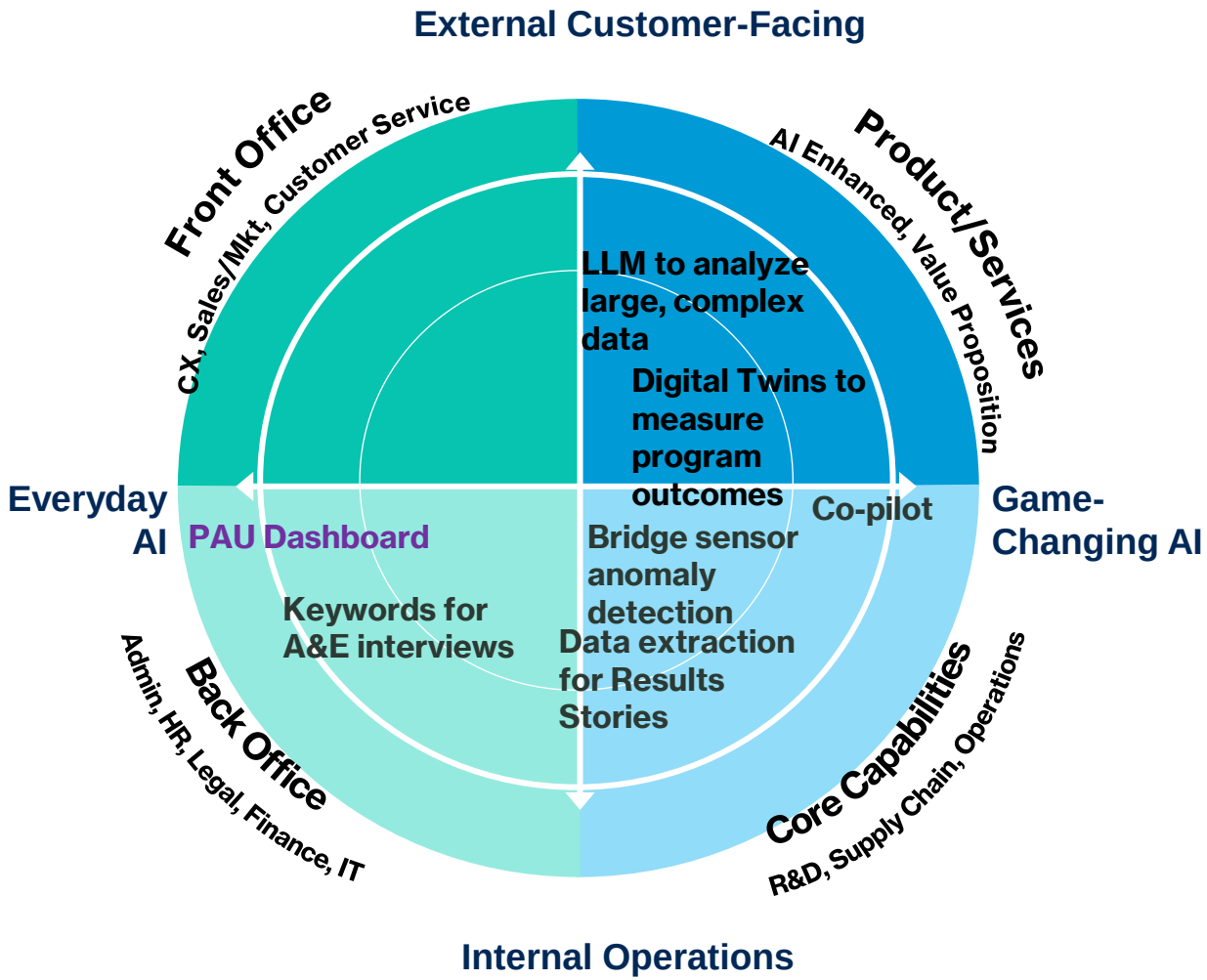
What's next for AI at INFC?

2024

Possibilities to Come

2025

2026



Thank you and contact us

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