
Plan Overview

A Data Management Plan created using DMPTuuli

Title: Printed Intelligence Infrastructure (RI-PII)

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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 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. In fact, one major target in PII is sustainability in a very broad scope including not only technological aspect but also environmental, social and economical ones.

PII's relevant fields of science and technology are experimental in nature. Because the field develops rapidly, it is essential for maintaining a globally competitive position to continuously update the key infrastructure. The PII consortium experts and stakeholders have identified specific capabilities and services that require improvement to achieve scientific breakthroughs and technological advancements in the field of printed intelligence in future. This project updates and upgrades the identified technologies for scientific excellence and renewal.

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Printed Intelligence Infrastructure (RI-PII)

Data management policy

1. General description of the administrative data of the RI

This data management policy takes into account national (Strategy for National Research Infrastructures in Finland 2020–2030) and EU-level guidelines (European Charter for Access to Research Infrastructures: Principles and Guidelines for Access and Related Services; The European code of conduct for research integrity drafted by the European Science Foundation (ESF) and the European Federation of National Academies of Sciences and Humanities (ALLEA)).

The PII-infrastructure is a distributed organisation where each background organization is responsible for handling administrative data such as usernames and contact information. The infrastructure is focused on manufacturing and characterization of materials and devices for printed intelligence. The use of the data produced by manufactured devices and structures will be handled by (sub-) projects opened within the organizations using the infrastructure. The organisations processing of personal data can be found at the following links:

Tampere University: <https://www.tuni.fi/en/about-us/data-protection/privacy-notice-administrative-personal-data-of-research-infrastructures>

Oulu University: <https://www oulu.fi/en/data-privacy-notice>

VTT: <https://www.vttresearch.com/en/data-privacy-and-accessibility>

Åbo Akademi University: <https://www.abo.fi/en/processing-of-personal-data-at-abo-akademi-university/>

University of Turku: <https://www.utu.fi/en/privacy/notice>

2. General description of research data managed within RI

The data collected will consist of results from experiments, and numerical modelling within all aspects of manufacturing and testing of materials, process and application design, characterization, development, description, and validation.

The data-generating experiments are based on custom-made specialized set-ups while most characterization rely on standardized instruments and protocols. Most of the data are collected in standard file formats. 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 recommended to be exported to standard formats if possible.

3. Ethical and legal compliance for personal or sensitive research data

The collected data are not considered sensitive research data. However, in some instances data will be collected using devices produced by the infrastructure. These data can then include sensitive personal data that each project collecting these data will be required to address such special issues in separate data management plans.

In short such recommendations are (<https://www.vttresearch.com/en/data-protection-practices-vtt-research>):

- Appropriate data privacy protection measures will be taken into use such as data pseudonymization and access control based on data needs. When necessary, risk assessments and data privacy impact assessments for processing such sensitive personal data will be carried out.
- For 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.
- Measurements 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.

4. Agreements on research data rights

The consortium agreement for the infrastructure defines the user rights and obligations, as well as IPR management. Every organization owns and guides the rights of use of 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 4.0) or other licenses more suitable depending on data type are recommended to ensure responsible reuse.

The infrastructure will guide users to improve and share best practices between the different organizations.

The recommendation will be that the data should be accessible and open when receiving a DOI for an accepted publication. The RI requires all the

publications to make a note in the acknowledgements that RI-PIL infrastructure was used using the following sentence: "Parts of the research used the Research Infrastructure "Printed Intelligence Infrastructure" (RI-PIL)."

5. Documentation and metadata

The infrastructure recommends user to prepare metadata following the [OpenAIRE Guidelines for documentation](https://www.openaire.eu/guidelines-for-documentation). Fairdata Qvain (<http://qvain.fairdata.fi>) will be used to create standardized metadata and persistent identifiers for data (URN or DOI) for datasets chosen for long-term preservation. For all data, each file and metadata file will be named by date, time and a brief descriptive statement. The data files will be saved in appropriate folders of the storage structure. We will use Directory Interchange Format (DIF) meta-data standard or Metadata schema of Fairdata Qvain as a starting point for infrastructure specific recommendations.

The quality control in RI manufacturing processes is being organised into the production control and monitoring system. The data of devices produced by the infrastructure can be collected from the designing, manufacturing and testing phases accordingly. Data quality is ensured with calibrated tools and methods. The research data is confidential and shared only within the research project and its responsibilities.

6. Access control, backup, storage, and disposal of the administrative and research data

Access to the RI-PIL is granted after a project is accepted for implementation by any of the background organization. The RI grant agreement states that the data management policies agreed upon by the organizations need to be implemented by every project. The co-PI from every organization is responsible for communicating the policy within the organization. Publicly funded projects need a public data management plan, while confidential projects follow the outline drawn in the contract agreement.

The organizations have enough storage space for data that will be generated during the research (estimated as 3 Tbit for the duration of the project) available for free.

We will use organizations' own servers for raw-data storage and recommendations for long-term storage. Each organization's data archive services will be used if needs for long-term data preservation are identified during the research. The responsible PI will secure that data will remain accessible also for later use through the project specific DMP.

Users of the infrastructure are. At least 5 years storage of data is required. Institutional and national data services do provide adequate level of data storage services for the infrastructure. The national service is provided by the Center for Scientific Computing (CSC) through the fairdata IDA platform.

7. Opening research data and/or metadata

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/university/node/43683#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>

University of Turku: <https://www.utu.fi/en/research/open-science/open-data>

The partners are committed to increase openness, visibility, and availability of their scholarly output by promoting open access and transparency in the management of research data and metadata. Data is produced in four different categories of openness within the project, as shown in Table 1, below, where also the access level is shown.

Table 1. Different openness categories of data produced within RI-PIL.

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	Data open and accessible after publication upon request	To access files, the user must request permission to do so.
3. Classified	Embargo	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 responsible PI will control access and secure that data will remain accessible also for later use through the project specific data management plan. The infrastructure is committed to make data which will be published shared in Fairdata IDA or in subject-specific or general repositories. Users are instructed to use the national infrastructure available for fairdata.

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 digital object identifiers (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.