

Linking Communities of Practice

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Overview

The term community of practice (CoP) has been applied to segments of work in the digital humanities in numerous ways over the years: as library training initiatives (Green 2014), as work around a specific encoding practice (Flanders and Jannidis 2015), and even to the DH community as a whole (Siemens 2016). This term, coined in 1991, was originally applied to learning, which the authors claimed was a “sociocultural practice” (Lave and Wenger). It has been further developed by Wenger (2011), who defines it as follows: “Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.” In this panel, we use this latter definition as a framework for reflecting on the first year of work in the Linked Infrastructure for Networked Cultural Scholarship ([LINCS](#)) Project.

A three-year infrastructure project funded by the Canada Foundation for Innovation, LINCS will convert existing humanities datasets into an organized, interconnected, machine-processable set of resources for Canadian cultural research. LINCS is not only creating a web of knowledge, however, for at the very core of research infrastructure you will find not only a technology stack, but people.

The LINCS core team is made up of thirty-five people across five provinces and five universities. In addition, forty-plus humanities and social science researchers across Canada are working with LINCS to bring their data together as linked data, and both research libraries and cultural heritage institutions are invested in the outcomes of the project. LINCS is privileged to have an international technical advisory board that spans nine institutions, with each member bringing knowledge from their own community of practice to bear on our decisions.

As we knit together these communities, each of the decisions we make, from the choice of platform to base ontology, impacts future LOD work across the country. As a community of practice, we are working to create “a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems—in short a shared practice” (Wenger 2011). LINCS, from the start, did not set out to create everything anew, but instead to draw from tools, practices, vocabularies, and ontologies that already existed to create a pipeline for LOD creation and use. We recognize those communities that built the pieces we are weaving together and work hard to be inclusive in our meetings, decision making, policies, and documentation.

When Lave and Wenger coined the term “community of practice” the web was in its infancy. In 2011 Wenger noted “New technologies such as the Internet have extended the reach of our interactions beyond the geographical limitations of traditional communities, but the increase in flow of information does not obviate the need for community. In fact, it expands the possibilities for community and calls for new kinds of communities based on shared practice.” Working on a project that brings deeper connections and meaning to the web makes this shared practice all the more necessary. The papers presented in this panel will present on major outcomes and decisions of LINCS’s first year, reflecting on how the CoP theory has been employed in these five areas: researcher inclusion (Martin), policy work and documentation (Roger), ontological decisions (Canning), platform choice (Schoenberger), and working with cultural heritage institutions towards sustainability (Brown).

Building a National Community of Researchers

Kim Martin

A community of practice is built through sustained interaction, engagement, and learning. Through LINCS, a network of forty-plus humanities and social science researchers are connected through their commitment to making their data available, as openly as possible, on the semantic web. The LINCS executive, from the beginning, has strived to work across the “two cultures,” to ensure that the technical experts on the project understand the desires of humanities scholars, and that the humanities scholars understand the language used by the technical team (Snow 1959). The complexity of speaking across languages has been evident to Digital Humanities’ scholars for some time now as a challenge of interdisciplinary research, and a project at a national scale, such as LINCS, needs to take these concerns seriously from its inception (Terras 2012).

With the challenges of interdisciplinary research and infrastructure in mind, several steps have been taken to ensure the building of community in and around LINCS. Firstly, a research board consisting of the leads of three overarching research themes, Janelle Jenstad (*Making Connections*), Jon Bath, (*Navigating Scale*), and Stacy Allison-Cassin (*Building Knowledge*) (see <https://lincsproject.ca/research/> for details on each of these themes), Susan Brown as PI, Sarah Roger as PM, and Kim Martin as chair, meets regularly. As representatives of the wider research community, the theme leads help to create policy and documentation, and to work with Martin to create ways of bringing the community together. Jenstad, Bath, and Allison-Cassin all have datasets that are early on in the conversion to LOD pipeline, and their experiences with LINCS will provide guidance to those that follow in their footsteps.

Secondly, a series of Data-Intake Interviews with individual researchers or research team leads and have been conducted in order to understand what questions these researchers want to ask when their data is converted to LOD (see a sample interview guide [here](#)). Martin, Canning, Roger, and LINCS data interface developer Alliyya Mo take part in these interviews, working together to understand researchers’ needs in relation to ontology work and interface development, and to ascertain similarities in topic, structure, or in questions deriving from various datasets. These interviews provide a starting point for collaboration: researchers begin to understand the process of working with linked data and the time

that goes into this work, and the LINCS team gains valuable insight into user expectations around creating and using LOD. As two way conversations, with the lead interviewer always encouraging the researchers to ask questions about LINCS processes, these discussions also act as a bridge over discrepancies in language, awareness, and knowledge, working to develop the trust required to ‘hand over’ one’s data for modelling, transforming, and incorporation into LINCS.

Finally, in order to ascertain the types of information LINCS researchers are hoping to highlight from their data a survey sent out in late 2020 allowed researchers to self-select from eight [Areas of Interest](#) (Aols) which, going forward, will become user groups that will meet to talk through potential connections, competency questions for the LINCS ontologies, and to test LINCS tools with datasets that are specific to their research topics.

As LINCS was conceived, the grant-writing team intentionally sought out researchers from a wide variety of disciplines, looking at various subjects throughout history, but with a shared interest in diversity and difference. Building community does not often happen easily, especially in the current climate, where everything is done in the virtual. However, as this network of people will form the start of a growing user base for LINCS, creating spaces for shared engagement and training are vital to the success of the grant.

Advancing Community Through Policy

Sarah Roger

LINCS is situated at the crossroads of research and infrastructure. The project’s contributors largely come from academia and related knowledge communities, where the focus tends to be as much on process as on results. Yet, LINCS is funded by a Canadian Foundation for Innovation Cyberinfrastructure Grant, for which infrastructure creation is the primary goal. The conjunction of community fostering with infrastructure building has LINCS harmonizing the needs of its producers with their pursuit of a product.

To achieve this balance of people and product, LINCS’s governing policies (the formal agreements that provide the project’s organizing structure) prioritize the equity, dignity, and growth of project members throughout the infrastructure-building process. This paper looks at the formal and informal structures LINCS uses to build community and how these structures centre collaboration, diversity, and inclusion.

Collaboration

Wherever possible, LINCS is looking to extend existing infrastructure, building upon established tools and interfaces rather than creating anew. To achieve this, LINCS is collaborating with [BigDIVA](#) at Texas A&M University, [HuViz](#) from Nooron Collaboratory, and the Canadian Writing Research Collaboratory ([CWRC](#)), among others. It is also forging new relationships with [ResearchSpace](#) at the British Museum (discussed in detail below) and with Natural Language Processing firm [Diffbot](#). In working with these groups, LINCS is valuing ongoing relationships and building on existing expertise. LINCS is similarly

fostering connections through the datasets it ingests. Among the many metrics LINCS has used for choosing datasets for early ingestion, a priority has been the energy that dataset owners have to invest in the LOD community. This investment can take many forms, for example helping assess tools, participating in education and knowledge mobilization activities, or contributing to the overall direction of the project.

The relationship between LINCS and both technical and research partners is reciprocal. The core team frequently engages in information gathering to ensure that we are meeting the needs of project participants and the broader community: for example, consulting with researchers about how to group datasets into mutually beneficial clusters, or working with Francophone colleagues to ensure that our interfaces are suitable for both research and teaching. These interactions spur further cooperative initiatives, such as including learning groups and tool demos that pull participants from outside of and therefore grow the LINCS community.

LINCS's boards have similarly been structured so as to throw open the project and its processes to build a community of developers and practitioners that mirrors the openness and connection that are central to LOD. Not only do we have a diversity of project partners but we are also establishing relationships across related fields. For example, the LINCS [Technical Advisory Board](#) draws on expertise in the Semantic Web, infrastructure projects, ontologies, and LOD initiatives worldwide. It is only by consulting with these other projects that we can ensure that LINCS achieves the interoperability we seek.

Diversity of needs

Just as we are working to draw in so many collaborators during the infrastructure development, so too are we writing documentation with an eye to LINCS's multiplicity of users. This means catering to people at whatever level they come to the tools and also providing access to resources that will encourage users to scale their abilities.

LINCS users will come from a broad range of starting points, from little understanding of LOD to advanced skill with SPARQL. They will also come from a broad range of backgrounds, from academic, community, GLAM (galleries, libraries, archives, and museums), and beyond. LINCS interfaces are being developed such that users situate themselves not with respect to what they do or do not know, what they can or cannot do, but rather with respect to the data and what they hope to get out of it. Our user profiles span both computer experience and domain-specific knowledge, with an eye to helping users grow in both areas (see Figure 1).

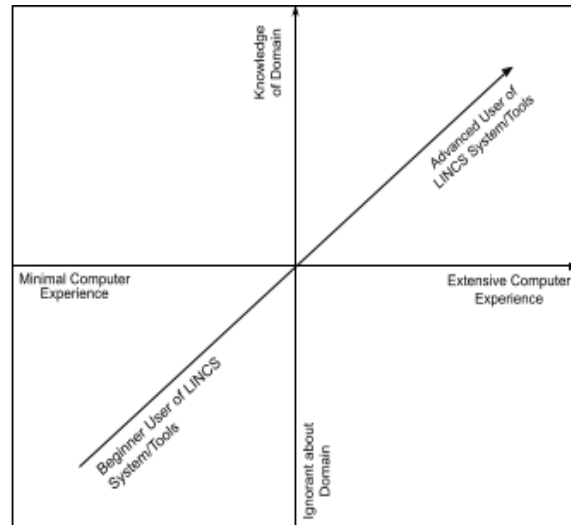


Figure 1. LINCS users across computer experience and domain knowledge
(developed from Nielson, 1993, p. 44)

Inclusive policies

LINCS's policies prioritize communities of practice in order to foster generosity and inclusion in infrastructure development. For example, community is at the centre of the [Project Charter](#), which states:

- We recognize that different people will have different levels of involvement and responsibility/commitment.
- We recognize all kinds of work are equally deserving of credit.
- We would like to foster goodwill among all the participants.

These principles combine the importance of the work being done with an acknowledgement that this value has been contributed by actual people. At its core, LINCS infrastructure is made up of the people, not tools. For LINCS, work provided by paid students or researchers giving freely of their time, full-time project staff or partners and collaborators is equally valuable not just in terms of its place within the project but also with respect to the credit that it deserves.

The LINCS [Data Contribution Agreement](#) similarly looks for ways to create a community of LOD contributors and users with statements such as:

- We are creating a repository that will make linked data more readily available, shareable, searchable, and reusable by other researchers and the larger public.
- We believe that individuals and projects should receive acknowledgement for creation of their collections.
- We have a shared interest in the ongoing accessibility, sustainable management, and long-term preservation by the LINCS project of the contributed data.

- We agree that it is desirable to allow other members of the LINCS community to build further on, update, or enhance materials in the Collection.

The Data Contribution Agreement highlights the creation of a resource that can be used by—and which will provide benefit to—people at a range of levels, and to valuing the contributions of all project participants, as well as ensuring that resources will be sustainable beyond the length of the project.

These inclusive, people-centred policies are not unique to LINCS. Indeed, we owe much credit to projects that preceded ours and which have provided guiding principles for our own, among them [A Student Collaborators' Bill of Rights](#), the [Postdoctoral Laborers Bill of Rights](#), the [Contributor Covenant](#), the [Collaborators' Bill of Rights](#), and the [ICMJE Guidelines on the Roles of Authors and Contributors](#).

The data contribution agreement, in particular, draws on a substantial body of preexisting work, including Stan Ruecker's [Interdisciplinary Project Charter Template](#), the [Data Archiving and Networked Services](#) License Agreement, the [Digital Research Infrastructure for the Arts and Humanities](#) Model Deposit License and the [Canadian Writing Research Collaboratory](#) Data Donation License Agreement.

Currently, there is no central, comprehensive repository for digital humanities research and infrastructure policy documents of the sort that we have drawn upon and are creating. We are looking to change this by archiving our documentation in a community space (e.g., Zenodo) and encouraging other projects to do the same. When the LINCS Technical Advisory Board reviewed our project workplan and policies, they noted that establishing the scaffolding on which LINCS is being built was work in its own right—and that this work deserved recognition and warranted dissemination.

For LINCS, inclusive policies are central to fostering collaboration and equity among contributors and users. If the goal of LINCS is to build infrastructure that will serve a diverse community, then the process by which it is built should serve as a model for the inclusivity LINCS aims to achieve.

Connecting User Communities through Ontologies

Erin Canning

For LINCS, as for any linked data initiative, the ontologies and vocabularies used are the technical means by which data—and through data, the communities who create and use the data—are connected. This occurs in three ways: through shared reference of *vocabularies* that allow researchers to express that they are discussing *the same person, place, thing, or idea*; through shared *ontologies* that allow researchers to express that they are discussing *the same kind of thing* (be it person, place, object, concept, or something else entirely); and through shared *ontology patterns* that allow researchers to express not only that shared use of classes and properties that comes from using the same ontologies, but by *putting these pieces together in the same way* to express synonymous concepts. However, this is not as simple as declaring a single model and vocabulary for researchers to map their data to, as that kind of approach would not take into consideration the myriad and varying needs of each researcher dataset, especially given the diversity of data and domains that make up LINCS and the project's

commitment to attend to intersectionality, multiplicity, difference, and the representation of situated knowledge (Haraway 1988). Instead, LINCS ontology work is evolving throughout the project to respond to the requirements of an increasingly wide range of researchers and their data. In order to manage this work, the ontology work is comprised of four continually looping steps:

1. Determining the foundations on which LINCS will approach making ontology decisions;
2. Making decisions about ontologies;
3. Implementing the decisions determined as a result of the first two steps of the process; and
4. Reviewing and reevaluating the decisions as they are put into practice with new researchers.

By reviewing the decisions made in light of each research project, LINCS will help bridge gaps between research communities through building up shared use cases while ensuring that each dataset is considered for its unique requirements.

Determining foundations for making decisions

At the start of the project, LINCS produced the first draft of the [LINCS Ontologies Adoption & Development Policies](#) that will govern the projects' approach to ontology selection and development. This was done before any decisions regarding ontologies were made, as it was important to outline the values and criteria against which potential ontological solutions would be evaluated. This policy document is a living document, to be updated throughout the lifetime of the project, that reflects how LINCS is going to be approaching questions of data representation.

This document touches on all three areas of connection: vocabulary selection, ontology selection, and ontology use. It lays out both key needs for handling data across the project as well as the positions held by the project in regards to the nature of very specific kinds of information, such as those related to identity and social classification. By considering micro and macro concerns, this document provides guidelines for the ontology decision making process throughout the project.

Making decisions

Guided by the policy document, ontologies are evaluated and selected in collaboration with LINCS user communities. All ontology decisions go through the Ontology Working Group before being used in the project. This group is made up of researchers from across LINCS, and bolstered by additional domain experts as required. This process ensures that decision about ontologies that effect specific domains are made in consultation with researchers from those domains: for example, the meeting to decide on ontologies for representing bibliographic and library data was attended by librarians and researchers working directly with bibliographic data in addition to regular Working Group members. However, requests for attendance are not sufficient to support involvement: it is essential for LINCS to be transparent and upfront about the nuances of the decisions to be made, as well as the evaluative process. To this end, before any Ontology Working Group meetings, the attendees are provided with clear and extensive documentations about the domain ontologies that were considered, along with an analysis of those options and a recommendation to be debated. This brings to the forefront not only the

question of what ontology to use, but the reasoning behind these decisions—especially the aspects of that consideration that are in alignment with, or contrast to, the values and positions described in the Ontologies Policies document.

Implementing decisions

The ontology decisions are then implemented in collaboration with project researchers. The researchers are involved throughout the process, and actively give feedback on the appropriateness of the vocabularies, ontologies, and ontology patterns used to represent their data. In this way, LINCS undertakes continual testing and review of the decisions made in the context of each new dataset and researcher need. Solutions developed for existing projects are proposed for new projects, and the feedback allows LINCS to “kick the tyres” on all of the decisions throughout the project, and across the three areas of connection.

Vocabularies

In order for multiple projects to reference the same vocabulary, there needs to be an agreement that the person, place, thing, or concept being referenced is accurate to the use of it by each project. This is relatively straightforward for references to people, and to lesser extents places and things, but is harder to do for concepts—especially as the meaning of things changes over time. An example of this is in referencing terms used to describe occupations or work titles held by people: the terms used by [Yellow Nineties](#) (researchers: [Lorraine Janzen Kooistra](#), [Alison Hedley](#)) have a distinctly Late Victorian context and meaning, and may not be the same in definition as the same title in a different time or place.

Ontologies

The ontologies chosen through the evaluation and selection process are tested out in implementation in both their ability to represent the data, but also in regards to the extent to which they are in alignment with, or contrast to, the theoretical perspectives that the researchers are working from. The core ontology that LINCS has adopted, [CIDOC-CRM](#), is event-centric in nature, meaning that it represents data as the result of interactions between people and other people or things, at places and times. AdArchive (researchers: [Michelle Meagher](#), [Jana Smith Elford](#)), which had been internally using the [Wikidata](#) ontology to structure their data, found that the focus on the labours involved in creating and distributing objects—in their case, feminist journals from the 1900s and the advertisements found in them—echoed feminist attention to labour, and as such represented their data in a way that more fully matched how they wanted to be representing and discussing their data and related research.

Ontology patterns

In addition to ontologies, patterns—specific ways of describing concepts using an ontology’s classes and properties—were tested across datasets. A notable example of this is a pattern to represent identities such as gender, religion, and other social classifications that came from the [CWRC Orlando](#) (principal researchers: [Susan Brown](#) and the Orlando team) dataset. This pattern, referred to as “Cultural Formations” (Brown et al. 2017), positions identity categories as not fixed classifications, but instead as

contextually embedded, culturally produced, intersecting, and discursive—startings points for investigation and understanding, not immutable points of data about a person. After mapping this pattern from the original CWRC ontology into CIDOC-CRM, LINCS is testing out the use of this pattern with additional incoming datasets to see if this representation of identity fits how researchers think of this data conceptually, if not how it is (yet) represented in their data.

Continually reviewing decisions

The process involved in implementing the decisions provides the opportunity to continually review and reevaluate the decisions made as each new perspective and accompanying sets of requirements and use cases enters LINCS. As the core purpose of these decisions is to connect a community of researchers through process and data, it is essential to leave these doors open for ongoing investigation. Throughout the project—and across each dataset—there is a need to balance interoperability, as achieved through a level of generalization, with contextual and domain-specific requirements. LINCS seeks to make visible areas of similarity while ensuring space for nuance, specificity, and difference. In order to achieve this, each researcher needs to be uniquely engaged in regard to vocabularies, ontologies, and ontology patterns that best fit their data and their needs.

Welcome to the LINCS community, ResearchSpace!

Zach Schoenberger

The LINCS Project is an effort to build an infrastructure that will enable Canadian humanists to convert, publish, share, and re-use structured research data over the web through linked data technologies. One of LINCS's early decisions was to evaluate and select a linked data storage and publishing solution that could best meet these objectives. This paper outlines the principles that guided the development of LINCS's storage and publishing infrastructure and introduces [ResearchSpace](#) as the principal application for this endeavour. This paper presents ResearchSpace as a linked data platform that will help LINCS promote a community of practice among Canadian humanities researchers. This presentation also comes from the perspective of a linked data technologist, whose technical work around the publishing of linked data is necessarily guided by ongoing communication with researchers, ontologists, and other linked data experts.

Although each participant in LINCS is part of the LINCS shared community of practice, they each possess varying knowledge of linked data technologies and concepts. An ideal linked data publishing platform should therefore provide certain affordances to its users that ease the barrier to interaction:

1. Users should not face unnecessary technical barriers (i.e., no practical knowledge of SPARQL required).
2. Users should not face unnecessary conceptual barriers (i.e., a nuanced understanding of a complex conceptual model is not required).
3. Users should be able to search, browse, create new entities, and build new links between entities across LINCS datasets, and across the wider linked open data cloud.

With these factors in mind, ResearchSpace was selected as the best candidate for the LINCS project. According to the creators, “ResearchSpace is an open-source platform designed at the British Museum to help establish a community of researchers, where their underlying activities are framed by data sharing, active engagement in formal arguments, and semantic publishing” (Oldman & Tanse 2018). In other words, ResearchSpace and LINCS share a similar vision, where researchers can engage with linked data as part of a broader community of practice. LINCS has since adapted the ResearchSpace platform to operate on its [Kubernetes infrastructure](#), and is in the process of [customizing an instance](#) to meet the needs of the LINCS community.

In linked data terms, unnecessary technical barriers include the provision of data storage typically through a triplestore, and the use of SPARQL, a complex query language designed specifically for linked data. To mitigate the first barrier, LINCS manages the technical infrastructure and its application centrally, thus reducing the burden of data storage otherwise placed on the end-user. In terms of SPARQL as a barrier to using linked data, ResearchSpace provides a mechanism of abstraction called [knowledge patterns](#). A knowledge pattern is a formalized way of providing instructions, written in SPARQL, to describe how a given entity (or class of entities) is represented in ResearchSpace. Knowledge patterns provide a flexible system for presenting data selectively to a user. When a user navigates to an entity, ResearchSpace looks for any corresponding knowledge patterns which, when executed, return a label and value(s) from the result set of the prepared query. This allows for flexible data models that can be customized to interact with any well-formed ontology. The creation of these patterns rely on collaboration between the technologist, ontologist, and researcher: a technologist to write SPARQL queries, an ontologist to help navigate the ontological density, and the researcher who ultimately decides the level of granularity and complexity that meets their needs. Most importantly, knowledge patterns relieve the end-user of having to interact directly with linked data in its native form.

Conceptual barriers to engagement were another concern in the selection of the platform. In particular, an end-user shouldn’t be expected to understand the nuanced complexity of an ontology like CIDOC-CRM. At the same time, this goal should be achieved without diminishing the value inherent in complex, nuanced ontologies. In the case of ResearchSpace, the knowledge pattern achieves this balanced approach. Knowledge patterns are iteratively designed in collaboration with researchers. This process results in knowledge patterns that traverse the complexity of the knowledge graph (using a constructed SPARQL query) while distilling that complexity into a human-readable format (i.e., a field label and a value), depending on the context of the data. By reducing conceptual barriers, more researchers are able to interact with linked data without requiring any additional knowledge of the specific ontological rules upon which their data has been modeled.

Functional support for research activities—for example, data discovery through search, browse, explore, etc.—was yet another consideration for an ideal publishing environment. Of particular interest was the ability for researchers to connect their data with others’ in the wider linked data universe.

ResearchSpace was designed with these goals in mind by providing customizable search interfaces, data visualization, a digital canvas called a “knowledge map” that facilitates visual exploration across the

graph, and experimental tools like the “semantic narrative,” which weaves traditional textual narratives with figures derived from the knowledge map. Moreover, researchers are able to expand and reshape the existing graph through embedded data creation and modification tools. All of these features are customizable based on the specific needs presented by the domain in general or the specific researcher.

LINCS is in the process of customizing an instance of ResearchSpace to meet the needs of researchers and the broader community. We are excited to say that testing of the application has revealed strengths in all of the three areas we were anticipating: low technical barriers, low conceptual barriers, and robust tooling. LINCS will be announcing a production release of the platform within the year.

Linking Ahead: Sustainability

Susan Brown

The LINCS project has incorporated sustainability considerations into its planning from the proposal stage. LINCS builds on and benefits from past crucial but tentative and disconnected efforts with LOD in Canada, and is formally partnered with some of the key but by no means all of the potential stakeholders in this space. “This space” is expansive, reaching beyond scholars working with LOD in the humanities and social sciences and the academic libraries that support them. The GLAM community of galleries, libraries, archives, and museums whose holdings researchers interpret, curate, and remediate have an interest in contextualized and nuanced LOD that parallels that of LINCS researchers. Publishers provide one of the most significant ways in which interpretation and remediation of cultural objects occurs, and stand to benefit from LOD’s ability to enrich online and device-based reading as well as from the greater exposure resulting from being linked into scholarly and institutional LOD networks. Knowledge ecosystem partners are also essential stakeholders with a long-term commitment to sustainability.

Together these current and potential future stakeholders in the LINCS infrastructure belong to an emergent LOD ecosystem within which shared infrastructure supports linkages between related online content across stakeholder groups, linked by overlapping communities of practice. LOD is a “heavy” technology stack that requires dedicated expertise to establish and maintain. For that reason, none of these sectors has implemented LOD technology fully. Yet its potential for research, cultural, social and economic benefits is huge when one considers the extent to which cultural materials span so many sectors. Groups that stand to benefit from and in many cases contribute to a robust LOD ecosystem in Canada include:

- Researchers (as individual researchers and through collaborative projects) and universities;
- Libraries (research libraries and public libraries);
- Knowledge-sector non-profits, such as the Canadian Research Knowledge Network ([CRKN](#)) and [Scholars Portal](#);
- GLAM institutions of all sizes and the theatre industry;

- Government agencies, including Library and Archives Canada ([LAC/BAC](#)) and the Canadian Heritage Information Network ([CHIN](#));
- University presses, small presses, and academic commercial presses; scholarly journals;
- The public education sector and the educated public.

None of these sectors is in a position to stand up a robust LOD stack independently but given their intersecting interests and the mutual benefit that would accrue from an infrastructure devoted to information sharing and interoperability, infrastructure that enabled the production and application of Linked Open Usable Data across all of these sectors would be a game-changer for the dissemination and study of Canadian culture online.

LINCS prepared to enter this space, grounded in the experience of sustaining the Canadian Writing Research Collaboratory ([CWRC](#)), fully aware that long-term sustainability would pose a major challenge. In the Canadian context, the creation of the New Digital Research Infrastructure Organization ([NDRIO](#)), which from March 2022 will assume the responsibilities of [Compute Canada](#) and assume a much broader mandate that includes support for research software as a vital component of infrastructure, makes the situation more hopeful but also more uncertain because the new model is not yet known. This makes the road ahead less clear with respect to multi-institutional and multi-sectoral infrastructure collaboration, but nonetheless the project has tried to lay the ground for sustainability. LINCS is looking hard at other organizational models for achieving infrastructure sustainability in the longer term, including CRKN, [Pelagios](#), [Huma-Num](#), [CLARIAH](#), [DARIAH](#) and [Parthenos](#), recognizing that sustainability strategies are hugely determined by funding conditions.

Practically speaking, LINCS hopes that existing partnerships with CRKN, LAC/BAC, and other data holders beyond academia, emerging partnerships with CHIN and key research initiatives in the GLAM field, as well as pilot projects in the publishing sector, will help to inform us of the needs and workflows associated with these areas of the ecosystem, and help to ensure that the infrastructure will be useful beyond the research context. The LINCS Technical Advisory Board, composed of leading international experts in LOD from a range of sectors, will also be helpful in this regard. The governance structure of the project is also designed to facilitate the shift to the operations and maintenance phase of the project. Two inter-institutional agreements (IIAs) were put in place at the start of the project: one governs the relationships among institutions who are building the infrastructure under the CFI grant; the other more substantial IIA lays out the principles and modes of collaboration and decision-making that allow other stakeholders to join the LINCS initiative, with a view to establishing a body for longer-term governance.

There are substantial challenges associated with this approach, including the tension between infrastructure building and the unfunded ancillary activities that position a project for sustainability, between broader community engagement and focusing on the research datasets LINCS is committed to mobilizing. Yet given its potentially very broad base of users spanning many different communities and sectors, LINCS offers a useful case for thinking through the ideal conditions for sustainability, in the context of the current consultations surrounding the reorganization of digital research infrastructure in Canada.

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