OVERVIEW OF NORWEGIAN AND INTERNATIONAL DIGITAL RESEARCH INFRASTRUCTURE

Relevant processes, existing digital research infrastructure, and training opportunities

Content

1 Introduction

This overview was written within the framework of the Governance Project D1(C) *Digital Research Infrastructure,* implemented in 2022. The overall purpose of the Governance Project is to respond to a particular challenge that Kristiania University College faces on the pathway to becoming a university: an increasing degree of research activity entailing greater demands concerning digital research and administrative infrastructure.

Greater and more secure digital research infrastructure will substantially help our institution to achieve excellent research quality. Moreover, we must ensure that digital research infrastructure accommodates the needs of each research field at Kristiania. We also aim at using digital research infrastructure to reach the European and national goals of open research, data sharing, and reuse of data embodied in the FAIR principles (Findable, Accessible, Interoperable, Reusable).

We focused on three areas: strategic processes and collaboration opportunities concerning digital research and administrative infrastructure; existing external digital research and administrative infrastructure; and available training opportunities.

Recommendation:
This overview gives Kristiania's researchers valuable information for selecting adequate, effective, and alternative digital research infrastructure for their projects. It can also serve Kristiania as a reference for the strategic acquisition of digital research infrastructure. Research leaders should get informed about (inter)national processes, external services and funding opportunities. This overview can also be useful for our research partners in Norway and internationally, giving systematized information that can help researchers to navigate the – sometimes – entangled landscape of digital research infrastructure to find effective tools for research.

2 Definitions and acronyms

Digital research infrastructure (e-infrastructure/digital infrastructure) is Information and Communication Technology (ICT)-based infrastructure that enables advanced and collaborative research. Digital infrastructure includes equipment, operations and related services for high-performance computing, data storage, software systems and high-speed networks, as well as tools for efficient workflows and software for the simulation and analysis of data. The term digital infrastructure is also used for digital registries and databases, as well as tools and services to secure and make these accessible.

RCN	The Research Council of Norway
HK-dir	The Norwegian Directorate for Higher Education and Skills
NeIC	Nordic e-Infrastructure Collaboration.
SIKT	Norwegian Agency for Shared Services in Education and Research
UiO	University of Oslo
UiB	University of Bergen

☑	Open for Kristiania
☒	Not available for Kristiania
€	Service for a fee

3 Relevant national and international processes and opportunities.

3.1 Ongoing relevant national processes relating to digital research infrastructure

- *New Norwegian roadmap for research infrastructure 2023*

  The roadmap is being prepared by the RCN using expert input from the institutions that have applied for funding from the National Financing Initiative for Research Infrastructure since its inception in 2009, and insights from thematic workshops. The final version of the roadmap is scheduled for completion in June 2023.

- *Action plan and co-management model for digital restructuring in higher education and research*

  HK-dir is responsible for following up on the strategy for digital restructuring in the university and university college sector. A draft action plan and co-management model for digital restructuring in higher education and research was launched in November 2022 after consultation with educational institutions, including Kristiania University College. A relevant strategic area is *Open research and new research opportunities*.

3.2 Completed relevant national processes relating to digital research infrastructure

- *Legal and ethical issues related to the collection, sharing and use of randomised trials in crises* (only in Norwegian). June 2022. Expert group led by Mari Rege and commissioned by several ministries and governmental agencies including RCN.

  Relevant conclusions:
  - A more data-driven management in normal times can help preparation for the next crisis (E.g., good infrastructure for collecting, sharing, and using data)
  - Focus on existing communities of expertise. Context is important: a) communities complement and support each other; b) users of the communities of expertise should not experience complex services and too many actors.

- *Efficient and secure infrastructure for sharing and using relevant statistics and data in crises* (only in Norwegian). June 2022. Expert group led by Simen Markussen.

  Relevant recommendations:
  - Investing in up-to-date infrastructure for receiving and processing large amounts of data.
  - Amending the statistics regulations that make it difficult to provide completely up-to-date data via Statistics Norway before statistics are published.

- RCN *Investment in infrastructures for FAIR research data and particularly relevant management data for research* (only in Norwegian). May 2022. Led by Kenneth Ruud.

  Relevant recommendations:

  - By 2030, all subject areas in Norway must have access to expertise, guidance and curation of research data, either in the form of national solutions, or wholly or partly through participation in European or international infrastructure collaboration.
  - In selected areas, Norway will have world-class data infrastructures preferred by international users.

- Norway must have an escalation plan for the organisation and financing of data infrastructures.

- Ministry of Local Government and Regional Development, *Sharing industrial data* (only in Norwegian). May 2022. Led by Heri Ramampiaro.

  Relevant conclusions:
  - In centralised architectures, such as data platforms, the parties' data sets are stored with a central actor. The infrastructure provider would also be responsible for interoperability and security in the architecture.
  - When exchanging data in a common architecture, a decision should be made as to who is responsible for following up access and managing (E.g., third party rights, data quality, etc) the common infrastructure or platform.

- RCN, *Evaluation of the INFRASTRUKTUR initiative as a funding instrument*. May 2021. Led by Lars Börjesson.

  Relevant conclusions:
  - INFRASTRUKTUR should continue and be the most important mechanism for investments in national research infrastructures and Norwegian nodes in international research infrastructures.
  - RCN should conduct landscape analyses to identify the needs for new investments and upgrades of existing research infrastructures with a 15-year perspective.
  - Research infrastructures that require regular, large investments and affect the entire research system should be funded centrally and not through INFRASTRUKTUR funding that is subject to competition. Central funding will ensure continuity and limit difficult prioritisations between these infrastructures and more specialised infrastructures. This applies especially to UNINETT Sigma2 AS (now SIKT)

- Sigma2-RCN-UiO-UiT-UiB-NTNU, Needs and funding strategy regarding national e-infrastructure for research during the period 2020–2030 (only in Norwegian). December 2019. Led by Kenneth Ruud.

  Relevant recommendations:
  - Basic funding of national, generic e-infrastructure should cover at least 80% of the total cost of these services.
  - Cutting-edge performance and investments in new e-infrastructure architectures and services should be funded through the arena in the INFRASTRUCTURE programme, subject to competition, and should not exceed 20% of the total e-infrastructure costs.
  - Basic financing of e-infrastructure services is agreed for three years with funding institutions, and includes expected growth during that time.

- RCN, Evaluation of UNINETT Sigma2. 2019. Led by Sverker Holmgren

  Relevant conclusions:
  - Sigma2 provides access to national e-infrastructure – with a focus on high-performance computing and large-scale data storage – enabling Norwegian researchers to be highly competitive in the international arena. Sigma2 is currently a well-functioning e-infrastructure.
  - Universities in the Sigma2 consortium should develop/clarify transparent e-infrastructure strategies fully harmonised with the national Sigma2 strategy and clarify the roles of the local computing centres/IT organisations.

3.3 Relevant international processes and collaboration opportunities.

- European Health Data Space
  The European Commission is leading an ongoing process for the introduction of a European framework for sharing health data. One of its goals is effective and secure access to health data for use in research, innovation, policy and regulatory development.
- The European Strategy Forum for Research Infrastructures (ESFRI)
  ESFRI acts as the European knowledge hub on Research Infrastructure (RI) and advises European countries on national, European and international investments in scientific facilities. Norway has appointed two delegates to ESFRI.

4 Access to external digital research infrastructure.

4.1 Relevant Norwegian suppliers of e-research infrastructure

To date, no complete overview of the Norwegian e-infrastructure landscape and access opportunities exists. OpenScience.no, coordinated by the RCN, Norwegian universities and Sikt, are mapping research infrastructures and services commonly used in Norway.

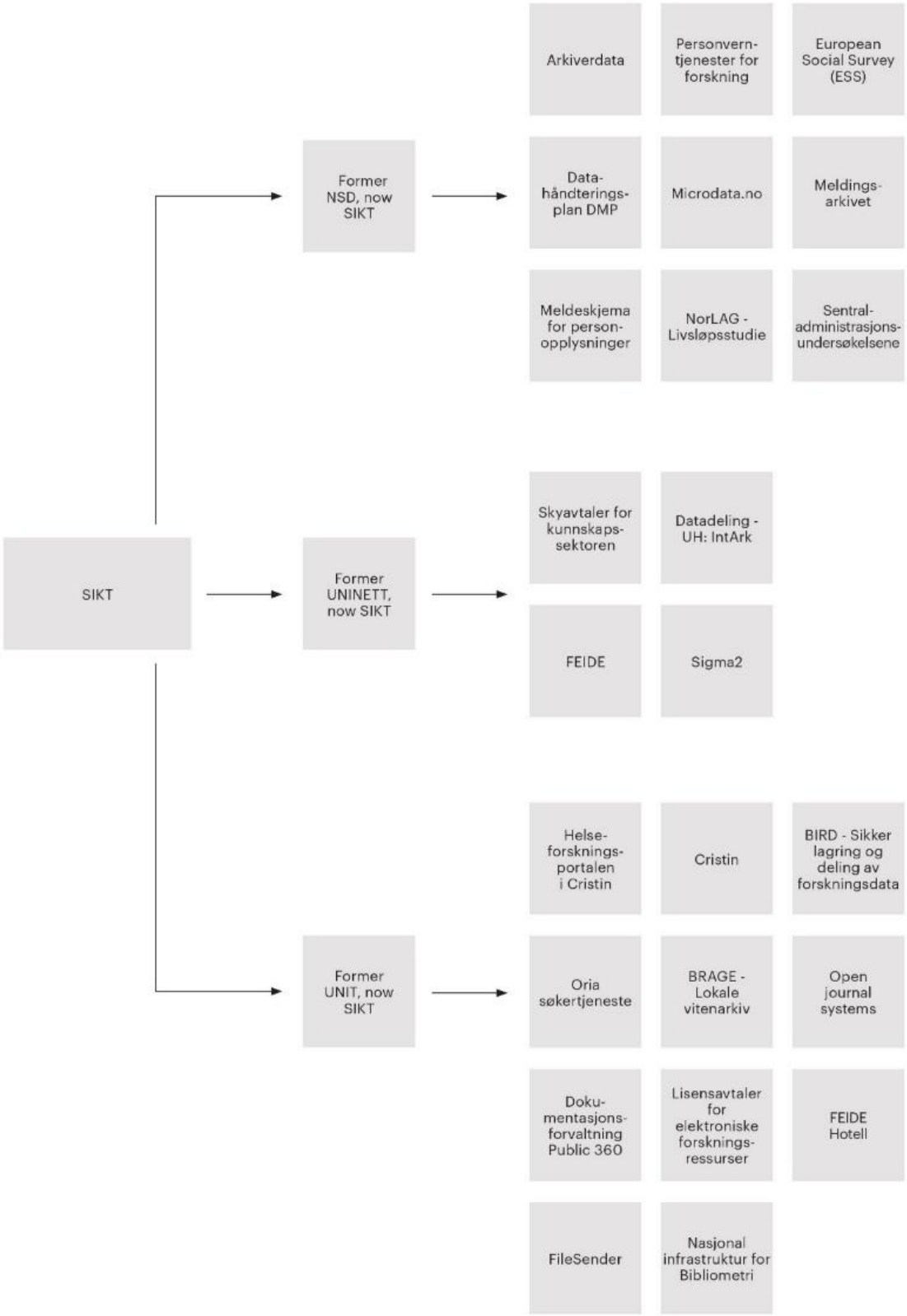
The Norwegian e-research infrastructure has mostly been coordinated through UNINETT AS (a part of Sikt) and its subsidiary Sigma2. They also have more specific user and data-oriented services provided by national initiatives and research infrastructures within specific domains.

4.1.1 Sigma2 ☑ €

Sigma2 is strategically and operationally responsible for the national e-infrastructure for computational science and storage of scientific data in Norway. Application is twice a year.

4.1.2 SIKT ☑ €

Sikt develops, procures and delivers services for education and research previously managed by UNIT, UNINETT and NSD. Sikt offers a common infrastructure for the knowledge sector and focuses on digitalisation, data sharing and open research. (Click on the infrastructure you want to read more about).


SIKT
Former NSD, now SIKT
Former UNINETT, now SIKT
Former UNIT, now SIKT
Arkiverdata
Personvern-tjenester for forskning
European Social Survey (ESS)
Data-håndterings-plan DMP
Microdata.no
Meldings-arkivet
Meldeskjema for person-opplysninger
NorLAG - Livsløpsstudie
Sentral-administrasjons-undersøkelsene
Skyavtaler for kunnskaps-sektoren
Datadeling - UH: IntArk
FEIDE
Sigma2
Helse-forsknings-portalen i Cristin
Cristin
BIRD - Sikker lagring og deling av forskningsdata
Oria søkertjeneste
BRAGE - Lokale vitenarkiv
Open journal systems
Doku-mentasjons-forvaltning Public 360
Lisensavtaler for elektroniske forsknings-ressurser
FEIDE Hotell
FileSender
Nasjonal infrastruktur for Bibliometri

4.1.3 Datafabrikken ☑

Run by DigitalNorway and the Norwegian Digitalisation Agency, it aims at reducing technical, legal and business barriers associated with sharing and using data. Available infrastructure and services:

- Search service ☑: Over 1600 datasets from the public sector
- Datajegeren ☑: Help to find public data which is not yet available in the data catalogue.
- Datafabrikken – Knowledge: Legal advice from experts on issues regarding GDPR, business agreements and technical challenges. They also have a National Resource Centre for Data Sharing, which is its legal specialist environment for data sharing and digitalisation.
- Datalandsbyen ☑: User forum creating arenas for innovation and business development.

4.1.4 UiT Open Research Data (Dataverse)☑

UiT's archive for open research data. Repository for research data regardless of discipline/subject area. Uploaded data is visible via large search engines such as Google Dataset Search.

4.1.5 NREC ☑€

Collaborative project between UiB and UiO, with support from NeIC. NREC provides cloud infrastructure for several high-profile academic projects, including CERN's ALICE and ATLAS experiments. Their hardware is located *on-premises*, their services are developed locally, and they are almost exclusively based on open-source software and open standards.

4.1.6 Educloud (UiO) ☑€

Project-oriented self-service platform for research projects and collaboration in research. This is designed for research projects that do not require the same high level of security as sensitive data. Educloud offers:

- A working environment for research projects that have participants from several institutions and countries
- Storage that can be accessed from anywhere, from any device and shared between project users and project platforms (Windows, Linux, HPC)
- A low-threshold HPC system that offers batch job submission (SLURM) and interactive nodes.

4.1.7 Other Infrastructures from UiO☑€

A complete overview of research infrastructure at UiO's Faculty of Mathematics and Natural Sciences can be found here: MN Library. All UiO approved core facilities: UiO Research Infrastructure

4.2 Relevant Norwegian funding sources for digital research infrastructure

4.2.1 RCN INFRASTRUKTUR initiative ☑

The RCN does not normally provide funding for investment in and operation of data resources for data-intensive data processing unless the investment is coordinated with, or comes entirely from, Sigma2. Research groups that require data resources are advised to contact Sigma2 at the beginning to clarify whether their needs can be met through existing or planned Sigma2 investments. Regarding applications for new national research infrastructure that requires storage or data resources, the RCN expects the project owner to establish a dialogue with Sigma2 on how these needs can be met and that the costs are incorporated into the budget for the infrastructure being applied for.

4.2.2 The Trond Mohn Foundation

They contribute to the establishment of infrastructure at the UiB and Helse Bergen. The projects range from innovative research infrastructure within the social sciences to medical equipment. The Mohn Foundation itself initiates new projects and contacts relevant partners.

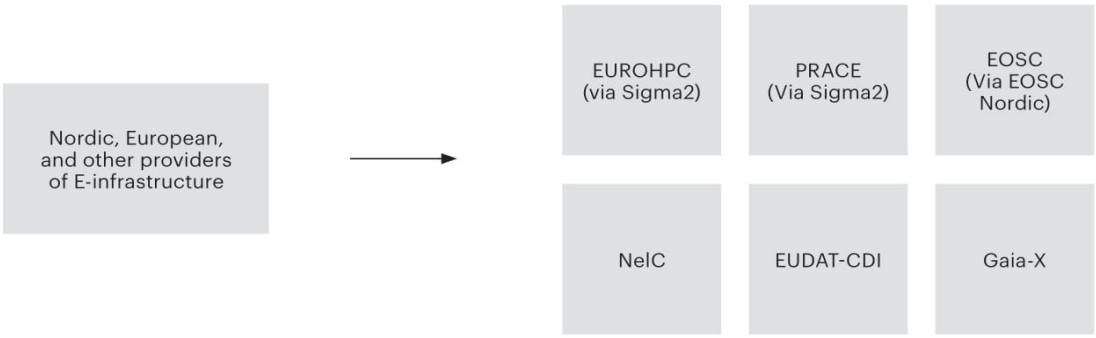
4.2.3 NORHED II ☑

Norwegian Programme for Capacity Development in Higher Education and Research for Development (NORHED) was established by Norad in 2012. NORHED aims at strengthening capacity in higher education and research in low and middle-income countries so that they can educate more qualified candidates, as well as produce an increased amount of good-quality research, conducted by the country's own researchers.

4.3 Relevant Nordic, European and other suppliers of digital research infrastructure.

At the European level, the European Commission provides a list of European research infrastructures that provide free transnational access.

The full Research Infrastructure Landscape list provides an overview of Horizon 2020 research infrastructures in Europe (including those that do not offer free access) arranged according to topic. The list is updated regularly. Included in the image are six providers that could be especially useful to researchers at Kristiania. (Click on the infrastructure you want to read more about)



4.4 Relevant Nordic, European and other funding sources for digital research infrastructure

4.4.1 Horizon Europe ☑

Horizon Europe will provide Europe with sustainable, world-class research infrastructure that is open and accessible to the best researchers from and outside of Europe. It will also encourage the use of existing research infrastructure. Funding information is available on the Funding and Tender portal.

4.4.2 Digital Europe Programme ☑

This programme provides strategic funding support to projects in five key capacity areas: in supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and ensure the broad use of digital technologies across the economy and society, including through digital innovation hubs. Information about funding is here.

4.4.3 NordForsk ☑

NordForsk funds and supports Nordic research collaboration and research infrastructure. The financier announces grants on an ongoing basis (approx. six times per year). Information about funding here.