
Plan Overview

A Data Management Plan created using DMPTuuli

Title: Printed Intelligence Infrastructure

Creator: Ronald Österbacka

Principal Investigator: Matti Mäntysalo

Data Manager: Ronald Österbacka

Contributor: Heli Jantunen, Jussi Hiltunen, Martti Toivakka

Affiliation: Åbo Akademi University

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Template: Data Management Policy (RIFs)

Project abstract:

Printed intelligence is rapidly emerging field of technology, being a key enabler for next generation electronics products such as flexible, thin, light-weight and cost- and resource-efficient electronics and photonics. Printed intelligence infrastructure (PII) is established to provide world-class research and development environment to researchers and technology developers in academy and industry. It offers an efficient use and easy access to a modern research and pilot-manufacturing infrastructure covering the whole research/development path from (i) materials via (ii) functional printing, (iii) components and devices to (iv) circuits and systems. PII provides open access

services: 1) collaborative research and development, 2) access to infrastructure, 3) design, prototyping, and piloting, 4) characterization and measurement services, and 5) training and education.

Available processes include synthesis on novel materials, formulation of pastes and inks, manufacturing from high-density digital fabrication to large-area roll-to-roll (R2R) processes to hybrid integration, low-voltage thin-film devices and circuitry, and finishing and integration steps to fabricate functional systems for e.g., distributed sensors, internet-of-everything, diagnostics, on-skin electronics, and personalized drug dosing, with sustainability as a comprehensive approach. One major target in PII is the sustainability in a very broad scope including not only technological aspect but also environmental, social and economical ones.

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Printed Intelligence Infrastructure

Data management policy

General description of data managed within research infrastructure

The data collected will consist of results from experiments, theoretical work and numerical modelling within all aspects of materials, process and application design, characterization, development, description and validation. Experiments are based on both home-made specialized set-ups while some rely on standardized instruments and protocols. Most of the data can be collected in standard file formats. Most data related to characterization of physical properties of materials, processes and devices are typically stored as text files that can be read via office tools. However, certain instruments may use proprietary formats. Even then, the data will be exported to standard formats if possible. The aim is that the data can be opened using widely used software packages. We will use standard quality control methods and protocols for capturing and evaluating data. These include, but are not limited to, taking repetitive measurements from different samples, use of reference measurements and samples, all aiming at increasing the data quality. Standard instruments will be calibrated as required by the manufacturer. Software for numerical modelling will be debugged extensively using well-known standard cases as reference. All data that will be published will be peer-reviewed as a final assurance of quality.

We foresee that the organizations have enough storage space for data that will be generated during the research (estimated as 3 Tbit) available for free. The infrastructure is not collecting sensitive personal data. However, some data (such as patients' vital data) will be collected using devices produced by the infrastructure. These data can include sensitive personal data. To process these data, appropriate data privacy protection measures will be taken into use (such as data pseudonymization and access control based on data needs). When necessary, personal data processing risk assessments and data privacy impact assessments will be carried out as well. However, the majority of the collected data is not considered personal data. In case of research data that includes personal data which possibly also includes sensitive personal data of users the advice is as following: For the studies including hospitalized patients, a favorable statement of the ethical review board of hospital will be applied to the research plans and the records of processing activities (GDPR Art. 30). All the research data will be processed as either anonymized or pseudonymized and the personal details (name, social security ID, contact information etc.) will not be delivered outside the hospital. This personal information will be accessed only by the medical doctors or nurses working in the hospital and treating the patients. The registers that list the patients participating in the studies will be stored and destroyed according to the patient and research data policy of the hospital and will not be delivered outside the hospital. Possible restrictions set by ethical review board and/or authorities related to the sharing of anonymized research data will be respected. The measurements related to the performance and feasibility of the printed sensors and conducted with healthy volunteers, a favorable statement of ethical review board (either the ethical review board of hospital or the Ethics Committee of the region/organization) will be obtained and the anonymized measurement data related to these measurements is made public similarly as the data from the measurements containing hospitalized patients.

Agreements on rights of use

The consortium agreement for the infrastructure defines the user rights and obligations, as well as IPR management. Every organization owns and guides the right to use their own data, according to the guidelines set by the respective organization and the recommendations in this policy. For shared data, Creative Commons licenses (e.g., CC BY for data and CC0 for metadata) or other licenses more suitable depending on data type are recommended to ensure responsible reuse.

The infrastructure will guide the user to improve and share best practices between the different organizations. The steering committee of the infrastructure recommends users to follow the FAIR principles: <https://www.go-fair.org/fair-principles/>

Opening or restricted sharing of data

Data is produced in four different categories of openness within the project:

Category of project	Openness of data	Handling of raw- and metadata	Note:
1. Fully open	Fully open data	Raw- and metadata is recommended FAIR compatible after publication	The data are available for everyone to download.
2. Partial confidentiality	Discretionary open	Metadata open (in Qvain) and data accessible after publication upon request	In order to download files, the user must request permission to do so.
3. Classified	Embargo	Metadata open (in Qvain) and data open for consideration after confidentiality period has expired	The data will be available for everyone to download from a specified "Date Available" date.
4. Industrial projects	Industrial projects	Classified, unless data owner has given written consent, according to agreements	

The partners are committed to increasing openness, visibility and availability of their scholarly output by promoting open access and transparency in the management of research data and metadata. The infrastructure is committed to making data which will be published shared in Fairdata IDA or in subject-specific or general repositories. Users are instructed in the "users handbook" to use the national infrastructure available for fairdata.

We will use the Qvain service (<http://qvain.fairdata.fi>) for publishing and documenting metadata, IDA for storing data: <https://www.fairdata.fi/en/ida/> and thereby searchable via the Etsin service (<https://etsin.fairdata.fi/>). The recommendation will be that the data should be accessible and open when receiving a DOI for an accepted publication. Researchers actively publish in scientific journals and deposit parallel copies at institutional repositories. The repositories offer free of charge online access to scientific journal articles and reports in pdf format. The results published in peer-reviewed scientific journals will receive DOI according to the publisher's procedure and can be found using search engines. When applicable, we will publish data sets along with these articles in the supplementary information. Use of the infrastructure should be acknowledged as "Support for the work from the Printed Intelligence Infrastructure through ...". The infrastructure will obtain e.g. Uniform Resource Name identifier (URN) or DOI for proper addressing.

The infrastructure is also acknowledging the open data policy at each organization, which can be found under the following links:

Oulu University: <https://www oulu.fi/en/research/responsible-research#accordion-control-open-and-fair-research-data>

Tampere University: <https://www.tuni.fi/en/research/responsible-research/open-science>

Åbo Akademi University: <https://abofi.sharepoint.com/sites/intra-en-research/SitePages/Open-science-and-research.aspx>

VTT: <https://www.vttresearch.com/en/vtts-administration>

Documentation & metadata

Fairdata Qvain will be used to create standardized metadata and persistent identifiers (URN or DOI) for datasets. If infrastructure specific metadata format is needed, we will use Directory Interchange Format (DIF) meta-data standard or metadata schema of Qvain as a starting point for infrastructure specific recommendations. A handbook for opening data will be available through the website of PII. The data files will be saved in appropriate folders of the storage structure.

Storage, backup and access control to data

We will use the organization's own servers for raw data storage. National fairdata services will be used if needs for long-term data preservation are identified during the research. The access level is shown in the Table above for different types of data. The responsible PI will control access and secure that data will remain accessible for later use through the project specific DMP. Users of the infrastructure are required to prepare a public project specific DMP in the Tuuli-service and shared with the infrastructure. At least 5 years storage of data is required. Institutional and national data services do provide adequate levels of data storage services for the infrastructure. The national service is provided by the Center for Scientific Computing (CSC) through the fairdata IDA platform.