Communications Research Centre Canada Open Science Action Plan: 2024-2029

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Executive summary

The Government of Canada has prioritized making federally funded science more accessible and available to the public. This commitment to openness and transparency of scientific data and publications will stimulate new research and innovation. It will also result in more Canadians understanding how publicly funded science can be used to improve the social and economic well-being of all citizens.

Getting there requires a whole-of-government approach. In February 2020, the Office of the Chief Science Advisor of Canada released the Open Science Roadmap, which recommended that each federal department and agency develop an action plan for making open science a reality.

The Communications Research Centre (CRC) Canada has responded with the development of an Open Science Action Plan aimed at making the agency's science and research open to the fullest extent possible, and readily accessible to all Canadians.

CRC is a research organization within Innovation, Science and Economic Development Canada (ISED) focused on client-driven applied research for advanced telecommunications. CRC's Open Science Action Plan aligns with the principles and objectives of the National Action Plan on Open Government, and ISED's Open Government goals, as well as the Government of Canada's and ISED's data management guidelines. The Action Plan also considers the importance of security in open science decisions.

The CRC's Open Science Action Plan is organized under four main themes:

- Governance
- Open Access Publications
- Open Data and Code
- Engagement, Monitoring, and Tools

The Action Plan is the first step in strengthening Open Science practices within the CRC, and providing the guidance needed to foster change and achieve success. Progress will be monitored annually, and course changes made where and when necessary. CRC intends to have these actions completed by 2029.

Foreword

The CRC's Open Science Action Plan was developed to provide increased access to its science and research products in support of the Government of Canada's commitment to open science and open government.

The Roadmap for Open Science, developed by Canada's Chief Science Advisor, states that:

"Open science is the practice of making scientific inputs, outputs and processes freely available to all with minimal restrictions. Scientific research outputs include (i) peer-reviewed science articles and publications (ii) scientific and research data and (iii) public contribution to and dialogue about science. Open science is enabled by people, technology and infrastructure. It is practiced in full respect of privacy, security, ethical considerations and appropriate intellectual property protection."

Open Science increases the accessibility of science by making it more transparent and inclusive, while also accelerating the pace of new discoveries and innovations.

Free and open access to scientific information, data, software code, and dialogue can promote scientific integrity and rigour by ensuring accountability, increasing methodological reproducibility, and reducing the duplication of effort.

For knowledge producers, making scientific work more openly available can increase its visibility and broaden its impact, bolster citation rates, create new opportunities for collaboration and innovation, increase uptake by policymakers, and ultimately foster trust in science among Canadians.

CRC's Open Science Action Plan outlines how the organization plans to move forward in making research available with an approach that balances accessibility and transparency with necessary privacy and security into consideration.

Introduction

The CRC's Open Science Action Plan is intended to guide managers, research staff, and policymakers in strengthening a culture of Open Science at CRC. The plan recognizes the value of intellectual property, safeguards sensitive personal and protected information, and catalyzes the potential of CRC science and research products in fostering innovation, collaboration, and growth in Canada.

An "open-by-default" approach, as outlined by the Office of the Chief Science Advisor, will be adopted based on the following principles, some of which are outlined in the Roadmap for Open Science:

Principles

Alignment

This plan aligns with the Government of Canada's data and information management policies and guidelines, which have been adopted at ISED.

Collaboration

Open Science enables collaborations between and among intramural and extramural science communities, within Canada and globally.

Inclusiveness

Diverse and inclusive approaches are used to achieve Open Science, reflecting the breadth of perspectives across scientific communities and knowledge systems.

People

Open Science is a shared commitment between all stakeholders. The scientific community is integral to Open Science and needs to be meaningfully engaged at every stage of the process, including the design, implementation, and evaluation of its effectiveness and impact.

Pragmatism

CRC will adopt a pragmatic approach to making its science open while respecting security, privacy, ethical considerations, appropriate intellectual property protection, and a scientific value framework.

Sustainability

Practicing Open Science requires a sustainable approach with concrete actions and the commitment necessary to achieve the long-term vision.

Transparency

Scientific research outputs that are not exempt as a result of protected information considerations are "Open by Design and by Default." These outputs are also "FAIR" (Findable, Accessible, Interoperable and Reusable).

Expected outcomes

The CRC anticipates several positive outcomes from making science inputs and outputs more publicly available:

Wider dissemination of knowledge

Open Science results in research outputs, including publications and data, that are freely accessible to all, including the general public, researchers in Canada and abroad, policymakers, and practitioners. This broader dissemination enhances the potential societal impact of research.

Create a solid foundation

By making high quality scientific research available for everyone, Open Science accelerates the discovery process by allowing others to build on previously validated discoveries and research contributions, and to create opportunities for innovation and prosperity.

Creating open engagement

Open and accessible science fosters public dialogue about, understanding of, and public confidence in, science. This inclusivity fosters a more informed and scientifically literate society.

Increased collaboration

By making more scientific research publicly available, more researchers will see CRC's work and will want to collaborate. This will advance science and create new synergies.

Reducing duplication

Open Science minimizes duplication of efforts and enables more efficient and effective use of research investments.

Increased research reproducibility

By making research data, methods, and findings openly accessible, Open Science fosters a culture of reproducibility. Other researchers can verify and replicate experiments, ensuring the reliability of scientific results.

New scientific discoveries

There will be more opportunities to build on previously validated research, which will accelerate new scientific discoveries. Shared data and findings can serve as a foundation for new research and accelerate advancements and discoveries.

Ensuring accountability

Open access to scientific research outputs provides greater accountability to taxpayers and research funders.

Leveraging diversity and inclusion

Open Science creates opportunities to benefit from the diversity of knowledge systems and perspectives.

Increased visibility and recognition for researchers

Openly sharing research findings can lead to increased visibility and citations for researchers. This visibility can enhance their academic reputation and career prospects.

Enhanced research integrity

Open Science promotes transparency, which is essential for maintaining research integrity. With open access to data and methodologies, researchers are encouraged to conduct their work ethically and avoid practices that compromise the credibility of scientific research.

How CRC will achieve Open Science

CRC will achieve Open Science by:

- Adjusting its governance,
- Increasing its open access publications,
- Sharing its open data and code, and
- Enhancing its engagement, monitoring, and tools

The intention is to have these actions completed by 2029.

Theme 1: Governance

Open Science is a commitment that extends to all of CRC's internal and external collaborators. It must align with federal directives and policies, particularly those focused on Open Government and Open Data. Governance for implementing CRC's Open Science Action Plan will incorporate these priorities, and put in place an effective structure and processes for decision-making, accountability, and approval for implementing elements described by the Roadmap for Open Science.

The governance structure should also define roles and responsibilities and consider linkages with Canada's Office of the Chief Science Advisor, other federal departments and agencies, and external partners. As the Open Science Action Plan is implemented at CRC, this governance structure will need to be reviewed, and modified as necessary, to ensure that open science is effectively realized.

CRC's Actions for Governance

A governance structure is required to implement CRC's Open Science Action Plan. This includes establishing a CRC Champion/Lead and working groups that will focus on particular elements of Open Science from start to finish. Working groups comprised of employees from across the CRC organization would consult with their peers and keep management apprised, enabling the exchange ideas and best practices, while avoiding duplication of efforts.

In developing the appropriate governance structure, CRC will consider guidance and practices from other science-based departments and agencies (SBDAs) and their Chief Science Advisors to ensure CRC aligns with government policy and adopts best practices.

Actions

1.1 Identify a CRC Open Science Champion(s) and establish the appropriate working group(s) to carry out the Open Science Action plan within CRC.

1.2 Continue to participate in cross-government initiatives to learn best practices and share ideas.

Theme 2: Open Access Publication

Facilitating the open publishing and release of federal science articles and publications (open access) is a key principle of open science. Open access supports the goals of Open Science by helping to foster important collaborations among the wider scientific community, and by promoting greater societal advancements through barrier-free access to cutting-edge research.

To support the goal of achieving open access for all federal science, SBDAs aim to make all new federal science journal articles and science publications as well as related data, maps, posters, videos, etc. openly accessible.

Open access also requires publications to be available in an accessible format. CRC will strive to ensure alignment with the ISED Accessibility Action Plan and the *Official Languages Act*. We will work with the Office of the Chief Science Advisor and publish on our website.

CRC Actions for Open Access Publication

To make more scientific publications available to the public and to the scientific community, CRC's plan will align with A Framework for Implementing Open-by-Default with Federal Government Science released by the Office of the Chief Science Advisor. This will ensure the

release of as many publications as possible, while also safeguarding protected and/or confidential information. Best efforts will be made so that all of the publications that can be released will be posted on the CRC website or in an accessible online reference site for all Canadians to access.

Actions

2.1 Review CRC publication policies and procedures and establish what should and should not be made publicly available, given privacy requirements, security concerns, intellectual property protection and ethical considerations, as well as the principle of open-by-default.

2.2 Post all scientific publications that can be made public for the scientific community and Canadians on the CRC website and/or on an accessible online reference site.

Theme 3: Open Data and Code

Making scientific data and open source code as available as possible contributes to the growth and sharing of knowledge, notably the ability of researchers to reproduce scientific results.

CRC's approach to data management will be guided by the FAIR principles. They require that data be:

- Findable: Unique identifiers and metadata are used to help locate data quickly and efficiently.
- Accessible: Data are available with the appropriate permissions. Meta data are freely available. Both should be accessed in a standardized way.
- Interoperable: Using standards, machine readable data are exchanged and yield outputs for use in a readable and useful format.
- Reusable: Metadata exist to describe the source, origin and destination of data and their usages in a standardized way, enabling the meaningful re-use of data over time.

Effective data management processes rely on ease-of-use, with clear guidelines on how to develop overarching data management plans. This includes conducting risk assessments that detail how the type and source of data will be used, and how access will be controlled (for unclassified, designated, and classified data) to help inform how, and whether, data can be shared and disposed.

Releasing scientific data and open source code in an open science context contributes to the growth and sharing of knowledge. It is critical to the scientific process in that it enables others to reproduce scientific results. Open access to scientific data, however, also brings with it risks related to privacy, intellectual property and security.

Code is generally understood to be a part of Open Data. Open code refers to software code that is available for others to view, copy, and modify for their own purposes or the benefit of Canadians and the larger research community. Sharing open code developed by CRC scientists can contribute to a more collaborative work environment.

Before that can happen, it will be important to define the scope of open scientific software and when it can be published. The tools and process required to share this software must also be determined, considering that software is often published in parallel with data and scientific publications.

CRC Actions for Open Data and Code

The Open Data and Code framework will align with existing government and ISED policies on data. Similar to the Open Publication framework, CRC's open data and code framework will promote a science culture that is "Open by Design and by Default", while also balancing privacy concerns, protected information, intellectual property protection, and security.

In addition, CRC will identify and leverage existing Government of Canada data and code repositories to make CRC's data and code available to the public, thereby increasing its application and value in society.

Actions

3.1 Review existing CRC policies and procedures to ensure they align with FAIR data principles, and are open-by-default.

3.2 Post all scientific data and code that can be made public for the scientific community and Canadians in Government of Canada-approved accessible repositories.

Theme 4: Engagement, Monitoring, and Tools

Adopting an Open Science culture will affect everyone engaged in research and development at CRC. It will necessitate changes in the way scientific outputs are both created and shared, and modifications to the way in which researchers approach their work.

Success starts with promoting a culture that embraces Open Science. This is an opportunity for more meaningful scientific collaborations, greater research impact, expansion of knowledge, and building on the CRC's reputation of scientific excellence.

Promoting a culture of Open Science requires addressing potential roadblocks. Those concerned about security must understand that open-by-default does not mean open-without-exception. Those concerned with the practicalities of publishing manuscripts, software, and data while also aligning with open science should know that ways to simplify these will be explored.

Measuring the progress of open science implementation will also be essential. It will help to identify areas of success that should be emulated, as well as components that may need course corrections.

CRC Actions for Engagement, Monitoring, and Tools

While CRC will work diligently to make publications, data, and software code available to the public, the work doesn't stop there.

Efforts will continue to instill a culture of open science with continued engagement from CRC's research community. In support of the open science objectives, CRC will also develop products, including tools that support researchers and monitor the organization's progress.

Actions

4.1 Build an open science culture and foster continued engagement with the research community based on best practices.

4.2 Develop tools to assist CRC's champions (change leaders/influencers) through the process and monitor progress.

Next steps

CRC envisions an Open Science Action Plan that is evergreen. Coordination and refinement of the plan—including identification of future open science priorities and action items—will be achieved through ongoing engagement with CRC's science and research community, policy and governance, and enabling centres and branches.

Extramural collaboration and the pursuit of shared solutions will continue through engagement with the Interdepartmental Open Science Working Group. This network will be leveraged to identify horizontal solutions, achieve economies of scale, and ensure harmonized approaches across the federal science landscape.

All employees are invited to participate as we move forward in strengthening a culture of openness, transparency, and scientific excellence at CRC.

For any questions or comments, or to get involved in Open Science initiatives, please contact the CRC at ic.crc_vpcc-crc_vpiac.ic@ised-isde.gc.ca.

Conclusion

Open science is an enabler for a more innovative and prosperous Canada. The CRC Open Science Action Plan for 2024–2029 provides a path forward for the organization to advance its efforts to deliver on Canada's Open Government and Open Science priorities of accountability and transparency in addition to the exponential benefits of open science across the country and around the world.

The plan will enable CRC to make its R&D open and accessible to the fullest extent possible, showcasing its expertise in advanced telecommunications R&D to interested stakeholders, as well to research communities across the globe.

Our publications, data, and software code are our calling cards. Making our science more widely and freely available will create new opportunities for collaboration and alignment of existing CRC initiatives. It will accelerate the pace of new discoveries and innovation, increasing uptake by policymakers, and ultimately fostering trust in science among Canadians.

Annex A: List of Acts, Policies, Guidelines and Strategies

The CRC Open Science Action plan should be read in conjunction with, though not limited to, the following acts, strategies, policies, and guidelines:

- Algorithmic Impact Assessments
- Canada's Digital Ambition
- Directive on Automated Decision-Making
- Disaggregated Data Action Plan
- Government of Canada—Open Data
- Guide for Publishing Open Source Code
- Gender-Based Analysis Plus
- Levels of Security
- Model Policy on Scientific Integrity
- National Action Plan on Open Government 2022–2024
- Policy on Government Security
- Policy on Privacy Protection
- *The Privacy Act*
- Privacy Impact Assessments
- *Statistics Act*

Annex B: Definitions

FAIR

The principle that scientific information that is open is also "Findable, Accessible, Interoperable, and Reusable" (or "FAIR") to maximize the benefit. FAIR data can assist computational systems to find, access, interoperate, and reuse data with no or minimal human intervention. By applying FAIR principles, researchers facilitate knowledge discovery and increase opportunities for collaboration.

Federal science publications

Scientific communications that scientists and researchers use to share their work include research or scientific reports, monographs, edited books, book chapters, conference proceedings, conference papers, conference contributions, posters, plain language summaries, and technical scientific products. These publications are validated through a peer-review process.

Open access

Open access ensures publications are accessible to anyone that has access to the internet. It supports open innovation and external collaborations.

Open data

Some data should be freely available to everyone to use and republish as they wish, without restrictions. Data repositories provide a way for scientists to make their data and methods open, contributing to data being more useful. Opportunities for sharing data make it more powerful through collaboration.

Open science

The practice of making scientific inputs, outputs, and processes is freely available to all with minimal restrictions. Scientific research outputs include peer-reviewed science articles and publications, scientific and research data, and public contribution to and dialogue about science. Open science is enabled by people, technology, and infrastructure. It is practised in full respect of privacy, security, ethical considerations, and appropriate intellectual property protection.

Open Source Code

Open source code commonly refers to software that is released under a licence granting anyone permission to use, modify, change, or redistribute the code for any purpose.

Acronyms

CRC:

Communications Research Centre

ISED:

Innovation, Science and Economic Development

OS:

Open Science

R&D:

Research and Development

SBDAs:

Science-based departments and agencies