NDRIO | NOIRN
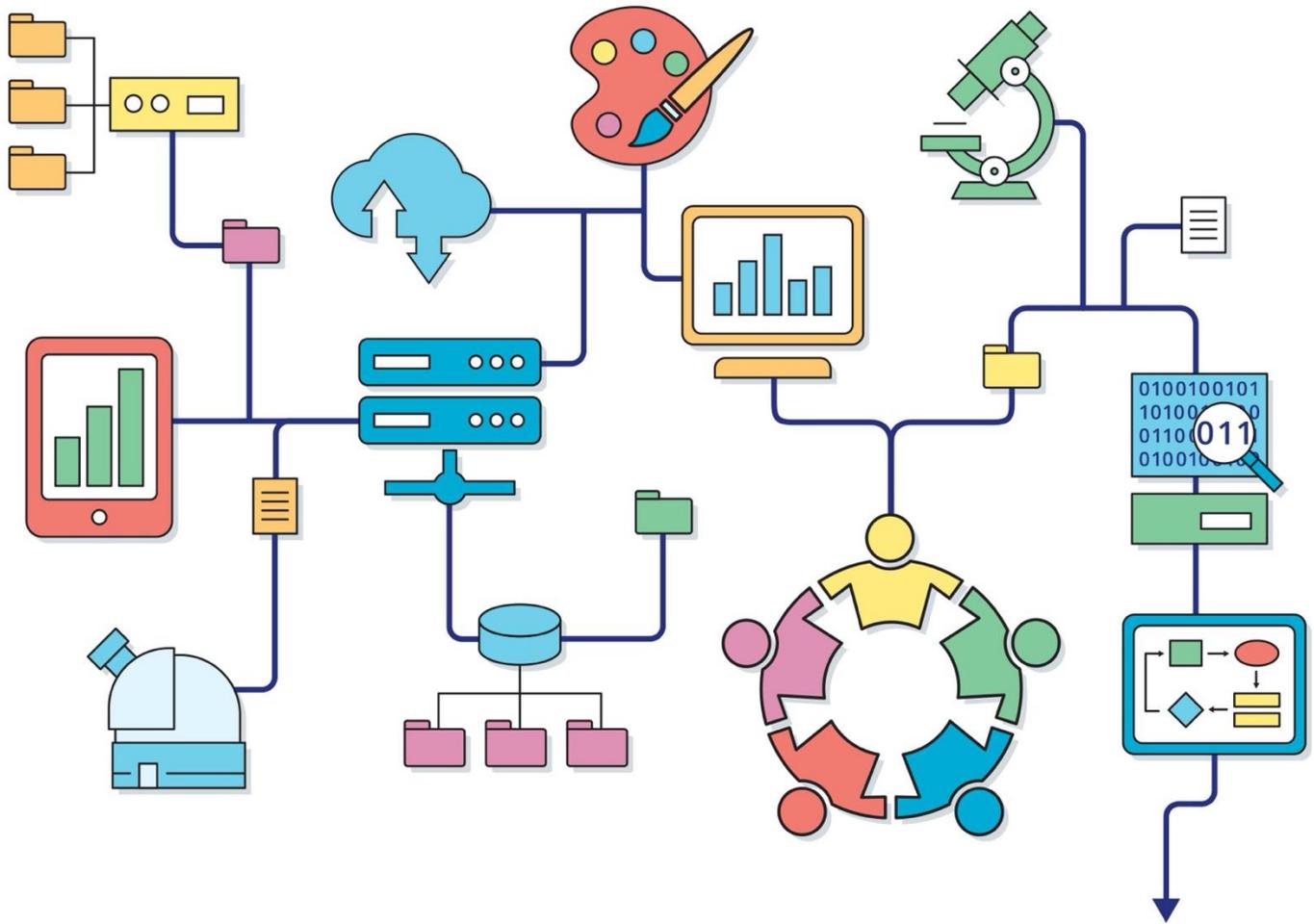
New Digital Research Infrastructure Organization | Nouvelle organisation d'infrastructure de recherche numérique

Corporate Plan

2021-2022

Submitted to:

Innovation, Science and Economic Development Canada

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Part I: Executive Summary

As the New Digital Research Infrastructure Organization (NDRIO) moves from 'start-up' to 'scale-up' in 2021-2022, the organization will focus on the following activities and outcomes:

Summary of 2021-2022 Activities & Outcomes

Stream 1: Build the Organization		
1. Further refine communications mechanisms	**Activities / Outputs** ▪ Membership Plan ▪ New brand and visual identity ▪ Refreshed website ▪ Equity, Diversity and Inclusion (EDI) Policy & Plan ▪ Official Languages Policy & Plan	**Outcomes** ▪ Member, researcher and stakeholder awareness, knowledge and satisfaction with NDRIO ▪ Demonstrated leadership in EDI
2. Provide RDM services to the researcher community	**Activities / Outputs** ▪ Provide RDM tools, platforms, processes, standards, and procedures ▪ Provide expert advice, support, and training in RDM best practices ▪ Support a growing community of practice	**Outcomes** ▪ Maintained continuity of services to users ▪ Researcher, disciplinary and institutional RDM needs are met ▪ Improved research visibility, reusability and impact
Stream 2: Prepare NDRIO's 2022-25 Strategic Plan		
3. Build the National Service Delivery and Funding Models, in collaboration with regions, host sites and other DRI partners	**Activities / Outputs** ▪ Work with ISED, CANARIE, Compute Canada, CARL, regions, host sites and other institutions involved in the delivery of services to researchers to define a National Service Delivery and Funding Models.	**Outcomes** ▪ Clear, harmonized and effective DRI service and funding delivery to Canada's researchers ▪ Researcher and stakeholder satisfaction
4. Prepare Strategic Plan under Board Leadership	▪ National vision and mission for DRI ▪ Key priorities ▪ SWOT analysis ▪ Desired states (ideal, feasible) ▪ Transformation plan: Moving from current state to desired	▪ Clarity of purpose, Key Performance Indicators (KPIs), activities and resource requirements to achieve the vision ▪ Community alignment / social licence to implement the strategy

	Activities / Outputs	Outcomes
	state, including HQP resource planning, retention and development. ▪ Roadmap ▪ Budget	
5. Prepare a Funding Request based on the Strategic Plan to be presented to ISED		▪ Sustainable funding ▪ Continuity of service to Canada's researchers
6. Safeguard DRI resources through enhanced investments and coordination in cybersecurity	▪ Collaborate with other organizations to prepare a cybersecurity framework	▪ Enhanced protection of Canada's Digital Research Infrastructure from cybersecurity threats

Stream 3: Coordinate Transition Activities

	Activities / Outputs	Outcomes
7. Commence implementation of transition plans, providing for continuity of service delivery and the assessment of existing HQP and infrastructure	▪ CCF – ARC ▪ CANARIE – RDC/RDM and RS	▪ Continuity of service to Canada's researchers ▪ HQP / talent retention
8. Coordinate transition activities across organizations, at the management and governance levels	▪ Considering the National Service Delivery and Funding Models, establish agreements with regions, host sites and institutions ▪ Review staff status, either through direct hires, secondment agreements or contracts ▪ Transfer licences, and assets	▪ Transitions are executed well ▪ Risks are identified and mitigated ▪ NDRIO's reputation is enhanced
9. Lead development of a change management strategy and professional development plan	▪ Support NDRIO employees, incoming staff and highly qualified personnel (HQP) in transition	▪ HQP / talent retention

Core to All Work Streams: Stakeholder Engagement

10. Lead researcher, partner and stakeholder engagement and communications	**Activities / Outputs** Participate in relevant national and international associations	**Outcomes** - Member, researcher and stakeholder awareness, knowledge and satisfaction with NDRIO - NDRIO's reputation is enhanced

2021-2022 Delivery Timeline

Transition Milestone #1 CARL Portage Research Data (RDM) Funding from CANARIE Ends and CARL Portage Integrates with NDRIO	October 2020
Operational Transition Plan (Compute Canada)	April 2021
Development and Delivery of Initial Projects	From January 2021
Draft National Service Delivery and Funding Models	May 2021
Organization Name and Brand Identity	September 2021
Delivery of the 2022-25 Strategic Plan	September 2021
Funding Proposal to ISED	December 2021
Cybersecurity Framework	March 2022
Transition Milestone #2: ISED ARC Expansion Program Funding Ends and NDRIO Funding Leadership Begins	April 2022
Transition Milestone #3: Canadian Foundation for Innovation Major Science Initiative Funding (Operations) Ends and NDRIO assumes full leadership of ARC	April 2022
Transition Milestone #4: Research Data Management (RDM) and Research Software (RS) Funding from CANARIE Ends and NDRIO assumes full leadership of RDM and RS Functions	April 2022

The financial plan for FY 2021-2022 reflects total revenues of $28,128,708 and planned expenditures of $27,459,000, resulting in a planned excess of revenue over expenses of $669,708. The planned excess of revenue over expenditures is due to membership fees and investment income on bank balances.

NDRIO will assess and record risks and mitigation strategies at least once per year or upon any material changes. The NDRIO senior leadership team, in collaboration with the DRI community and the Audit and Investment Committee of the Board, has identified 14 potential risks and suggested mitigation strategies during the 2021-2022 year.

NDRIO continues to build on momentum as it moves from start-up to scale-up. Together with its Members, stakeholders and ecosystem partners, NDRIO will continue to make significant strides to fulfil its role in the Government of Canada's historic investment in the DRI Strategy to the benefit of researchers, and ultimately all Canadians, from coast to coast to coast.

Part II: Introduction

NDRIO exists to serve Canadian researchers – ultimately propelling Canada onto the international stage as a leader in the knowledge economy. Its coordination and funding of activities in advanced research computing (ARC), research data management (RDM) and research software (RS) will not only immensely benefit Canadian researchers, but researchers from around the world.

NDRIO has an ambitious mandate – to transform how research data across all academic disciplines is organized, managed, stored and used. NDRIO will help ensure the calibre of Canadian research is globally competitive and world class. The result will help our country's research community access and interpret data and information faster than ever before.

In Year Two, the organization continues to work with other ecosystem partners and stakeholders across the country to help provide Canadian researchers with the support they need for leading-edge scientific excellence, research, innovation and advancement across all disciplines. NDRIO is currently moving from start-up to scale-up.

This work would not be possible without the vision and leadership in the national DRI Strategy from NDRIO's funder, the Government of Canada through Innovation, Science and Economic Development Canada.

Success for NDRIO in the years ahead will be defined by our ability to:

- Demonstrate NDRIO is well governed, well led and accountable, with clearly defined roles among organizations whose activities are being absorbed by NDRIO.
- Bring access to stable federal and provincial funding through new models that are predictable and reflective of national services.
- Transition services without disruption to researchers.
- Enable service support to a full range of research services. This includes building capacity in the system for innovation and experimentation in how services are delivered.
- Achieve Member satisfaction.
- Retain Highly Qualified Personnel, creating new opportunities for skills and career development, new opportunities for innovative work, and predictability with respect to roles and needs.
- Improve Canada's international reputation and impact in the DRI and academic research space.

Part III: 2020-2021 Accomplishments

This section describes the accomplishments from April 2020 to December 2020, and activities planned from January to March 2021. Because of the impact of COVID-19 on NDRIO's ability to engage with stakeholders, some of the planned activities have been rescheduled (with ISED's collaboration and approval). This mainly affected the Strategic Planning process and the launch of Anticipated Inaugural Projects. Other deliverables, such as ISED's required reporting, for example, were not affected.

Leading and Coordinating Governance of the DRI Ecosystem

NDRIO Membership

NDRIO has 49 Primary (Voting) Members and 93 Associate (Non-Voting) Members as of January 1, 2021.

Member engagement is core to all streams of NDRIO's work plan. The organization proactively shares information with its Members and stakeholders through a variety of channels in a manner conducive with its Guiding Principles, inviting feedback and two-way dialogue. Per its Guiding Principles, NDRIO is committed to being researcher-centric, service-oriented, accountable and transparent, striving for excellence and collaborative.

A Membership Plan is currently under development, which will further articulate and demonstrate NDRIO's Member Value Proposition. Consultation with Members will help to inform this plan.

Inaugural Board of Directors

The 15-member Inaugural Board of Directors was elected at a Special Members' Meeting in March 2020, in Ottawa. The Board's first task was to complete the governance and program frameworks of NDRIO. The Board also led the process to hire NDRIO's inaugural CEO, Nizar Ladak. Mr. Ladak started his mandate on October 5, 2020.

The Board appointed external auditors, approved investment policies consistent with the obligations of the Contribution Agreement and established three Sub-Committees of the Board with Terms of Reference and supporting policies.

With the help of a Research Advisory Group, the Board oversaw the selection of the members of the Researcher Council, who were announced at the NDRIO Annual General Meeting in September 2020.

Researcher Council

The NDRIO Researcher Council is a critical component of NDRIO's commitment to involve the research community as it designs and delivers a national service delivery model to support Canada's national Digital Research Infrastructure (DRI) Strategy.

The 22-member Council was selected after an open call for nominations from NDRIO's Primary Members and independent applications, as well as a targeted recruitment campaign. NDRIO reached out directly to 700 potential candidates to apply for the Researcher Council. The organization's outreach efforts resulted in a strong pool of 137 candidates, 117 of whom were nominated by NDRIO's Primary Members.

The Researcher Council is composed of multi-disciplinary researchers from across Canada (eight from Ontario, seven from Quebec, five from the Western provinces and two from the East Coast). Nearly 80 per cent of the Council has DRI experience (in ARC, RDM and/or RS), and all have Tri-Agency Representation (with many members receiving funding from more than one research funding agency). For a more fulsome overview of the Researcher Council composition, please see Appendix A on page 53.

The Researcher Council is fully involved in the phases linked to the preparation of the Strategic Plan. The Council meets monthly and sub-committees are created to address specific topics, including a sub-committee on governance to finalize the Council's Terms of Reference and a sub-committee to support the preparation of the Researcher Needs Assessment survey. A Secretary to the Council was hired to support their activities. In addition, the senior analysts hold open attendance sessions to discuss specific topic of interest to the Council.

Principles of Equity, Diversity and Inclusion

NDRIO recognizes that the research ecosystem is strengthened, research quality is enhanced, and social relevance and impact are improved when all groups contribute to research and innovation. The organization is committed to ensuring that Canadian researchers have equitable opportunities to participate and that principles of Equity, Diversity and Inclusion (EDI) are embedded into the organizational fabric. The creation of an equitable, diverse and inclusive research ecosystem requires participation of all Members and stakeholders, and NDRIO is committed to supporting its partners and community in moving this endeavour forward.

In support of NDRIO's Governance and Membership Model, the organization seeks diverse representation through the institutional and industry stakeholder communities it serves. This includes diversity of personal and demographic characteristics represented in Canadian society including gender, sexual orientation, ethnicity, age, business experience, functional expertise, personal skills and geographic location.

Working with executive recruitment firm Odgers Berndtson, EDI considerations were undertaken during the nomination and selection process of NDRIO's inaugural Board of Directors. The recruitment posting was shared with the following diversity-focused organizations to distribute within their networks:

- Women's Executive Network (WXN)
- 30% Club
- Women Get on Board
- Women General Counsels of Canada
- Canadian Council for Aboriginal Business

Odgers Berndtson also avoids the use of candidate pictures and images to reduce possibility of unconscious bias or overt discrimination in screening and has implemented a voluntary self-disclosure form that it asks all candidates to complete with every application, enabling the firm to track diversity statistics for all its executive searches.

NDRIO's EDI efforts with regard to the inaugural Board resulted in a Board composed of 53% female Directors, with Indigenous representation and linguistic and geographic diversity.

NDRIO's Researcher Council is also committed to representing the diversity of the national research enterprise. To form the inaugural Researcher Council, targeted outreach, based on measurable goals and best practices in position posting, search and selection, were employed. A focus on EDI during the recruitment and outreach process resulted in an extraordinarily strong group of researchers with highly diverse backgrounds. Members of the Researcher Council have self-identified as women, visible minorities and people with disabilities. Just over 50% of the Researcher Council identifies as women, 25% are visible minorities and two have a disability. As well, 57% of the Council can communicate in both of Canada's official languages.

While the results of this Research Council recruitment outreach were strong, NDRIO is placing emphasis on engagement with the Indigenous research community for future participation on the Council. In the interim, remedial action will be taken to ensure Indigenous researcher participation through Council advisory committees or groups. Outreach efforts will continue in an effort to ensure lasting Indigenous researcher involvement with the Researcher Council.

NDRIO's public efforts towards increased representation and recognition of diverse groups involve participation in the Government of Canada's "50-30 Challenge." This Challenge asks that organizations aspire to two goals:

1. Gender parity ("50%") on Canadian board(s) and senior management; and,
2. Significant representation ("30%") on Canadian board(s) and senior management of other under-represented groups, including racialized persons, people living with disabilities (including invisible and episodic disabilities) and members of the LGBTQ2 community. The program and participants recognize that First Nations, Inuit and Métis peoples as founding peoples of Canada are under-represented in positions of economic influence and leadership.

The "50-30 Challenge" will be an important accountability mechanism for NDRIO to ensure increased representation and inclusion of diverse groups, while highlighting the benefits of EDI to its overarching organizational goals.

It will be crucial to build on this progress through continued feedback of the NDRIO team, Members and partners. Further strategies and initiatives are being developed and will be launched over the coming months as the NDRIO EDI Action Plan is advanced. Priorities in the EDI Action Plan being mobilized include:

- Development of measured deliverables including equity gap analysis, ongoing requests for self-identification information and tracking efficacy of search processes and outcomes;
- Establishment of EDI Resources in line with current best practices (i.e. NSERC Dimensions Resource) to educate the NDRIO team;
- Development of policies and procedures in line with established EDI Principles; and,
- Initiation of progressive monitoring of EDI outcomes to ensure that where specified goals are not met, steps will be taken to alleviate gaps.

NDRIO recognizes that challenges remain in achieving the full participation of equity-seeking groups (including women, Indigenous Peoples, persons with disabilities, members of visible minority/racialized groups, and members of the LGBTQ2+ community) in research careers and is committed to identifying and eliminating barriers that may exist within its own hiring process, programs, and practices. In that regard, in 2021-2022, the CEO, a member of a visible minority himself, has also set a target of achieving gender parity among his Vice Presidents in recruitment and has set a goal of 30% of all staff being members of underrepresented groups.

Strategic Plan

The timeline of the delivery of the Strategic Plan has been revised to reflect the impact of COVID-19 on NDRIO and its stakeholders. The plan was to be delivered in December 2020 and serve as the foundation for a funding request to ISED to cover the years 2021-2024. The plan schedule was aggressive, compressing the required phases to attain the December deadline. In consultation with ISED, NDRIO revised the timeline, placing the phases in sequence and allowing for more time for each one to ensure that the required consultations with stakeholders would take place so the plan would truly address the needs of the community in line with ISED's objectives.

The delay in delivering the Strategic Plan has an impact of the delivery of the Funding Proposal in December 2020, which will now only cover the year 2021-2022. In addition, ISED will extend the ARC Expansion Program from April 1, 2021 to March 31, 2022 to address infrastructure and support needs for the National Host Sites.

In the revised timeline, NDRIO's Strategic Plan will be delivered in September 2021 and form the core of the proposal to ISED to fund its activities for the years 2022-2025. NDRIO's Strategic Plan will respect the following Guiding Principles:

- Working collaboratively with partners to align investments and maximize impact to increase capacity and availability of ARC, RS and RDM resources; and
- Promoting productive networks and collaboration internationally, and among Canadian universities and colleges, to enhance research outcomes and maximize efficiencies.

The process involves four phases:

1. Current State Assessment – May 2020 to February 2021
2. Needs Assessment – October 2020 to February 2021
3. National Service Delivery and Funding Models – February to May 2021
4. Strategic Plan – April to September 2021 (FY21-22)

Current State Assessment

For this phase, NDRIO recruited four senior analysts – three to chair working groups (ARC, RDM, and RS) and a fourth mandated to coordinate the outreach and consultation of the community for each phase. The working groups are composed of service providers (CANARIE, Compute Canada Federation and CARL/Portage) and a diverse group of researchers. The main deliverables are updates of the ARC and RDM 2018 Leadership Council for Digital Research Infrastructure (LCDRI) position papers and a RS position paper, all including:

- Ecosystem mapping
- Review of current services
- Challenges and opportunities

The RDM Position Paper was delivered for a first round of validation in October 2020 and will be published in January 2021. The delivery of the ARC Position Paper is planned for the end of January 2021, while the delivery of the RS Position Paper is planned for February 2021. A validation process will follow the initial delivery resulting in final revision, translation and publication in May 2021.

Needs Assessment

The Needs Assessment phase, which began in the late fall of 2020, is led by the Researcher Council and consists of consulting the researcher community to identify researchers' needs, aggregating and validating the results, and producing a report. The consultation is taking place through three inputs:

- A *Call for White Papers* that invites individual perspectives on current challenges accessing DRI tools, services and support; the ideal future state of DRI in Canada; and how NDRIO could achieve such a state.
- A *Call for Current Documentation* that invites Canadian research institutes and organizations to share existing documentation (e.g., strategic plans, roadmaps, position papers, etc.) on the current and future state of advanced research computing, research data management and research software.
- A *Survey* addressed to researchers in Canada.

Both the *Call for White Papers* and the *Call for Current Documentation* had a deadline of December 14, 2020. NDRIO received 107 white papers and 19 contributions for the call for

existing documentation. Moreover, remaining true to its organizational commitment for transparency, the white papers appear on NDRIO's website for the public to review and understand the variety of advice NDRIO has received. The survey is planned for February 2021. A first report on initial findings will be published in Spring 2021 for validation and comments. The Researcher Council will identify priorities and a high-level timeframe for solution delivery, which will be incorporated in the final report.

National Service Delivery and Funding Models

This phase will require intensive consultation with multiple stakeholders. The complex logistics requirements and the relative short timeframe have led NDRIO to issue a Request for Proposals by invitation in December 2020. The selected firm will start this phase in February 2021 with an end date of May 2021. The deliverables include:

- International Funding Landscape Assessment
- Technology Landscape Assessment
- National Service Delivery Model (including HQP impact)
- National Funding Model

Anticipated Inaugural Projects

Due to the impact of COVID-19 and to ensure full participation of all stakeholders, the launch of a Call for Anticipated Inaugural Projects was postponed to the fourth quarter of 2020-2021. Meanwhile, a Grant Program Manager was hired to support the process. The call will be launched in 2021, but the projects will start in FY 2021-2022. Moreover, as part of its outreach and partnership goals, NDRIO has collaborated with Canada's National Granting Councils (NSERC, SSHRC, CIHR and CFI) to maximize the potential impact of the Anticipated Inaugural Projects and will issue a joint call. NDRIO will also benefit from the expertise of Canada's Granting Councils in order to ensure value for money to Canadians.

On the CEO's national listening tour, Nizar Ladak met with more than 200 individuals and groups, and participated in speaking engagements to audiences cumulatively totaling more than 500 participants. During the tour, he discussed transition frameworks and the Anticipated Inaugural Projects. Strong, comprehensive and impactful project proposals are anticipated to be submitted. Mr. Ladak explained during these consultations that partnerships and collaborations among the ARC, RDM and RS communities would be expected, and inter-provincial teams would be highly desired with proposals earning higher points during assessment and evaluation.

Transition

In 2020-2021, NDRIO worked with its partners, CANARIE and Compute Canada Federation, to prepare the transition plans of their activities to NDRIO on April 1, 2022. CANARIE was mandated to prepare the transition plan for its RDM and RS activities. The Transition Plan was

completed in November 2020, was approved by both NDRIO and CANARIE Boards in December 2020. The transition plan will be delivered to ISED as originally planned in January 2021.

NDRIO was mandated by ISED to deliver the transition plan for Compute Canada Federation in January 2021 in support of the transition of national ARC activities. Because of the impact of COVID-19 on the multiple stakeholders involved, the delivery date was moved to April 2021 with ISED's approval.

In preparation, NDRIO and Compute Canada formed a joint committee of their two Boards to oversee the transition process, and formed a working group composed of NDRIO and Compute Canada staff to prepare the transition plan. In addition, both organizations appointed a project manager to oversee the preparation of the transition plan.

On October 1, 2020, NDRIO assumed funding of the Portage Network which is dedicated to the shared stewardship of research data in Canada. Since NDRIO was not certain its back-office systems would be in place to fully integrate Portage at that date, a contract was signed with the Canadian Association of Research Libraries (CARL) to continue providing back-office support to Portage until March 31, 2021. A working group was put in place to complete the integration by April 1, 2021.

Support of Highly Qualified Personnel

NDRIO will work with partners and stakeholders to provide for proper change management in establishing and executing the National Service Delivery Model and the Transition Plans.

NDRIO will also expand research and job opportunities by providing support through the research infrastructure for the development of highly qualified personnel (HQP).

Following the recruitment of its first CEO, NDRIO is gradually recruiting a permanent team through public postings and targeted outreach.

NDRIO is committed to a seamless transition of Canada's valued Highly Qualified Personnel. It is imperative that Canada's researchers are not negatively impacted by transition plans that could interrupt their critical research. NDRIO recognizes that Canada's system analysts, data managers, software experts and many other HQP supporting Digital Research Infrastructure are instrumental in this regard.

As at the date of the 2021-2022 Corporate Plan submission, the CEO and senior team have met with key members of the HQP community, who engaged in open discussions about their interest in transitioning to NDRIO from their current employment relationships. Town Halls and sector-specific meetings took place between October 2020 and January 2021 whereby the CEO reinforced the message that seamless and uninterrupted transition plans are being developed. The cumulative total participants attending those meetings exceeded 700.

As NDRIO embarks on its National Service Delivery Model development, working groups, Town Halls and focus groups have been planned to engage HQP in the design of the new model. By April 1, 2021, it is anticipated that staff from two of the three sectors will be fully integrated within NDRIO, namely HQP from Portage and Research Data Canada. NDRIO's current organizational structure has been communicated on its website, and placeholders have been included by function to assure HQP that their functions will continue. (Also see the section on Management and Administration on page 19 of this report.)

NDRIO has also openly communicated that as it initiates a National Service Delivery Model, this model will reflect the status quo. Therefore, NDRIO cannot commit that every single staff person of the 250+ currently employed in Canada's DRI ecosystem will be performing the same role/function they currently do once the new model is established. This would undermine the design of the National Service Delivery Model and any objective analysis required to re-design, improve upon and propel Canada onto the global stage of the knowledge economy. Nevertheless, it is NDRIO's ambition that the National Service Delivery Model will be designed in an open, transparent and objective manner, and be driven by principles of fairness, effectiveness, efficiency and excellence.

ARC Resource Allocations

The main activities around ARC are concentrated around the phases leading to the Strategic Plan and transition planning with the Compute Canada Federation. The delivery of the ARC Current State Assessment is scheduled for January 2021, followed by a validation period leading to the translation and publication of the final version of the position paper in May 2021.

In addition to the working group engaged in the preparation of the Current State Assessment, three other working groups were constituted to take a deeper dive in specific areas:

Pan-Canadian Artificial Intelligence Working Group

The Pan Canadian AI Working Group provides leadership oversight on the development of a proposal to ISED toward renewal of the Pan-Canadian AI Strategy as it corresponds to infrastructure needs of Artificial Intelligence and Machine Learning (AI/ML) researchers in Canada. A Steering Committee was formed, which is Chaired by an NDRIO Board Member, and includes representation from CANARIE, the three CEOs of Canada's AI Institute's, Canadian Institute for Advanced Research (CIFAR), the three CEOs of ARC regional organizations and ISED (as an observer only).

Contributed Systems Working Group

The working group is tasked with four primary objectives:

1. Review and update the existing CFI policy on contributed systems through the lens of the policy renewal guidance proposed, and independently verify that the definition of and the principles of contributed systems are well articulated and appropriate for the research context.
2. Advise and define the exemptions for a contributed system, address the considerations raised in the proposed policy renewal guidance – along with other considerations, as appropriate – and articulate best practices and lessons learned to adjudicate, and review requested exemptions.
3. Advise on the process for assessing exemptions. It has been proposed that an NDRIO-established advisory panel will provide recommendations on appropriate exemptions, which will support NDRIO management in deciding which systems to discount as contributed systems.
4. Provide further advice on policies pertaining to site selection and disposal of contributed systems.

Storage Working Group

The working group will be tasked with two primary deliverables:

1. Short-Term Business Case:
- Develop a business case for additional storage requirements (12-18-month timeframe, beginning April 1, 2021), based on an assessment of current use and capacity, and how this might be allocated across the national platform, consistent with national policies and procedures.
- Based on the proposal, identify policies and policy development needs to guide active management of current and additional capacity.
- Articulate how the proposal aligns with NDRIO's longer term planning for research data storage, across active, nearline, back-up, repository, and preservation storage infrastructure.

2. Long-Term Storage Analysis
- Review and assess the current use and capacity of storage through the CCF community to establish a baseline for analysis and trend analysis of needs. This would include an analysis of storage capacity and usage (i.e. demand, use, and availability/supply over time and any available capacity).
- Conduct an environmental scan of global best practices and standards to increase storage space. It should reflect current practices as well as those proposed for future needs.
- Articulate definitions and policies for active, nearline, back-up, repository, and preservation storage infrastructure, and develop policies for active management of current capacity.

National-Layer RS Activities

The main activities around RS are concentrated around the phases leading to the Strategic Plan

and transition planning with CANARIE. The delivery of the RS Current State Assessment is scheduled for February 2021, followed by a validation period leading to the translation and publication of the final version of the position paper in May 2021.

National RDM Activities

2020-2021 was a period of rapid growth and progress for research data management (RDM) in Canada, supported by overlapping directed funding from both CANARIE and NDRIO. Much of the work undertaken and accomplished during this period should be seen as both transitional and foundational -- laying the groundwork for RDM's merger into NDRIO with the integration of Portage in October 2020, and the planning of the integration of Research Data Canada (RDC) and the RDM program (CANARIE) on April 1, 2022.

NDRIO also established a RDM working group, integrating representation from Portage, RDC and researchers to write a RDM Current State position paper 'The Current State of Research Data Management in Canada: An Update to the LCDRI Data Management Position Paper,' that reflects the advances made in addressing researcher needs by facilitating the development and deployment of a diverse array of RDM platforms, supports, services and training, aligned closely with key stages of the research data management lifecycle. The Position Paper is to be published in January 2021.

With the integration of Portage, NDRIO has now moved from strategy and planning to operations in two main areas: National data stewardship support, and the development and support of a RDM platform. For completeness, the accomplishments listed below addresses work anticipated to be completed in the January to March 31, 2021 period.

National Data Stewardship Support

Through the 2020-2021 period Portage:

- Maintained and grew national data stewardship support by augmenting the current Secretariat to include additional data life cycle-aligned positions, all working closely with the national Network of Experts and the broader Community of Practice. New Secretariat positions included:
  - Three new Coordinator positions to support: policy, privacy and sensitive data; researcher intelligence gathering initiatives; and data management planning.
  - Three new Curation Officer positions to help deliver nationally coordinated curation support.
- In response to COVID-19 restrictions, pivoted planned face-to-face training and outreach efforts to fully online – introducing an ongoing series of webinars and community-

building 'watercooler chats, as well as providing several online presentations for conferences, research projects, government and partners.

- Developed a pan-Canadian, researcher-centric RDM training strategy that focuses on bilingual and blended delivery (online and face-to-face), and a multi-modal, reusable approach to learning.
- Translated RDM outputs (documents, guidance, webpages, tools and training materials) to make them available in both of Canada's official languages, and to support internationalization of RDM platforms and services.
- Published "Conceptualizing a National Approach to Data Curation Services in Canada" that outlines the community's vision.

RDM Platform, Services and Ecosystem Development

Through the 2020-2021 period Portage:

- Provided operations support for the Federated Research Data Repository (FRDR) to offer scalable repository services on a 'by request' basis to researchers during limited production.
- Expanded FRDR development and operations team.
- Translated FRDR and Globus Web Services interfaces for fully bilingual support.
- Designed and implemented geo-replication failover for both the FRDR website and storage.
- Conducted a usability study to improve FRDR's user interface.
- Worked with CCF partners and national host sites to increase the amount of curated repository storage available to Canadian researchers.
- Integrated map-based searching functionality into FRDR discovery platform.
- Integrated the Simon Fraser University sensitive data pilot project into FRDR workflows, providing FRDR with the technical capacity to manage data of varying levels of sensitivity.
- Provided funding support to the Ontario Council of University Libraries' Scholars Portal to reduce per-institution costs for institutions participating in the developing national instance of Dataverse.
- Provided technical and administrative guidance on certification for Canadian repositories, and piloting support for Canadian repositories to attain certification as a continuation of an existing project that aims to increase the number of certified data repositories in Canada.
- In coordination with the Canadian Research Knowledge Network (CRKN), promoted the adoption of Digital Object Identifiers (DOIs) – an internationally recognized standard for persistent identifiers for digital objects – by Canadian repositories.
- Hired a Data Management Planning Coordinator to support researchers and institutions in the adoption, use, and customization of the DMP Assistant to meet their ongoing data

management planning needs and to address ongoing strategic development of this online data management planning platform.

- Supported the ORCID-CA consortium by becoming a member. Membership will provide premium access to the ORCID API, enabling the development of more advanced integrations with ORCID.

Management and Administration

In its second fiscal year, NDRIO focused on working with partners to create a vision of a coordinated DRI ecosystem, and to initiate planning towards a coordinated operating ecosystem.

NDRIO is engaged in developing a vision and Strategic Plan for the organization and its delivery of national-level advanced research computing (ARC), research data management (RDM) and research software (RS) services.

- This work required engaging with DRI ecosystem partners (e.g. ISED; Compute Canada; CANARIE; and national, regional and local DRI providers) to prepare transition plans and to define roles and responsibilities across the national, regional and local layers of the DRI ecosystem's service delivery model.
- NDRIO consulted the research community to assess current services and identify priority-based needs for computing, data and software.
- These efforts are informed by, and build on, existing work undertaken by DRI ecosystem partners, and includes engagement with the community.
- NDRIO has partnered with CANARIE to produce a Joint DRI Ecosystem Plan that will be submitted to ISED on January 31, 2021.

A new CEO was selected in August 2020 and is gradually replacing interim employees with permanent employees. An overlap of resources had been included in the budget to provide for a smooth transition.

The implementation of a permanent team requires organizational development, including the definition of key executive roles and drafting of position profiles. It also requires the development of a recruitment strategy, and management and strategic planning processes.

The expansion of the current team is supporting the core activities of 2020-2021.

The new CEO and the senior team of NDRIO have prepared an Organizational Chart to guide the recruitment of permanent staff.

Board of Directors

Researcher Council

CEO

Office of the CEO
- Executive Assistant
- Board Secretary
- Corporate Administrative Asst

(Feb 2021) — **Vice President Corporate Services**
- Director Finance
  - Sr. Financial Analyst
  - Financial Analyst
  - Internal IT specialist
- Manager Human Resources
- Director Procurement & Grant Mgt
  - Mgr, Grant Oversight
  - Procurement Specialist

(Feb 2021) — **Vice President Strategy and Planning**
- Director Strategic Initiatives
  - Lead, Researcher Council
  - Senior Analyst x 4
- Director Architecture
  - Lead, Infrastructure & Security Architecture
  - Lead, Software Architecture
  - Lead, Data Architecture
  - Lead ARC Resource Allocation
- Director International Relations & Industry Engagement

(Mar 2021) — **Vice President Operations & Security**
- Director Operations
  - Helpdesk
  - Host sites coordinator
  - Software and data management coordinator
- Director Information Security
  - Cybersecurity Specialist

(Apr 2021) — **Vice President Communications and External Relations**
- Director Stakeholder & Member Relations
  - Member Relations Coordinator
  - Corporate Event Planner
  - Digital Media Coordinator

Management Functions

In addition to core activities, NDRIO is putting in place management functions required to support its operations.

- Support for the Board, the Researcher Council and other councils and working groups
- Finance and procurement policies, processes, and procedures
- HR policies, processes, and procedures (including an executive management hiring process)
- Performance, Evaluation, Risk and Audit Framework, that was submitted to ISED in December 2020
- Project management, tracking and controls
- Accounting and payroll
- Reporting – Annual Report, Corporate Plan and Progress Report
- Communications and stakeholder relations
- Grant program support
- Infrastructure and back-office systems

Grant Program Management

Although ongoing delivery of existing services (on existing infrastructure) will be funded directly by NDRIO, in some cases expansion or delivery of new services will be funded by grant programs managed by NDRIO or by procurement of commercial services. NDRIO will develop a new Grant Program Management model, moving from a project-based approach to a service-based one. To prepare, NDRIO has hired a Grant Program Manager.

Part IV: Year 3: 2021-2022 Planned Activities and Outcomes

Core to achieving NDRIO's Contribution Agreement Objectives are its 2021-2022 Activities, contained within NDRIO's 2021-2022 Performance, Evaluation, Risk and Audit Framework. The Planned Activities include three main streams:

1. **Building the Organization** – In the fall of 2021, NDRIO will solidify its brand, visual identity and further refine communications mechanisms. In the short term, it is focused on recruitment for a variety of roles within the organization.

2. **Preparing the 2022-2025 NDRIO Strategic Plan, Including the National Service Delivery and Funding Models –** NDRIO's Strategic Plan, to be delivered in September 2021, and developed following an extensive consultative process, will form the core of the proposal to ISED to fund its activities for the years 2022-2025. NDRIO's Strategic Plan will respect the following principles:

   - Working collaboratively with partners to align investments and maximize impact to increase capacity and availability of ARC, RDM and RS resources; and
   - Promoting productive networks and collaboration among Canadian universities and colleges, to enhance research outcomes and maximize efficiencies.

   The team will prepare a detailed plan, including a critical path, to help ensure that activities required to deliver the Canadian Digital Research Needs Assessment, the National Service Delivery and Funding Models, and the 2022-25 Strategic Plan are synchronized.

3. **Coordinating Transition Activities –** NDRIO will plan to prepare for a smooth transition of the delivery of national-level services. Its aim is to establish the required structure, policies, procedures and controls to accommodate seamless transfers with no impact on users. Early in 2021, it will work with CANARIE and Compute Canada to establish appropriate coordinating mechanisms to oversee the year of transition at the governance and management levels. The transition process will be completed on April 1, 2022.

   CANARIE and NDRIO have committed to work together with enthusiasm and diligence to meet the requirements set out in their respective Contribution Agreements. CANARIE and NDRIO will co-develop and implement a project management approach to track the progress of the transition. In addition to providing oversight to the transition of each program, the approach will also provide oversight and management of any financial / budgeting aspects, as well as any external communications regarding the transition. The two organizations are currently meeting every two weeks; these meetings will track and manage the transition to support its timely completion. Similar steps will be taken with Compute Canada.

Part of NDRIO's transition planning approach includes leading the development of a change management strategy and professional development plan for ARC and RS. NDRIO will assume the operations of RDM.

On a biweekly basis, the Executive Teams of both Compute Canada and NDRIO meet to discuss elements of transition work. There are information exchanges around service delivery as currently configured within the Compute Canada Federation (CCF) and those that are coordinated on behalf of the Federation through the Compute Canada head office. These services are being diligently documented and will be shared with the consulting firm leading the work of the National Service Delivery and Funding Models. In addition, a joint committee of NDRIO and Compute Canada Board members has been established to support the timely and appropriate transition of responsibilities.

In parallel, quarterly meetings between Canada's National Host Site Leads are occurring where transition discussions are scheduled to take place as the National Service Delivery Model design work begins. Finally, bi-monthly meetings with the CEOs of the regional ARC organizations take place to consider transition plans and collaborative opportunities between the ARC regions and NDRIO.

A resulting expectation from both Host site and ARC region meetings is that appropriate information is also being cascaded to Compute Canada Federation staff to inspire confidence and enable input into the discussions.

At the centre of these three Planned Activities streams is **Stakeholder Engagement** – encompassing first and foremost the research community, ecosystem partners and the DRI community.

To achieve these three Planned Activities, and as outlined in NDRIO's Logic Model, the following Outcomes have been categorized by Eligible Activity as defined in the Contribution Agreement.

Leading and Coordinating Governance of the DRI Ecosystem

2022-2025 Strategic Plan

In 2021-2022, NDRIO will complete delivery of the National Service Delivery and Funding Models, the last building blocks for the 2022-2025 Strategic Plan.

This will include, but is not limited to, the following activities:

- Validation of desired future state/end state (illustration follows) including principles and guidelines for future state, for example:
    - ISED requirements
    - Guiding Principles
- Validation of the current state delivery model, as produced by NDRIO, and augmented by the vendor, if required, including a description of current services and how they are currently being provided

- Validation of the DRI needs assessment as produced by NDRIO, and augmented by the vendor, if required
- Survey of international benchmarking within the DRI environment globally and documentation of industry best practices
- Overview of technological advances on the horizon
- Design of National Service Delivery and Funding Models
- Workshops (vendor-led) of possible solution options with NDRIO and stakeholders
- Development of detailed transition guidelines

Following the delivery of the National Service Delivery and Funding Models, NDRIO will start the preparation of the Strategic Plan (5-year projection). The preparation of this plan will be led by NDRIO's Board and will aggregate the findings of the Current State Assessment, the Needs Assessment, the Service Delivery and Funding Model and will include the following deliverables:

- National vision and mission for DRI
- Key priorities
- SWOT analysis
- Desired states (ideal, feasible)
- Transformation plan: Moving from current state to desired state, including HQP resource planning, retention and development.
- Roadmap
- Budget

The Strategic Plan will serve as a foundation to the preparation of a Funding Proposal to be delivered to ISED in December 2021.

Anticipated Inaugural Projects

NDRIO is working with partners to harmonize and improve Canada's Digital Research Infrastructure (DRI) services and tools for Canadian researchers to support scientific excellence, academic research and innovation across disciplines. NDRIO's Call for Anticipated Inaugural Projects, undertaken in collaboration with Canada's National Granting Councils (National Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council, Canadian Institute of Health Research and Canada Foundation for Innovation), aims to bridge current gaps among the three components of DRI (ARC, RDM and RS) over the research lifecycle, while responding to the needs of Canada's research community. Specifically, NDRIO encourages projects that will integrate ARC, RDM and RS in its research to make the project's processes more FAIR (Findable, Accessible, Interoperable and Reusable). In doing so, funded projects will serve as flagships of an integrated and open Canadian DRI landscape.

Key Objectives

NDRIO is seeking proposals that will:

- Facilitate interoperability and integration among existing DRI components, new compute accelerator technologies and cloud computing infrastructure.

- Develop new or enhanced tools and platforms to facilitate the discovery, analysis, management and security of various components of the research ecosystem.
- Enable new approaches to conduct digital research in areas of national and international importance.
- Enable new approaches to conduct digital research in historically underserved disciplines.

As described in Part III, the Call for Anticipated Inaugural Projects has been postponed to the fourth quarter of 2020-2021 and the projects will start in FY 2021-2022. Following discussions with the community around the Anticipated Inaugural Projects, some potential candidates are emerging. While not assured, these projects represent promising initiatives that could propel Canada forward in the global DRI landscape. While not explicitly stated in the potential projects listed below, NDRIO is committed to meeting the needs of underserved communities both in discipline and demographically (e.g. arts, humanities, social sciences, Indigenous communities, etc.). Evaluative criteria used to assess potential projects will examine and encourage project proposals that address the unique needs of these communities.

Potential Project 1: A National Cloud Strategy

With rapid technology and cost improvements, it is increasingly clear that commercial cloud providers have an important role to play in the academic advanced research computing (ARC) sector. The National Science Foundation in the U.S., for example, recently funded an initiative (CloudBank) that provides commercial cloud access and support for computer science research and education. The top 500 list of supercomputers for June 2019 featured an entry (at #136) which was an ephemeral AWS "cluster" that cost just $5,000 to run the necessary HPL benchmark. Despite significant investments federally and provincially, researchers are still able to satisfy only 40% (or less) of their demand for compute resources on publicly funded platforms. In fact, there are academic groups and collaborations who currently pay commercial providers (using grant funding or other means) to access computing capacity to carry out their research projects. Tapping into commercial cloud resources could be beneficial for Canada's researchers as the scale, capabilities and services of the compute and storage resources available in the commercial cloud are staggering. Combined infrastructure spending by cloud providers worldwide averages more than $200M per day. Therefore, a project to explore what the potential commercial cloud can offer Canada's Researchers should be considered.

Potential Project 2: Digital Agriculture

Canada has long been a global leader in exporting its rich natural resources. Therefore, it should come as no surprise that Canadian researchers are global leaders in developing innovative solutions that improve the sustainability and productivity of agricultural production at global, national, and micro scales. Research initiatives are currently underway in Ontario, Saskatchewan and in British Columbia, which in amalgam represent a spectrum of highly innovative opportunities to make Canada a global leader in digital agriculture. For example, projects are underway to:

- Develop tools, approaches and technologies to leverage data to improve food production and sustain ecosystems;

- Transform agriculture's impact on biodiversity at the global scale;
- Sustainably intensify food productivity at the national scale; and
- Enhance food safety and livestock health at the microscale.

As an illustrative example, Canadian researchers are collaborating globally on shared data platforms to enhance food safety. Many infectious disease specialists agree that the next pandemic is largely a question of "when, not if." Many argue that the next pandemic is likely to be a food-borne illness (e.g. Bovine spongiform encephalopathy [BSE], commonly known as mad-cow disease). As a result of genetic sequence information from livestock, Canadian researchers, as a result of their collaborations, could specify down to the individual steer where an infection arose in order to take immediate and corrective actions.

Potential Project 3: Canadian Health Data Management Strategy

National digital health platforms that enable data sharing among institutions across Canada would improve health outcomes for Canadians; position Canada as a world leader in evidence-based, data-driven health research; and attract investments in the health and life sciences industries to Canada. The development of common platforms to link and share health data across institutions and jurisdictions would help researchers answer key questions about health, risk factors and disease, and would support clinicians in delivering the best care in the most affordable way. To achieve this, however, the silos in which health data currently exist need to be flattened.

One of the most compelling examples of these silos emerged during the Covid-19 pandemic, where information could not be shared between provinces that share borders. It seemed absurd that while Covid-19 did not respect geographic borders, health data did.

Enhanced digital infrastructure is essential to spur innovation, increase economic growth and increase Canada's global competitiveness. Interoperability of systems and a harmonized data and privacy framework are identified by Canada's Health and Biosciences Economic Strategy as key elements missing from Canada's digital health infrastructure. High-performing, interoperable, digital health systems and platforms are seen as critical enablers of data-driven advances in health and medicine. Yet, Canada faces significant challenges in implementing and using digital health systems.

The creation of an innovation ecosystem of researchers, industry, clinicians, and patients would strengthen Canada's international competitiveness. By investing in digital health platforms, Canada could be a leader.

Potential Project 4: Green Data Centres

On Nov. 19, 2020, the federal government introduced Bill C-12, the Canadian Net-Zero Emissions Accountability Act. Its purpose is to legislate five-year targets leading up to net-zero emissions by 2050 and to create an institutional structure to ensure that those targets are achieved. In legislating a net-zero target, Canada joins other countries that have done the same including the United Kingdom, Sweden, Denmark, Hungary, New Zealand and France.

As a growing number of organizations seek to become major players in today's data-driven economy, the data centre remains one of the most important pieces of business infrastructure. Recent predictions state that the energy consumption of data centres is set to account for 3.2 per cent of the total worldwide carbon emissions by 2025, and they could consume no less than a fifth of global electricity. By 2040, storing digital data is set to create 14 per cent of the world's emissions, around the same proportion as the U.S. does today[1]. Moreover, the amount of energy used by data centres continues to double every four years, meaning they have the fastest-growing carbon footprint of any area within the IT sector. More alarming is the fact that at three per cent of the global electricity supply and accounting for about two per cent of total greenhouse gas emissions, **data centres have the same carbon footprint as the aviation industry**[2]. NDRIO's assertion is such that if we cannot live without data centres, the technology sector needs to look for alternative models to redress their carbon footprints.

The climate research suggests that organizations lead with an energy-efficient design from the onset, adopt the latest in building technology and influence the overall supply chain for the actual sourcing of materials for these buildings. By establishing proactive sustainability and efficiency measures at inception, and by leveraging the latest technology these companies can ensure that the facility can be operated, maintained, repaired, and refurbished easily, moving into a more circular use of materials and smarter, cleaner ways of consuming energy and water.

Artificial intelligence is also being deployed in some data centres to reduce power consumption. AI can analyze data output, humidity, temperature, and other important statistics in order to find a way to improve efficiency, drive down costs and reduce total power consumption.

A potential green data centre project could be scaled to reduce the carbon footprint of NDRIO's five national data centres.

Transition

In 2021-2022, NDRIO will conduct the activities defined in the CANARIE and Compute Canada Transition Plans so full integration will be completed by April 1, 2022. The process will be overseen by the Boards of the three organizations. Project managers will lead working groups mandated to deliver the diverse components required to ensure transitions that will not impact service delivery to the researcher community.

ARC Infrastructure

In 2021-2022 NDRIO will not be involved in ARC operations. However, the ARC team will participate in the Strategic Plan process, will be engaged in the transition activities, will

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[1] Trueman, C. Why Data Centres are the new frontier in the fight against climate change. ComputerWorld, Aug 9, 2019: IDG Communication.
[2] Ibid.

contribute to the preparation of the Cybersecurity Framework, and will prepare the calls for the upgrade of the ARC infrastructure as defined in the Strategic Plan.

The ARC team will also oversee the Anticipated Inaugural Projects in assessing progress and quality of ARC deliverables.

National-Layer RS Activities

Like ARC, NDRIO will not be involved in RS operations, but the RS team will participate in the Strategic Plan process, the transition activities, the preparation of the Cybersecurity Framework, and will prepare a Call for Proposals.

The RS team will also oversee the Anticipated Inaugural Projects in assessing progress and quality of RS deliverables.

National RDM Activities

The RDM component of NDRIO helps researchers and the research community address research data management (RDM) challenges and requirements. The planned activities align with the longer-term objectives articulated in the five-year RDM roadmap for funding priorities, submitted to ISED in March 2019.[3] This work also aligns with previous reports and recommendations,[4] relies upon ongoing consultation with a national Network of Experts and Community of Practice, and is coordinated with the efforts of Research Data Canada[5] and WDS-ITO.

Progress toward achieving NDRIO's researcher-centric guiding principles will continue to be achieved by focusing on three primary goals:[6]

1. **Meeting researcher, disciplinary and institutional RDM needs** by developing and providing innovative services and resources, distributed across research institutions, coordinated nationally, internationally recognized, sustainable and based on best practices, standards and protocols.

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[3] Data Management Roadmap – 2019-2024, March 2019

[4] LCDRI Data Management Position Paper for ISED, Aug 2017; Consolidated Response to Questions from ISED on the LCDRI DM Position Paper, Fall 2017; LCDRI Coordination Position Paper for ISED, Jan 2018; LCDRI Backgrounder, Jan 2018

[5] Consultations with RDC Executive Director, and alignment with The Kanata Declaration, and other outputs from successive National Data Services Framework Summits

[6] LCDRI Data Management Position Paper for ISED, Aug 2017, p. 27

2. **Improving research, its visibility, reusability and impact** by advancing, developing and/or adopting RDM tools, platforms, processes, standards, and procedures, informed by researcher, institution, and discipline-specific needs, and in support of the entire research lifecycle (research data management planning, creation, curation, deposit, access, discover, reuse, and preservation). This work is further informed by FAIR,[7] CARE,[8] and TRUST[9] principles, specific to research data, Indigenous data and trustworthy digital repositories, respectively.

3. **Providing researchers with expert advice, support and training** in RDM best practices through a distributed network of experts, a growing community of practice and a strategic vision, plan, program and resources for RDM training in Canada.

The work of Portage, and now NDRIO, is community-driven and foundational – drawing upon a well-established and diverse cross-section of Canadian data management experts, researchers, and stakeholders who have contributed to a broad vision for RDM through their generous engagement in national Expert Groups which are, themselves, aligned with the research data lifecycle. The investment and commitment of local institutions in sharing this nation-wide pool of expertise, *pro bono*, is significant and has had a strong multiplier effect in the development and delivery of national RDM supports to researchers in Canada.

NDRIO promotes standards and best practices, expanded services, reusability, and sustainability. Much progress has been made, much work is underway, and much remains to be done as NDRIO RDM comes into being on April 1, 2021.

Standards and Best Practices

All platforms and services, and NDRIO's work with domestic and international partners and initiatives, follow and contribute to advancement of RDM standards and best practices, which in turn support achievement of the FAIR,[10] CARE,[11] and TRUST[12] Principles.

Expanding Services

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[7]Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Bouwman, J. (2016). The FAIR Guiding Principles for scientific data management and stewardship. Scientific data, 3

[8]CARE Principles for Indigenous Data Governance - https://www.gida-global.org/care

[9] TRUST Principles for Trustworthy Digital Repositories - https://www.rd-alliance.org/trust-principles-rda-community-effort

[10] Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J., Appleton, G., Axton, M., Baak, A., ... & Bouwman, J. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data, 3*.

[11]CARE Principles for Indigenous Data Governance - https://www.gida-global.org/care

[12] TRUST Principles - https://www.rd-alliance.org/trust-principles-rda-community-effort

Activities are focused on maintaining and expanding existing tools, platforms and services for researchers and the research community.

Reusability

NDRIO activities support all of the FAIR Principles (making research data Findable, Accessible, Interoperable and Reusable). Regarding the last of these principles, NDRIO follows and contributes to best practices and standards to ensure data, metadata and code are reusable.

RDM initiatives also align with the Government of Canada's 'Roadmap for Open Science'[13] call for transparency in scientific research outputs – making data "open by design and by default."

Sustainability

Expansion of national RDM services has been strategic, measured, and incremental. Transition of the Portage suite of RDM activities into NDRIO coincides with the April 1, 2021 start date of this Corporate Plan.

2021-2022 RDM Planned Activities

This Corporate Plan articulates a flexible, researcher-focused vision for RDM. This vision is designed to maintain continuity and momentum for core, ongoing elements of Portage's work,[14] while anticipating and being responsive to feedback from the forthcoming NDRIO Needs Assessment and guidance from the NDRIO Researcher Council. Initiatives will also proactively foster researcher-centric synergies among NDRIO RDM and both Advanced Research Computing (ARC) and Research Software (RS) to help ensure the success of NDRIO in fulfilling its broader DRI vision and mandate. Work will be organized under four main headings:

1. National Data Stewardship Support
2. RDM Training
3. RDM Platforms and Services
4. RDM Ecosystem Development

National Data Stewardship Support

By virtue of two previous tranches of directed funding from CANARIE and NDRIO, national data stewardship support has grown to include a strategic mix of HQP, aligned closely with the

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[13] Roadmap for Open Science, 2020 - https://www.ic.gc.ca/eic/site/063.nsf/vwapj/Roadmap-for-Open-Science.pdf/$file/Roadmap-for-Open-Science.pdf

[14] Established under earlier CANARIE and more recent NDRIO directed funding ending March 31, 2021

research data lifecycle and well positioned to address researchers' RDM needs at the national level.

In FY 2021-2022, national data stewardship support activities will include:

- Maintaining momentum on, and strategically growing, established national data stewardship supports and initiatives, working closely with the national Network of Experts, the broader Community of Practice, and other partners and stakeholders.
- Maintaining and growing international connections through membership and active participation in international organizations such as: Research Data Alliance (RDA), RDA Region of the Americas, CODATA International, Research Software Alliance, World Data System, GO FAIR and domain-specific organizations of importance to the Canadian research community, with the goal of extending and socializing the efforts and deliverables of these groups through the national network of experts and as part of broader NDRIO RDM outreach and training initiatives.
- Working closely within NDRIO to collaboratively develop a Strategic Plan for future RDM efforts, in coordination with ARC and RS.
- Maintaining momentum on the development of a national curation network[15] in coordination with the Curation Expert Group (CEG) and other community stakeholders by:
  - Conducting a gap analysis (current curation capacity, existing resources, researcher and other stakeholder needs).
  - Developing general curation workflows using best practice guidance.
  - Supporting existing and developing new communication channels (listservs, Slack channels, etc.) for community curation support.
  - Maintaining the community-generated knowledgebase for curation materials.
  - Continuing to work with the repository community to develop support mechanisms for the needs and queries of local data curators.
- Supporting the growth of a nascent network of Preservation Service Providers (PSPs) in Canada.

RDM Training

NDRIO RDM will continue the work of advancing RDM training in Canada. A new training strategy, *Strengthening Research Data Management in Canada: A National Training Strategy*, will be reviewed and validated by the community and guide training efforts. Specific mention is made of two key initiatives under the strategy: running a national virtual Data Science School and developing and launching a national Training Portal.

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[15] As articulated in the community-developed "Conceptualizing a National Approach to Data Curation Services in Canada"

- Work with the National Training Expert Group and other stakeholders, to implement the National RDM Training Strategy.
- Work with the National Training Expert Group, in partnership with other stakeholders, to organize and run a virtual, 10-week CODATA-RDA Data Science School.
- In collaboration with ARC and RS stakeholders, continuing work toward the development and launch of a national DRI Training Portal to better support researchers, data professionals, and other stakeholders.

RDM Platforms and Services

NDRIO RDM will continue to develop and deploy a diverse array of RDM platforms and services in support of key stages of the research data management life cycle. Overseen by the NDRIO RDM Service Manager, progress on several fronts, including repositories, discovery, access, reuse, sensitive data, certification, storage, and data management planning, are described below.

- Continuing the operations of the Federated Research Data Repository (FRDR) as a national repository service for Canadian researchers.
- Working with CCF partners and national host sites to develop and maintain existing storage infrastructure for FRDR.
- Ongoing FRDR Repository software development.
- Enhancing the Canadian National Discovery Service.
- Advancing the SFU-FRDR Sensitive Data Pilot.
- Providing technical and administrative guidance on certification for Canadian repositories, and piloting support for Canadian repositories to attain certification.
- Continuing to partner with CRKN to provide technical support for the DataCite Canada Consortium[16].
- Support the national ORCID consortium (ORCID-CA) HQP to:
    - Lower costs for institutions to join ORCID-CA to help attract and maintain membership.
    - Provide bilingual technical and member support, and,
    - Increase identifiability and discovery of Canadian research data.
- Continuing operational support for the DMP Assistant[17] in partnership with the University of Alberta.
- Supporting the development of an NDRIO-led DRI services catalogue across the RDM, ARC, and RS ecosystem.
- Support for data stewardship for COVID-19-related research projects in meeting FAIR data principles.

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[16] https://www.crkn-rcdr.ca/en/datacite-canada-consortium

[17] https://assistant.portagenetwork.ca/

- Continue to build relationships with and find ways to support and integrate the work of domains as they address the challenges of RDM.
  - Expand domain representation on NDRIO RDM Expert Groups
  - Continue and expand outreach to and involvement in various domain-specific initiatives with an interest in RDM.

RDM Ecosystem Development

Looking ahead, NDRIO recognizes the importance of a healthy and growing RDM ecosystem to the success of NDRIO and the need for flexibility in achieving this goal. A number of initiatives are currently underway to support the RDM ecosystem development in Canada.

Through its working groups, NDRIO is coordinating complementary activities with the World Data Systems International Technology Office (WDS-ITO). NDRIO is also working closely with Research Data Canada (RDC), currently funded under CANARIE (to be transferred to NDRIO in 2022-2023). These organizations work together to leverage resources in pursuit of common goals to advance RDM in Canada, while pursuing distinct initiatives that showcase their unique value propositions to the researcher community.

WDS-ITO serves as an international engagement mechanism for NDRIO, providing a two-way pipeline to import best practices used when building infrastructure designed to support research from other countries, and exporting Canadian expertise globally. The ITO value proposition lies in integrating data services with research software and computing resources. Broadly speaking the ITO, NDRIO RDM and RDC contribute to working groups and training programs led by each other. The ITO's FY2021-2022 SOW (supported by NDRIO) focuses on coordinating the global open science commons, developing tools and alignment between Arctic and Antarctic semantics, and integrating data services within virtual laboratories. As part of these three focus areas, the ITO and RDC co-lead an international working group creating a roadmap for research commons integration. ITO staff are members of NDRIO RDM Expert Groups on best practices in RDM.

In addition to this work with WDS-ITO and RDC, it is expected that new ideas and priorities will emerge from the NDRIO Needs Assessment, input from the NDRIO Researcher Council, and from discussions with both ARC and RS. The potential for new and/or expanded RDM initiatives and integrations is great. Support for some of these as yet unarticulated activities will take the form of targeted, '*directed funding*'; support for other initiatives would be determined through a transparent, competitive, adjudication process.

Some suggestions worth considering for competitive calls include:

1. Persistent IDs Enhancements to Existing RDM Platforms

    Standards are key to the building of effective, interoperable platforms and Persistent IDs (PIDs) are recognized as foundational in this context. Specific well-known examples include DOIs and ORCID IDs, which were a common theme across a majority of recent

CANARIE-RDC RDM funded projects. Support for these PIDs varied from being a simple field in the metadata, to the 'scraping' of the ORCID registry for metadata related to researchers' published outputs. Stronger support for PIDs would benefit both repositories and researchers. Repositories could, for instance, benefit from a push/pull integration with the ORCID registry, adding metadata from their repository to a specific researcher's ORCID record, and/or adding metadata from a researcher's ORCID record to the local repository (e.g., to link a paper to the deposited dataset). Researchers would benefit from reduced administrative burden.

2. CAF Integration

   Some recent CANARIE-funded projects intended to implement authentication and/or authorization via the Canadian Access Federation (CAF) framework. To pursue this effort, funding could be provided for an open call for existing platforms to add CAF integration.

3. Enhancements to Achieve CoreTrustSeal Certification

   The Data Repositories Expert Group is working on a pilot to provide HQP support for Canadian data repositories to achieve CoreTrustSeal Certification. As part of that process, it is likely that some repository systems would need to undertake some development effort to enhance their platforms and may need funding to be able to do so. This is different from the CoreTrustSeal Certification pilot that focuses on helping repositories work through the actual certification process itself.

4. New Data Repositories for Existing Communities of Practice

   There are a number of communities of practice (CoP) that have existing data collections/archives or who are building data collections. Some funding could be made available to facilitate integration with an existing repository community (e.g. DataONE, Dryad, OSF, Dataverse, FRDR) that is able to accommodate large data collections instead of building a new one.

   Aside from providing greater access to Canadian datasets, this program would allow NDRIO to consider possible national/international repository partners and models for collaboration.

5. Canadian Data Champions Program

   The Tri-Agencies and other stakeholders have had a range of discussion around the concept of funding "Data Champions." These would be the equivalent of an academic stipend and would achieve a number of goals: 1) promote RDM best practices in specific domains; 2) identify key "RDM-savvy" resources in all provinces and territories, and across a wide swath of domains; 3) provide NDRIO with a natural cohort of experts to engage in a range of NDRIO activities; 4) further build the national Network of Experts.

6. Improved Stewardship of Sensitive Data

Many challenges surround the management of data that are 'sensitive' by way of ethics, intellectual property, Indigenous, ecological, or other concerns. A funding call for projects to help address such issues, and to make sensitive data as FAIR as possible, is seen as a way of ensuring these data are well-described, securely stored, discoverable, and have robust access protocols in place to ensure appropriate access.

Cybersecurity

NDRIO is mandated by ISED to deliver a Cybersecurity Framework by March 2022. To that end, a Director Information Security and a Cybersecurity Specialist will be hired to prepare the framework and to work collaboratively with CANARIE and Compute Canada to harmonize approaches across all components of the DRI infrastructure.

In early November 2020, NDRIO and CANARIE agreed to align on a single brand for cybersecurity services. With this approach, all regional, national and global cybersecurity programs available to the sector will be searchable and accessible through a central website and brand identity. More details about this new site and brand will be announced in early 2021.

NDRIO has retained Information Technology expertise to ensure best practices are performed with respect to intrusion detection, addressing phishing attempts, etc. NDRIO remains diligent in its own practices and recognizes the increasing cybersecurity threats aimed at research organizations and their supports.

NDRIO also recognizes that individual organizations are incapable of addressing the spectrum of increasing cybersecurity threats they may face. Therefore, a partnership approach also underlies NDRIO's approaches externally (e.g. with CANARIE) and internally via ISED, CSE and others more knowledgeable in this space).

In 2021, upon hiring its VP Security and Operations, NDRIO will also reach out to national security partners to organize briefings by CSIS and CSE for staff and the Board, and arrange voluntary internal audits of its practices. In the meantime, NDRIO has found the following website a very helpful resource in identifying and mitigating potential security risks to the organization and has chosen to include the reference here for the benefit of others reading this plan: www.science.gc.ca/safeguarding-your-research

Management and Administration

NDRIO will complete hiring of a permanent team to support its activities. Significant work will be required to prepare the transitions with CANARIE and Compute Canada to:

- Prepare the change management framework
- Enrol staff transitioning to NDRIO
- Prepare calls for proposals, when required

- Review all contracts with third parties
- Transfer ownership of assets

Additional management and administration activities for 2021-2022 include the following:

- The organization will finalize a Membership Plan to articulate and support NDRIO's value proposition for Members.
- The NDRIO brand will be developed, including name, visual identity, tone and brand voice. The brand development process will run in parallel with the Strategic Planning process, for completion in fall 2021.
- Stakeholder engagement and communications will remain a priority, supported by a host of channels and tools. The website will be refreshed in 2021, NDRIO's social media presence will grow, and the organization will expand on other direct-to-stakeholder communications and engagement opportunities.
- The development of an Equity, Diversity and Inclusion (EDI) Policy and Plan, and Official Languages Policy and Plan, are both currently under development.

Summary of 2021-22 Planned Activities & Outcomes

| Stream 1: Build the Organization		
1. Further refine communications mechanisms	**Activities / Outputs** ■ Membership Plan ■ New brand and visual identity ■ Refreshed website ■ Equity, Diversity and Inclusion (EDI) Policy & Plan ■ Official Languages Policy & Plan	**Outcomes** ■ Member, researcher and stakeholder awareness, knowledge and satisfaction with NDRIO ■ Demonstrated leadership in EDI
2. Provide RDM services to the researcher community	**Activities / Outputs** ■ Provide RDM tools, platforms, processes, standards, and procedures ■ Provide expert advice, support, and training in RDM best practices ■ Support a growing community of practice	**Outcomes** ■ Maintained continuity of services to users ■ Researcher, disciplinary and institutional RDM needs are met ■ Improved research visibility, reusability and impact
Stream 2: Prepare NDRIO's 2022-25 Strategic Plan		
3. Build the National Service Delivery and Funding Models, in collaboration with regions, host sites and other DRI partners	**Activities / Outputs** ■ Work with ISED, CANARIE, Compute Canada, CARL, regions, host sites and other institutions involved in the delivery of services to researchers to define a National Service Delivery and Funding Models.	**Outcomes** ■ Clear, harmonized and effective DRI service and funding delivery to Canada's researchers ■ Researcher and stakeholder satisfaction
4. Prepare Strategic Plan under Board Leadership	■ National vision and mission for DRI ■ Key priorities ■ SWOT analysis ■ Desired states (ideal, feasible) ■ Transformation plan: Moving from current state to desired state, including HQP resource planning, retention and development. ■ Roadmap ■ Budget	■ Clarity of purpose, Key Performance Indicators (KPIs), activities and resource requirements to achieve the vision ■ Community alignment / social licence to implement the strategy

	Activities / Outputs	Outcomes
5. Prepare a Funding Request based on the Strategic Plan to be presented to ISED		▪ Sustainable funding ▪ Continuity of service to Canada's researchers
6. Safeguard DRI resources through enhanced investments and coordination in cybersecurity	▪ Collaborate with other organizations to prepare a cybersecurity framework	▪ Enhanced protection of Canada's Digital Research Infrastructure from cybersecurity threats

Stream 3: Coordinate Transition Activities

	Activities / Outputs	Outcomes
7. Commence implementation of transition plans, providing for continuity of service delivery and the assessment of existing HQP and infrastructure	▪ CCF – ARC ▪ CANARIE – RDC/RDM and RS	▪ Continuity of service to Canada's researchers ▪ HQP / talent retention
8. Coordinate transition activities across organizations, at the management and governance levels	▪ Considering the National Service Delivery and Funding Models, establish agreements with regions, host sites and institutions ▪ Review staff status, either through direct hires, secondment agreements or contracts ▪ Transfer licences, and assets	▪ Transitions are executed well ▪ Risks are identified and mitigated ▪ NDRIO's reputation is enhanced
9. Lead development of a change management strategy and professional development plan	▪ Support NDRIO employees, incoming staff and highly qualified personnel (HQP) in transition	▪ HQP / talent retention

Core to All Work Streams: Stakeholder Engagement

	Activities / Outputs	Outcomes
10. Lead researcher, partner and stakeholder engagement and communications	▪ Participate in relevant national and international associations	▪ Member, researcher and stakeholder awareness, knowledge and satisfaction with NDRIO
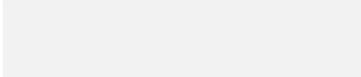
- NDRIO's reputation is enhanced

Note that following the delivery of NDRIO's Strategic Plan in September 2021, the organization will further refine its Performance, Evaluation, Risk & Audit Framework, including Performance Indicators and Outcomes.

Part V: Delivery Timeline 2021-2022

Transition Milestone #1 CARL Portage Research Data (RDM) Funding from CANARIE Ends and CARL Portage Integrates with NDRIO	October 2020
Operational Transition Plan (Compute Canada)	April 2021
Development and Delivery of Initial Projects	From January 2021
Draft National Service Delivery and Funding Models	May 2021
Organization Name and Brand Identity	September 2021
Delivery of the 2022-25 Strategic Plan	September 2021
Funding Proposal to ISED	December 2021
Cybersecurity Framework	March 2022
Transition Milestone #2: ISED ARC Expansion Program Funding Ends and NDRIO Funding Leadership Begins	April 2022
Transition Milestone #3: Canadian Foundation for Innovation Major Science Initiative Funding (Operations) Ends and NDRIO assumes full leadership of ARC	April 2022
Transition Milestone #4: Research Data Management (RDM) and Research Software (RS) Funding from CANARIE Ends and NDRIO assumes full leadership of RDM and RS Functions	April 2022

Part VI: Financial Plan

The following charts illustrate the 2021-2022 financial plan annual cash flow requirements.

Chart 1

STATEMENT OF OPERATIONS	2021-22 Corporate Plan	ISED Funding Only 2021-22 Corporate Plan
Revenue		
2021-22 Planned Activities	14,236,000	14,236,000
2020-21 Carry-Over Funds	1,973,000	1,973,000
Anticipated Inaugural Projects	11,250,000	11,250,000
ISED Contribution	**27,459,000**	**27,459,000**
Membership Fees	600,000	
Interest Income Earned	69,708	
Total Revenue	**28,128,708**	**27,459,000**
Expenses		
Operations		
Salaries and Wages	3,437,000	3,437,000
Benefits	597,000	597,000
Transportation and Communication	123,000	123,000
Services	6,043,000	6,043,000
Services – Anticipated Inaugural Projects	11,250,000	11,250,000
Supplies	236,000	236,000
Total Operations	**21,686,000**	**21,686,000**
General & Administration		
Salaries and Wages	2,586,000	2,586,000
Benefits	454,000	454,000
Transportation and Communication	38,000	38,000
Services	2,577,000	2,577,000
Supplies	118,000	118,000
Total General & Administration	**5,773,000**	**5,773,000**
Total Expenses	**27,459,000**	**27,459,000**
Excess of Revenue over Expenses	**669,708**	**-**

Financial Plan – Chart 1

Chart 1 illustrates NDRIO's 2021-22 Corporate Plan and reflects:

- Revenue from all sources – $28,128,708
- Expenses – $27,459,000
- Excess of Revenue over Expenses – $669,708

Overview

Revenue – $28,128,708

ISED Contribution amounts to $27,459,000 and includes:

- $14,236,000 for 2021-22 Planned Activities
- $1,973,000 relating to 2020-21 Carry-Over Funds
- $11,250,000 for Anticipated Inaugural Projects

Other revenue sources are:

- $600,000 in membership fees
- $69,708 in interest earned on bank balances

Expenses – $27,459,000

Excess of Revenue over Expenses – $669,708

The $669,708 excess Revenue over Expenses relates to membership fees and interest on bank balances.

Expenses

Expenses are composed of Eligible Costs ($16,209,000) and Anticipated Inaugural Projects ($11,250,000).

Eligible Costs

Eligible costs pertaining to Eligible Activities total $16,209,000 (the sum of 2021-22 Planned Activities and 2020-21 Carry-Over Expenses).

2021-22 Planned Activities – $14,236,000

As outlined in the 2021-22 Performance Framework, NDRIO has identified three planned activities:

- Building the Organization

- Preparing the 2022-25 NDRIO Strategic Plan, Including National Service Delivery and Funding Models, and
- Coordinating Transition Activities~~, Assuming RDM activities.~~

NDRIO Organization – $9,437,000

2021-22 planned costs reflect the costs associated with the building of its permanent organization structure (38 FTE's) and costs associated with strategic planning, completion of the National Service Delivery and Funding Models, transition planning support for ARC and RS, AGM and Board governance, branding and website development, administrative costs associated with legal, audit, insurance and bank and payroll charges, lease accommodation and transition support for permanent staff.

National Data Management – Portage – $4,374,000

Effective April 1, 2021, Portage activity will transfer to NDRIO. The transfer includes three broad cost categories: staff, on-going development and support for the Federated Research Data Repository (FRDR) and new initiatives that will be confirmed through the National Service Delivery Model needs assessment.

National Data Management – World Data System - International Technology Office (WDS - ITO) – $425,000

This program is a continuation and expansion of this international data management activity that began in 2021-22.

2020-21 Carry-Over Funds - $1,973,000

NDRIO is requesting $1,973,000 in 2020-21 ISED funds to be carried forward into 2021-22. The funds are to be used for:

- $1,047,000 – Data centre modifications to the three national data centres to accommodate new servers to be purchased for potential new funding that NDRIO could receive for sector specific proposals currently underway. It is anticipated that infrastructure modifications will be deemed ineligible as part of any funding NDRIO receives and as a result, this carry forward is being requested to support modifications needed for National Data centres to accommodate the volume of servers being estimated to result from this net new funding.

- $476,000 – Portage to support COVID-19 related research projects and the Repository Certification Pilot (Core Trust Seal certification).

- $450,000 – for National Service Delivery Model to recognize the delayed start date of the project and additional costs to support the strategic planning and grant management processes.

Anticipated Inaugural Projects – $11,250,000

NDRIO has initiated calls for Anticipated Inaugural Projects, totalling $20,000,000. The calls and related funding and costs are as follows:

- **Potential Project 1: A National Cloud Strategy** ($5,000,000 project total, $2,500,000 in fiscal 2021-22)
- **Potential Project 2: Digital Agriculture** ($5,000,000 project total, $2,500,000 in fiscal 2021-22)
- **Potential Project 3: Canadian Health Data Management Strategy** ($5,000,000 project total, $2,500,000 in fiscal 2021-22)
- **Potential Project 4: Green Data Centres** ($5,000,000 project total, $3,750,000 in fiscal 2021-22)

As described earlier in this plan in Part II and IV under the sub-heading *Anticipated Inaugural Projects* within the sections on *Leading and Coordinating Governance of the DRI Ecosystem*, four potential project proposals are being developed through collaboration with the ARC, RDM and RS communities.

Eligible Costs Mapped to Eligible Activities

The following chart illustrates the allocation of Eligible Costs to Eligible Activities and cross references to the planned activities.

Eligible Activity	2021-22 Planned Activities	2020-21 Carry-Over Funds	Total	Planned Activities
Leading and coordinating DRI governance	$3,342,000	$250,000	$3,592,000	• Building the organization • Preparing the 2022 NDRIO Strategic Plan, National Service Delivery and Funding Models
National Research Data Management (RDM) Activities	$4,991,000	$476,000	$5,467,000	• Assuming operations for RDM
Management and Administration	$4,453,000	$200,000	$4,653,000	• Building the organization
ARC Infrastructure	$592,000	$1,047,000	$1,639,000	• Coordinating transition activities
National Layer Research Software Activities	$315,000		$315,000	• Coordinating transition activities
Cybersecurity	$543,000		$543,000	• Coordinating transition activities
Total	**$14,236,000**	**$1,973,000**	**$16,209,000**	

Approximately 90% of the 2021-22 Planned Costs (Leading and coordinating DRI governance, National RDM activities and Management and Administration) relate to activities assumed by NDRIO in 2021-22, with the remaining 10% associated with planning for activities pertaining to 2022-23 transfers.

Management and Administration costs are a high proportion of the 2021-22 Planned Costs and reflect the back-office commissioning that will support future year's operational activity.

Cash Flow – Chart 2

Chart 2 illustrates the 2021-22 cash flow that reflects the timing of the funding sources, expenses and changes in working capital. The 2021-22 Planned Activities assumes 25% of the funding is received in April 2021 (with approval of the Corporate Plan) and the remaining 75% received in Quarter 2 with the approval of the 2020-21 Annual Report. It is assumed that the 2020-21 Carry-Over amount is available in April 2021.

Chart 2

CASH FLOW	Qtr. 1	Qtr.2	Qtr.3	Qtr. 4	Total Annual Cash Flow
Cash - Opening Balance	2,760,050	1,271,250	8,216,450	4,867,450	2,760,050
2021-22 Funding					
2021-22 Planned Activities	3,559,000	10,677,000			14,236,000
Membership Fees	600,000				600,000
Interest Income Earned	8,900	25,000	25,400	10,408	69,708
Anticipated Inaugural Projects		3,750,000	3,750,000	3,750,000	11,250,000
Total 2021-22 Funding	4,167,900	14,452,000	3,775,400	3,760,408	26,155,708
2021-22 Expenses					
2020-21 Carry-Over	1,973,000				1,973,000
2021-22 Planned Activities	3,598,100	3,689,000	3,345,000	3,603,900	14,236,000
Anticipated Inaugural Projects		3,750,000	3,750,000	3,750,000	11,250,000
Total 2021-22 Expenses	5,571,100	7,439,000	7,095,000	7,353,900	27,459,000
Changes in Working Capital					
Receipt of prior year HST rebate	305,000				305,000
Payment of 2021-22 HST to be recovered in Qtr.1 2022-23	- 65,600	- 67,800	- 29,400	- 31,800	- 194,600
Payment of March 31, 2021 accounts payable	- 625,000				- 625,000
Projected month-end accounts payable	300,000				300,000
Total Changes in Working Capital	- 85,600	- 67,800	- 29,400	- 31,800	- 214,600
Cash - Closing Balance	1,271,250	8,216,450	4,867,450	1,242,158	1,242,158

Notes: The opening cash balance ($2,760,050) includes the 2020-21 Carry-Over amount ($1,973,000), Net Assets ($507,000 – accumulated membership fees and interest earned since inception) and net working capital ($280,050).

The closing cash balance ($1,242,158) includes accumulated cash balances relating to membership fees, interest income on cash balances and year-end working capital amounts.

Part VII: Risk and Mitigation

NDRIO will assess and record identified risks in a risk register at least once per year or upon any material change.

An Audit and Investment Committee of the Board has been formed. This committee is responsible to help ensure a risk assessment is performed regularly, and the Board is informed of its risk management responsibilities.

The NDRIO senior leadership team, in collaboration with the DRI community and the Audit and Investment Committee, has identified the following potential risks during the 2021-2022 year:

Risk	Mitigation
Expectations & Timing Initial Projects delivery timelines may lag given the complexity of the subject matter, the aggressive schedule and limited resource availability. This could affect NDRIO's ability to fully meet community expectations. There is also a risk of fragmentation among the DRI community – including competing funding proposals and regional and discipline-specific approaches rather than a unified national approach – if NDRIO cannot meet expectations.	▪ NDRIO has a fully articulated workplan and resource allocation, which was developed with the full engagement of the community. In balancing the needs of the workplan with project timelines, it has had to make adjustments to its Critical Dates to meet its commitments to the community. After seeking approval from ISED, NDRIO shared these changes with its membership and the broader DRI community in July 2020 and December 2020. ▪ To mitigate against unfulfilled expectations, NDRIO will provide concrete demonstrations of delivering capacity and services, including an agile approach with Anticipated Inaugural Projects. For example, NDRIO is reserving a portion of Inaugural Project funding to ensure digital humanities, Indigenous researchers and others are targeted in the Call, as well as involving coordinating bodies such as the First National Information Governance Centre (FNIGC), with access to 10 regions and First Nations data specialists.
Continuity & Quality of Service The transition of ARC, RDM and RS to NDRIO, combined with the continuity of current operations may be complex to execute without impacting quality of service. The transition to a production-type environment will require Service Level Agreements and KPIs to assess performance. Current resources may not have the skills and/or experience to manage this transition. In	▪ NDRIO will finalize a researcher needs assessment focused on both future needs and existing requirements. ▪ It will develop and implement an aggressive outreach and communications strategy. ▪ During the transition planning, special attention will be given to ensuring a seamless transfer of operations from existing organizations to NDRIO.

Risk	Mitigation
addition, retention of HQP may prove difficult the longer the transition takes.	▪ NDRIO will undertake change management and HQP professional development. ▪ A comprehensive strategy for HQP issues management, including retention and hiring for HQP in the ecosystem, is under development (also see section on HQP on page 14 within this plan).
Domain Focus Although ARC is more complex and involves more resources (HQP and budget), transition planning for ARC should not be to the detriment of RDM and RS.	▪ The new National Service Delivery and Funding Models will be inclusive of ARC, RDM and RS. ▪ Strategic planning will reflect the differential status within each of these domains. ▪ Leads for each domain, with appropriate resource allocation, will participate in the planning process to provide for a balanced approach to transition.
Community Buy-In & Mobilization The implementation of NDRIO will require many activities to be executed in parallel. Most of these will require significant participation of the DRI community. Some resources will be solicited repeatedly, which may cause challenges with community capacity. Also of note, some individuals do not consider it part of their role to inform**,** debrief, or solicit input from a broader audience or to the broader governance or implementation groups in which they participate. This is a common occurrence with coordinating organizations like NDRIO, and often results in a perception of some in the "know" and others "not in the know," thereby contradicting goals of wide collaboration and input.	▪ Whenever possible, current existing forums will be used to optimize community participation. ▪ NDRIO has multiple layers of consultative mechanisms integrated into the organization through many channels, including the Researcher Council and Working Groups. This multi-dimensional approach helps avoid consultation fatigue from the community while securing the input needed to achieve NDRIO's goals. ▪ NDRIO will make concerted efforts to ensure it is efficient in the use of its Members' and stakeholders' time. For example, working groups will be consolidated to reduce duplicate or overlapping work and meetings. Other measures include recording presentations with voice-overs to maximize in-person meeting time (this is undertaken with NDRIO's 22-member Researcher Council). ▪ NDRIO will continue its efforts to communicate often and frequently. NDRIO is mindful of the need to share information and seek input broadly to ensure appropriate two-way information flows throughout the transition (e.g., explicitly stating expectations in Terms of Reference for working groups; using the CEO Blog as a vehicle to share information and encourage feedback; always inviting feedback in corporate communication emails via "Cyberimpact"; and encouraging information sharing and dialogue through social media.

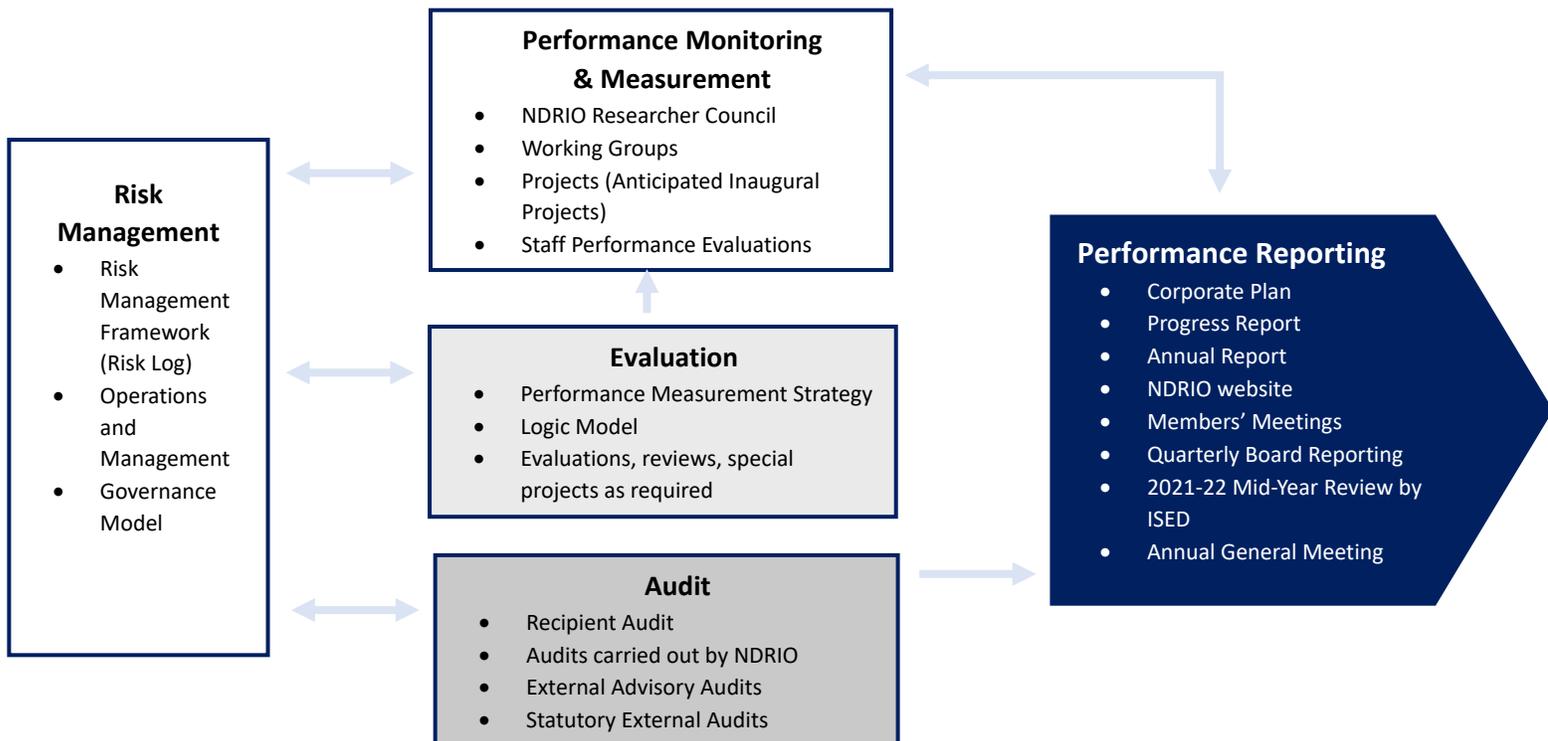| Risk	Mitigation
Stakeholder Reach NDRIO needs to involve the DRI ecosystem in its planning and operations. Significant effort has been made to identify all stakeholders, but there may be unintentional omissions.	▪ NDRIO is developing a stakeholder engagement strategy, including the implementation of leading stakeholder engagement tools. ▪ NDRIO will consult regularly with key stakeholders to augment its lists. ▪ When important information is shared with stakeholders, NDRIO will request that the communication be forwarded to any person the recipient thinks might be interested.
Inclusivity Well-established research communities may unintentionally crowd out groups that are not traditionally represented in this arena.	▪ NDRIO will undertake specific, targeted EDI activities in NDRIO governance, organizational and advisory functions. ▪ It will explore means to build capacity and support engagement for underrepresented groups.
Security – Confidentiality Risks include the disclosure of personal information in NDRIO's custody; unauthorized access to information; and ransomware or hack discovered at the National Data Centre.	▪ Personal information is restricted to HR staff. ▪ NDRIO will actively monitor and secure access to data / files. ▪ NDRIO will ensure data centres are applying cybersecurity best practices.
Security – Integrity Risks include the alteration or loss of personal information in NDRIO's custody and the inability to integrate with legacy systems of onboarding partners, e.g. CANARIE, Cybersecurity risks. There are also high levels of risk identified by recent CSE and Canadian Centre for Cybersecurity advisories. There is a substantial risk of sophisticated, targeted attacks through state-sponsored actions.	▪ Access to this information is restricted and data is backed up as needed. ▪ NDRIO will proactively consider the likelihood of this risk as part of transition plans being established. ▪ A partnership is in place with CANARIE in a jointly branded task force and initiative that considers the level of risk to intellectual property and research infrastructure, and appropriate responses based on assessed risk per the CSE and Canadian Centre for Cybersecurity advisories.
Infrastructure Risks include loss or damages of office equipment; the inability to fulfill funding requirements six months prior to the end of MSI year 5 at March 31, 2021; and the inability to synchronize maintenance and upgrade schedules for equipment at National Data Centres resulting in down times at host sites.	▪ NDRIO will ensure office systems are in secure office space; desktop and laptop systems can easily be replaced; back-up file storage in place via the Cloud (DropBox). ▪ NDRIO will engage in discussions with ISED and Compute Canada to consider alternate plans to mitigate impacts while emphasizing the need to have funds. ▪ Discussions have begun between the CEO, the Vice President, Strategy and Planning and Host

Risk	Mitigation
	Site leaders to consider timeliness and costs for equipment maintenance.
Finance Risks include adverse financial audit opinion and delays in developing the back office.	▪ Active engagement with Auditors on engagement letter and review audit plan with Board Audit & Resources Committee. ▪ NDRIO will consider alternate third-party management services in the event certain deliverables are not achieved.
Human Resources Failure to recruit qualified personnel and the inability to integrate benefits structure among transitioning organizations.	▪ NDRIO will offer fair and competitive compensation and benefits packages. Early transition plans are seeking benefits and pension comparisons to identify significant deviations from NDRIO benefits plan.
Reputation Failure to manage stakeholder expectations; failure to adequately serve the research community; NDRIO Contribution Agreement not met.	▪ The organization will ensure transparency with stakeholders and follow through on commitments; we will maintain regular and effective communications. ▪ NDRIO will actively engage in the NDRIO Researcher Council and encourage them to serve as ambassadors for NDRIO to receive and share progress. ▪ It will adequately resource projects during budget development and embrace good project management.
Governance / Collaboration Failure to provide good governance; challenges developing value proposition for Primary & Associate Members; and lose of organizational history when Board Director one-year terms are completed.	▪ NDRIO has adopted best practice governance standards: corporate By-Laws and policies, a skills matrix, self-assessment, diversity, and Board sub-committees. ▪ Working with Board Stakeholder and Member Committee to define value proposition; NDRIO has already started to engage the membership for input. ▪ Staggered terms mitigate loss of organizational memory. Governance and Nominating Committee is assessing the implications of Board terms.
Funding Inability to finalize the Contribution Agreement; inability to generate match funding with provinces; and the unacceptance of the National Service Delivery and Funding Model, and Strategic Plan**.**	▪ Work plan development with milestones. Buffer built in to work plans to ensure slippage is not detrimental. ▪ ISED and NDRIO engaging in conversations with provincial ministries and regional ARC organizations to assess likelihood of provincial match. ▪ Extensive engagement, involvement and community consultation planned to ensure

Risk	Mitigation
Inability to finalize the 2021-2022 Corporate Plan, Cash Flow and Contribution Agreement before April 1, 2021	issues / concerns are identified early and dealt with in a timely manner. • Provide required reporting to ISED on time. Ensure that ISED is kept informed of matters as they arise; promptly respond to ISED's request for information

Part VIII: Performance Monitoring Strategies

NDRIO has developed a Performance, Evaluation, Risk, and Audit Framework that was presented to ISED in December 2020. We will use the Performance Framework as a mechanism with which to monitor activity, performance and risk, at both the senior management and Board levels.

NDRIO Performance, Evaluation, Risk and Audit Framework

Risk Management
- Risk Management Framework (Risk Log)
- Operations and Management
- Governance Model

Performance Monitoring & Measurement
- NDRIO Researcher Council
- Working Groups
- Projects (Anticipated Inaugural Projects)
- Staff Performance Evaluations

Evaluation
- Performance Measurement Strategy
- Logic Model
- Evaluations, reviews, special projects as required

Audit
- Recipient Audit
- Audits carried out by NDRIO
- External Advisory Audits
- Statutory External Audits

Performance Reporting
- Corporate Plan
- Progress Report
- Annual Report
- NDRIO website
- Members' Meetings
- Quarterly Board Reporting
- 2021-22 Mid-Year Review by ISED
- Annual General Meeting

Part IX: Conclusion

NDRIO will continue to build on its first full year of operations to undertake the significant planning, coordination and change management that lies ahead. It is working hard to solidify a stellar team, establish processes, gather information, re-examine data it has collected and consult with the community. Active, regular communication, transparency and consultation are the cornerstones of everything NDRIO does. Our sincere intent is to deliver excellence for the research community and position Canada as a key player in the global knowledge economy.

Appendix A
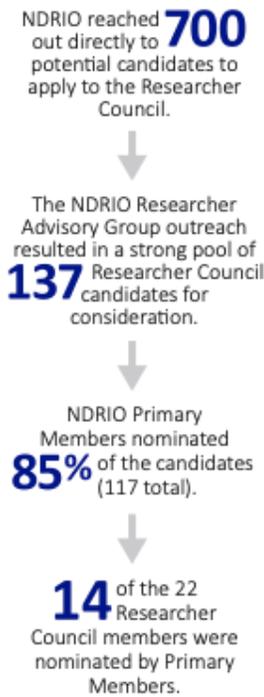
The NDRIO Researcher Council: By the Numbers

NDRIO reached **700** out directly to potential candidates to apply to the Researcher Council.

↓

The NDRIO Researcher Advisory Group outreach resulted in a strong pool of **137** Researcher Council candidates for consideration.

↓

NDRIO Primary Members nominated **85%** of the candidates (117 total).

↓

14 of the 22 Researcher Council members were nominated by Primary Members.

NDRIO | NOIRN
New Digital Research Infrastructure Organization | Nouvelle organisation d'infrastructure de recherche numérique

Researcher Council Stats

19 members are from universities

3 members are from research hospitals

18% are early-career researchers (those who have held an independent academic position for 5 years or less)

Regional Breakdown

Ontario - **8**
Quebec - **7**
West - **5**
East - **2**

DRI Expertise

Advanced Research Computing: **5**

Research Software: **6**

Data Management: **6**

Experience in all three domains: **5**

Tri-Agency Representation*

SSHRC CRSH — **7** members

CIHR IRSC — **6** members

NSERC CRSNG — **9** members

*Many Researcher Council members receive funding from more than one research funding agency.

The NDRIO Researcher Council

Guillaume Bourque
McGill University

Karen Bakker
University of British Columbia

Girma Bitsuamlak
Western University

Bruno Blais
Polytechnique Montréal

Susan Brown
University of Guelph

Carolyn Côté-Lussier
Institut National de la
Recherche Scientifique

Constance Crompton
University of Ottawa

Carl D'Arcy
University of Saskatchewan

Rebecca Davis
University of Manitoba

Philippe Després
Université Laval

Erin Dickie
Centre for Addiction
and Mental Health

Benoît Dupont
Université de Montréal

Laura Estill
St Francis Xavier University

Benjamin Fung
McGill University

Anne Martel
Sunnybrook Research
Institute

Erika Merschrod
Memorial University

Marie-Jean Meurs
Université du Québec
à Montréal

Rebecca Pillai Riddell
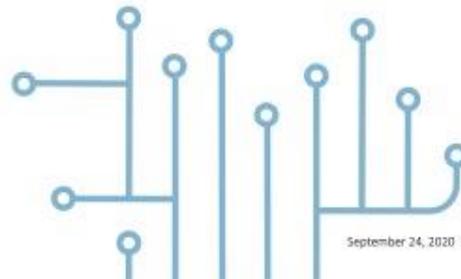York University

Erik Rosolowsky
University of Alberta

Pekka Sinervo
University of Toronto

Randall Sobie
University of Victoria

Amol Verma
Unity Health Toronto

September 24, 2020