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Data management plan - 3

Work Package 6

Project management and coordination

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1 INTRODUCTION

This document is the third and final version of the Data Management Plan (DMP) of the OrChESTRA project, prepared at Month 36 to reflect the final status of data generation, handling, sharing, and preservation throughout the project lifecycle. It builds upon the previous versions submitted at M6 and M18, incorporating all relevant updates, new datasets, and final considerations based on the completed project activities. The document outlines the types of data collected, processed, or generated within the scope of OrChESTRA, the data management methodologies applied, and the procedures adopted to ensure that data are FAIR — Findable, Accessible, Interoperable, and Reusable. It also highlights the measures taken to safeguard sensitive and personal data in compliance with General Data Protection Regulation (GDPR) and other applicable regulations.

As the project has reached its conclusion, this version of the data management plan (DMP) provides a consolidated overview of:

- the final data generated across all work packages,
- the standards and tools used for data documentation and preservation,
- the open access status of research outputs and datasets,
- and the long-term storage and accessibility arrangements beyond the project's end.

This final version also includes reflections on any significant changes that occurred since the previous version, including developments in data workflows, integration of additional datasets, and updates to consortium-wide data handling practices, such as:

- addition of new data types or formats,
- updates to data storage and sharing practices,
- or improvements in data curation and metadata generation strategies.

Through this document, the OrChESTRA consortium ensures the responsible and sustainable management of all data produced throughout the project duration, in full alignment with Horizon Europe guidelines and in accordance with widely accepted best practices in open science, data stewardship, and research integrity.

2 ORCHESTRA PROJECT

OrChESTRA – *Organ-on-a-Chip Focused Strategic Partnership* – is a Horizon Europe Twinning Action that brings together ODTÜ MEMS (Türkiye), TU/e (Netherlands), IMEC (Belgium), and UFR (Germany) to strengthen scientific excellence, innovation capacity, and international visibility in the field of **organ-on-a-chip (OoC)** technologies.

The core objective of the project is to develop a long-term strategic collaboration framework centred around ODTÜ MEMS, enabling the transfer of advanced know-how, the design of joint research agendas, and the creation of a dynamic scientific ecosystem in the microfluidics and organ-on-a-chip domain. This includes joint activities such as best practice sharing, mentoring, training programmes, technical workshops, staff exchanges, and collaborative research.

In addition to coordination and support activities (e.g. capacity building, institutional development, and stakeholder engagement), OrChESTRA also includes a focused research component under **WP3 Development of organ-on-a-chip platform (intestinal drug absorption)**. This component aims to develop an **integrated**

organ-on-a-chip platform equipped with **electrochemical biosensors** for in situ and real-time monitoring of biological responses to external stimuli, such as pharmaceutical agents.
The project has been designed not only to build technical excellence but also to ensure **sustainability** and continued impact beyond the project duration by fostering long-term cooperation, increasing visibility in the European Research Area, and contributing to the strategic positioning of ODTÜ MEMS as a reference centre in the field.

3 DATA SUMMARY

The OrChESTRA project, as a Coordination and Support Action (CSA), has generated and processed a broad spectrum of data throughout its 36-month implementation period. These datasets have been created in relation to both the coordination activities and the scientific research component of the project.

Data collection, processing, and generation activities were primarily aimed at enabling:

- effective management of the consortium and reporting,
- successful implementation and documentation of project events, training, and mobility actions,
- and the development and validation of organ-on-a-chip research outputs under WP3.

Each category is further detailed below.

3.1 Project management data

Project management data involves data provided by the project partners with the purpose of monitoring the progress of the project implementation and preparing project progress reports. ODTÜ MEMS, as the coordinator, has been responsible for the collection, analysis and storage of the project management data generated under the relevant tasks of WP6 – Project Management and Coordination.

The datasets generated under project management data are as follows:

- Data about the project partners: Contact names and info, mailing lists, address, bank account etc.
- Data generated during the consortium meetings: Data generated during the kick-of-meeting, periodic consortium meetings and other internal meetings organised as needed.
- Reporting data related to project administrative/financial management: Data on usage/reallocation of budget resources, progress of project activities against relevant tasks, milestones and deliverables, data on actual performance against project objectives and KPIs.

Formats used: Data have been collected and stored in various formats, including MS Office documents (.docx, .xlsx, .pptx), Adobe PDF (.pdf), image files (.svg, .png, .jpg), and video files (.mp4), etc.

Data storage and sharing: All project management and reporting datasets have been shared electronically and stored in the project's "OrChESTRA-Shared" Dropbox folder. These datasets will be archived and retained for a five-year period after the end of the project.

Exploitation / data access policy: The project management datasets are used solely for administrative purposes and are not intended for broader dissemination. All data collected from partners have been treated as confidential. The dissemination level of certain documents (e.g. "D6.1 Progress Report", "D6.2 Quality Management Plan", "D6.3 Risk and Contingency Plan") is defined as **sensitive**.

3.2 Project activities data

Project activities data involves data originating from the project's operational and dissemination actions, particularly under WP1, WP2, WP4 and WP5. These include best practice sharing, benchmarking activities, mobility, mentoring, training, communication, networking, and public outreach events. In addition, data collected from and/or about individuals participating in OrChESTRA activities are included under this category.

The responsible task leaders from the respective work packages have overseen the collection of relevant data, while ODTÜ MEMS, as the coordinator, has been responsible for the overall storage. All partners have contributed to the analysis of project activities data.

The datasets generated under project activities data are as follows:

- Training/meeting materials: Materials, presentations and video files that originates from the training sessions, webinars, summer schools, project workshops, meetings with stakeholders etc.
- Data collected for carrying out the project tasks: Datasets collected by the partners for the purposes of carrying out a project task (activities and events) including lists of lecturers/speakers and participants, agendas of the workshops, lists of mentors-mentees, data on the short-term staff exchanges, short-term expert visits, registration data (i.e. name, name of organisation, role in the organisation, and contact data) of the participants attending workshops, meetings and other events, business-related contacts, contact information related to dissemination etc.
- Derived data regarding the project tasks: Datasets created by the partners via processing the output of the project task (activities and events), including guidelines, procedures, reports on participation in international conferences, communication report, results of interviews with the stakeholders, results of surveys etc.

Formats used: Data have been collected and stored in various formats, including MS Office documents (.docx, .xlsx, .pptx), Adobe PDF (.pdf), image files (.svg, .png, .jpg), and video files (.mp4), etc.

Data storage and sharing: All datasets have been stored in the shared Dropbox folder ("OrChESTRA-Shared") and will be retained for five years after the project's completion. Public deliverables derived from these data have been submitted through the EC Funding & Tenders Portal and made accessible under the "Publications" tab on the project website.

Exploitation / data access policy: These datasets have been used for developing public deliverables, supporting dissemination and communication efforts. Personal data were collected only as necessary for the execution of project tasks and in line with the data minimisation principle. Unnecessary personal data have been deleted once the relevant activities were completed. Any personal information retained is reviewed annually to assess continued relevance. Original personal data will not be shared with third parties without explicit permission.

3.3 Research data

Research data of the OrChESTRA project refers to the scientific results and outcomes of the research component (WP3 which aims to develop a novel organ-on-a-chip platform integrated with sensors) and other joint research activities initiated in scope of the project via exchange of scientific knowledge and data. The

foreground knowledge/IP expected from the results of WP3 are “electrochemical biosensor”, “organ-on-a-chip device (gut-on-a-chip)” and “whole platform including OoC and the biosensor”.

Formats to be used: Data generated during research activities are primarily electronic, including data tables in various formats (MS Excel file .xlsx, GraphPad Prism file .pzfx, etc.) and images (.tiff, .jpg). The raw characterization data (such as FTIR, XPS, Absorbance, etc.) were transferred to Origin 2022, where they were plotted and saved as .tiff files. The electrochemical data obtained via Methrohm software Nova 2.1 were stored within the program itself. KiCAD software was used to design the printed circuit board to operate integrated organ on a chip platform. The design files were stored as KiCAD’s native file formats (.kicad_sch, .kicad_pcb). Finalized design was exported as gerber and drill files (.gbr, .DRL) for manufacturing.

In addition, computer aided design (CAD) models generated using Autodesk Fusion 360 and Autodesk Inventor during the design of the organ-on-a-chip, electrochemical sensor packaging, reservoirs, and the fluidic circuit board were stored in their native formats (.f3d, .ipt, .iam) and exported as .STEP files for interoperability. 3D printing preparation files, including PreForm project files (.form) for SLA printing and G-code files generated for FDM printing (Bambu Lab A1), were archived. Manufacturing files generated in Fusion 360 Manufacturing workspace and the corresponding post-processed part programs (.knc files) for CNC micromilling were stored as part of the fabrication dataset. Photographs of fabrication steps, assembly, and leakage/validation tests were stored in .jpg and .tiff formats.

The organ-on-a-chip membrane layouts were designed using L-Edit, with outputs stored as GDSII layout files (.gds). The same format was also used for the MEMS electrochemical sensor designs, ensuring compatibility with cleanroom lithography processes.

For computational studies, finite element modeling (FEM) of transepithelial electrical resistance (TEER) sensors was performed using COMSOL Multiphysics, with the associated simulation files archived as COMSOL model files (.mph). In parallel, MATLAB scripts and models were developed for the calculation of flow rates and pressure distributions within the microfluidic systems, stored as MATLAB script (.m) and data (.mat) files. These files complement the experimental datasets by enabling predictive modelling and design optimisation.

Data storage and sharing: The data sets collected/generated in scope of the WP3 activities were shared electronically by the project partners and stored in the dedicated project files under the project’s “OrChESTRA-Shared” Dropbox folder. The relevant datasets relating to the project activities will be stored in dedicated repository for a 5-years period after the end of the project. The project deliverables were submitted to the EC via the Funding & Tenders Portal. The public deliverables were published under the “Publications” tab on the project website (https://www.orchestra-project.eu/publications).

During the fabrication of MEMS electrochemical sensors and parylene membranes, all processes were carried out in the ODTU MEMS cleanroom facility, which could only be accessed by authorized researchers. Recipes and process parameters (e.g., deep reactive ion etching (DRIE) for molds, metal sputtering, reactive ion etching (RIE) for metal patterning) were documented on each instrument’s dedicated computer and log sheet, which could only be accessed at the corresponding tool within the cleanroom, ensuring traceability of process parameters.

All fabrication notes, optimization procedures, and stepwise microscopy images documenting the process flows were stored in ODTU MEMS cleanroom infrastructure. Additionally, mask design files (.gds) were shared with the mask fabrication staff at ODTU MEMS for photomask production. COMSOL (.mph) and

MATLAB (.m, .mat) files, as well as associated design files, were stored on dedicated encrypted desktop computers provided by ODTU MEMS to project personnel.

For dissemination and backup, the notes and images related to MEMS fabrication (including high-resolution microscope images and chip/die photographs) were also saved in .jpg and .tif formats and securely archived using the internal project management infrastructure based on Feng Office software (https://eflatun.mems.metu.edu.tr/). These files were further backed up on encrypted work computers assigned to the responsible researchers.

The data of electrochemical experiments conducted at BioMEMS laboratory of ODTU MEMS, were stored on the computer connected to the device in folders named according to the date of the experiment. Additionally, for the purpose of examining the experiment data obtained at the end of each completed experiment set, the relevant data was backed up by the project scholars on the personal encrypted computers. The experiment data were saved as .nox files and could be opened and examined using the free software "NOVA" specific to the device.

Exploitation / data access policy: These data are used for developing the related public deliverables of the project and for communication and dissemination purpose. The protection and procedures about the use of IPRs are applicable to outputs explicitly resulting from the project twinning activities. The reports and other related deliverables on the twinning activities are public but only include non-sensitive data. Some of the data already obtained has started to be shared through international publications and conferences. In the future, data from the current period will also be shared in a similar manner through international publications and conferences.

4 FAIR DATA

OrChESTRA has followed the FAIR principles throughout its implementation to promote the accessibility and reusability of the data and processes developed in the project, while remaining sensitive to partners' local regulatory frameworks and security/privacy requirements. This approach has ensured that all data generated or processed during the project have been **Findable, Accessible, Interoperable, and Reusable (FAIR)**, in line with EU guidelines.

FAIR data efforts have been carefully balanced with the need to protect sensitive and personal information. In particular, all personal data have been kept confidential and processed in full compliance with the **EU General Data Protection Regulation (GDPR) 2016/679**.

4.1 Making data findable, including provisions for metadata

Regarding findability of data and research outputs, the existing cloud-based infrastructure maintained by the consortium was actively used to store and organise datasets throughout the project. Data that were declassified and suitable for open sharing have been prepared for submission to platforms such as **OpenAIRE**, ensuring public availability and findability.

Research publications and project-related outputs were supported with appropriate keywords to optimise reuse possibilities and enhance discoverability. Each consortium partner ensured clear versioning of documents and datasets they produced. Descriptive, structural, and administrative metadata were created to make data findable, including:

- dataset title and short description,
- author/responsible institution,
- date of creation,
- file format,
- related work package/deliverable,
- and intended access level.

Where applicable, **Digital Object Identifiers (DOIs)** were or will be assigned to research outputs linked to open datasets. For internal documentation and deliverables, consistent naming conventions were used (e.g. project acronym, deliverable number, document title, and date).

Open access data sources and publications have been made discoverable and identifiable using standard mechanisms, in accordance with FAIR principles. Public deliverables were also published on the OrChESTRA website accompanied by relevant metadata to ensure findability beyond the project duration.

4.2 Making data accessible

The OrChESTRA twinning action project produced strategy planning documents, forecasts, monitoring reports, scientific research papers, conference proceedings, presentation materials, social media content, and other dissemination materials, many of which were made available through partially open publication channels. Restricted materials were shared only within the consortium and, where appropriate, with the European Commission, in line with previously established confidentiality agreements. This was particularly the case for sensitive research findings or project deliverables that may affect partners' intellectual property or business interests.

The dissemination level of key documents, such as:

- D6.1 Progress Report,
- D6.2 Quality Management Plan,
- D6.3 Risk and Contingency Plan,
- D2.2 Institutional Capacity Enhancement Report,
- and research deliverables under WP3 (e.g. D3.1, D3.2, D3.3),

was set to sensitive, meaning they were accessible only to consortium members and the Commission Services.

All personal data were stored and handled in accordance with the **General Data Protection Regulation (GDPR) 2016/679**. Raw data files were stored securely by partner institutions and made accessible to other partners upon justified request.

The OrChESTRA consortium supported open and publicly accessible scientific information. Peer-reviewed publications resulting from the project have been or will be made openly available after any applicable embargo periods and following the necessary steps to protect intellectual property rights.

Open access has been provided through:

- institutional repositories,
- the project website,
- and platforms such as **OpenAIRE**, where appropriate.

Research outputs were made accessible using widely supported formats (e.g. PDF) and standard metadata. The **OrChESTRA website** has served as a central access point for all public deliverables, publications, and newsletters.

An internal process was followed to classify the accessibility of new results:

- Newly generated data were evaluated during internal meetings.
- Results classified as public were shared immediately.
- Results classified as potential IP were held under restricted access and reviewed for patentability.
- If no IP protection was initiated within six months, data were re-evaluated for possible public release.

This ensured a balance between open science and strategic protection of valuable results.

4.3 Making data interoperable

Provisions were taken to ensure that the open access data produced during the OrChESTRA project would be interoperable, facilitating the exchange and reusability of data across research institutions, organisations, and platforms.

Data were presented in standard, widely used formats — such as **.docx, .xlsx, .jpg, and .pdf** — all of which are compatible with open or commonly available software tools. This enabled unrestricted data exchange between researchers, institutions, and stakeholders both within and beyond the consortium.

Interdisciplinary interoperability was further supported by the use of standardised and structured metadata, with controlled vocabularies applied where relevant, ensuring clarity and consistency in data description and enabling alignment with broader scientific and technical communities.

4.4 Making data reusable

Decisions regarding the use and reusability of project data by third parties were made following communication and agreement among the relevant consortium member(s) and data owner(s), taking into account applicable intellectual property rights (IPR) regulations. Background intellectual property was made available on a royalty-free basis for the execution of the project and under fair and non-discriminatory conditions for potential use. Project results were owned by the partners who contributed to their development. Access to knowledge for project purposes was royalty-free, while access for further use by new actors was subject to preferential or market-based conditions, depending on the nature of the data and agreements in place.

Data that fell under IP protection were handled by the consortium in accordance with the Grant Agreement and relevant policies, and may be licensed to external users under appropriate terms. Open access data were made available as early as possible under a **Creative Commons (CC)** licence, following an embargo period of up to one year when necessary to safeguard commercial or IP value.

Scientific data were stored long-term by the coordinator and partner institutions. All project data will be retained for **a minimum of five years** after the end of the project. Open access publication data are expected to remain available for the lifetime of the respective journal or repository. Public content made accessible via the OrChESTRA website has been made downloadable and reusable without restrictions or embargoes.

Data quality was ensured by the responsible partners through continuous review of accuracy, completeness, and relevance during the project. Each dataset was curated by its creators and validated prior to sharing or publication, supporting responsible and meaningful reuse by external users.

5 ALLOCATION OF RESOURCES

Costs related to data management activities were covered under the project budget, as foreseen in the original Grant Agreement. These included efforts for data collection, curation, storage, metadata preparation, and internal quality checks carried out across different work packages.

Expenses related to open access publishing — such as article processing charges — were also considered eligible and were funded within the framework of the Horizon Europe grant. These costs were planned primarily for peer-reviewed scientific publications resulting from the research activities.

Long-term storage and backup of data were managed by individual consortium partners using their institutional infrastructure, including actively maintained cloud storage solutions and encrypted local systems. No additional external costs were incurred for long-term archiving beyond the project duration.

Responsibility for data management and preservation was distributed across the work package leaders and the authors of specific outputs. Each partner was responsible for curating and storing the datasets generated under their respective tasks. ODTÜ MEMS, as the coordinator, oversaw the implementation of the data management procedures and ensured that storage and access provisions were in line with FAIR principles and legal requirements.

6 DATA SECURITY

ODTÜ MEMS, as the coordinator of the project, was the main entity responsible for the overall data management. Nevertheless, the consortium as a whole decided on relevant aspects of data handling, and each data creator was responsible for ensuring the quality and security of the data they generated.

During the implementation of the OrChESTRA project, data were collected in various forms — including electronic documents, handwritten notes, photographs, and videos. These datasets were stored by each partner for documentation and reporting purposes. Each partner applied their own institutional rules and regulations for data storage and protection in accordance with internal policies.

Data collected from participants involved in project activities were handled by the coordinator in line with the project's data protection strategy and in full compliance with the GDPR. All data were stored and transferred in accordance with applicable national, EU, and international legislation on data security.

General procedures for secure data handling, access control, and backup were implemented across all partners. No project outputs involved dual-use content, and no military-related activities were carried out in the scope of the project.

Personal contact data collected during project activities were stored internally within each partner institution. Each partner ensured the secure storage of these data in full compliance with EU data protection laws. In line with the project's retention policy, all personal data collected will be deleted from the project's

data repositories five years after the end of the project, unless otherwise required for legal or auditing purposes.

7 ETHICAL ASPECTS

All OrChESTRA activities were carried out in accordance with the national legal and ethical requirements of the countries where the project was implemented — namely Türkiye, the Netherlands, Belgium, and Germany. The consortium ensured full compliance with applicable international and EU legislation throughout the project duration.

OrChESTRA adhered to the ethical standards and guidelines defined under the **Horizon Europe framework**, including the **European Commission Ethics Self-Assessment Guidelines** and the provisions of the **GDPR 2016/679** for the collection and processing of personal data.

Although no ethics-related issues emerged during the project, appropriate measures were in place to safeguard personal data and ensure that all data collection activities — particularly those related to meetings, training sessions, and communication tasks — were conducted with informed consent and in line with data protection principles.

8 CONCLUSION

This final version of the OrChESTRA DMP summarises the approach taken to ensure that all data generated, processed, and shared throughout the project were handled in line with FAIR principles and Horizon Europe requirements.

Over the course of the project, the consortium consistently applied high standards in data quality, security, accessibility, and ethical compliance. While the majority of data were administrative and related to coordination activities, a significant portion also supported dissemination efforts and research outputs under WP3. Data were stored using secure institutional infrastructures, shared through appropriate platforms, and accompanied by relevant metadata and access control measures.

All public-facing deliverables and open access publications have been made available via the project website and relevant repositories. Sensitive data and personal information were managed in compliance with the GDPR and subject to retention and deletion policies.

As OrChESTRA concludes, data generated by the consortium will remain accessible as defined in this document and preserved for a minimum of five years beyond the project's end, ensuring continued value and impact for the wider research and innovation community.