



**Coordinated  
Trainings**

**Credentialing**

**Community support**

# **Research Data Management Training for the German National Research Data Infrastructure**

Service for enabling and improving research data management through coordinated trainings, credentialing and community support within NFDI and beyond.



Proposal Submitted for the  
Integration Phase of Base4NFDI  
Submitted: 2026-01-27  
On behalf of NFDI Section  
Training & Education  
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# 1 General Information

**Name of proposed Basic Service (in English):** Competence Training for Research Data Management

**Acronym of the proposed Basic Service:** RDMTraining4NFDI

**Service "subtitle" explaining key functionality:** Central services for RDM training

**Corresponding NFDI Section:** NFDI Section: Training & Education

**Lead institution:** ZB MED - Information Centre for Life Sciences,  
Gleueler Straße 60, 50931 Cologne

**Name of lead institution principal investigator:** Prof. Dr. Konrad U. Förstner,  
foerstner@zbmed.de

**Authors of the proposal:** Mareike Wohltmann<sup>1</sup> <https://orcid.org/0009-0006-4329-7619>,  
Sina Bock<sup>2</sup> <https://orcid.org/0000-0001-6754-8810>, Justine Vandendorpe<sup>4</sup>  
<https://orcid.org/0000-0002-9421-8582>, Mirjam Blümm<sup>5</sup> <https://orcid.org/0000-0003-3665-7031>, Rabea Müller<sup>4</sup> <https://orcid.org/0000-0002-3096-8237>, Birte Lindstädt<sup>4</sup>  
<https://orcid.org/0000-0002-8251-1597>, and Konrad U. Förstner<sup>4</sup> <https://orcid.org/0000-0002-1481-2996>

Participating institutions

Table 1: List of participating institutions

Principal Investigator	Institution, location	Contact E-mail	Member in [consortium] <sup>3</sup>	Funding requested [y   n]
Prof. Dr. Mirjam Blümm	Technische Hochschule Köln (TH Köln)	mirjam.bluemm@th-koeln.de	NFDI4Memory	yes
Prof. Dr. Konrad U. Förstner	ZB MED – Informationszentrum Lebenswissenschaften	foerstner@zbmed.de	NFDI4Microbiota	yes
Prof. Dr. Florian Stahl	Universität Mannheim	florian.stahl@uni-mannheim.de	BERD@NFDI	no
Prof. Dr. Johannes Paulmann	Leibniz-Institut für Europäische Geschichte	paulmann@ieg-mainz.de	NFDI4Memory	no

<sup>1</sup> ZB MED – Information Centre for Life Sciences, Germany.

<sup>2</sup> Technical University of Cologne (TH Köln), University of Applied Sciences, Germany.

<sup>3</sup> Name one DFG consortium the institution is or has a route to become a member of and through which funds should be appropriated if this proposal is approved.

Prof. Dr. Frank Ewert	Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF)	frank.ewert@zalf.de	FAIRagro	no
Prof. Dr. Frank Oliver Glöckner	Alfred-Wegener-Institut	frank.oliver.gloeckner@awi.de	NFDI4Biodiversity	no
Prof. Dr. Christoph Steinbeck	Friedrich-Schiller-University Jena	christoph.steinbeck@uni-jena.de	NFDI4Chem	no
Prof. Dr. Michael Hintermüller	Weierstrass Institute for Applied Analysis and Stochastics (WIAS)	Michael.Hintermueller@wias-berlin.de	MaRDI	no
Dr. Andreas Förster	DECHEMA e.V.	andreas.foerster@dechema.de	NFDI4Cat	no
Prof. Dr.-Ing. Peter F. Pelz	TU Darmstadt	peter.pelz@tu-darmstadt.de	NFDI4Ing	no
Dr. Philipp von Rummel	Deutsches Archäologisches Institut	generalsekretaer@dainst.de	NFDI4Objects	no

**Initialisation Phase:** 1 February 2025 – 30 April 2026

**Planned duration of the Integration phase:** 24 months

**Statement on efforts required by consortia for integration of service**

RDMTraining4NFDI supports multipliers across NFDI consortia to strengthen their research data management (RDM) competencies and training skills. The service aims to provide training and consultancy on didactic approaches, promote the creation and reuse of FAIR training materials, drive standardisation in training materials, and support the development of an RDM credential framework. This includes developing certification criteria for training materials in a community-driven review process, as well as a practical certification process for training units and courses.

RDMTraining4NFDI will build on the distributed versioning system Git and the software forge Codeberg to ensure easy access for users, and will provide training to develop Git skills where requested.

The time investment required depends on how extensively consortia choose to adopt RDMTraining4NFDI components. It can range from a few hours – for participating in training or reusing templates – to several weeks for integrating micro-credentials into their consortium structures.

By integrating RDMTraining4NFDI, consortia will be supporting a “demand-driven service [...], thereby laying the foundation for a community-driven, networked information infrastructure” (NFDI, 2023) and helping to build a sustainable RDM training infrastructure. The service will avoid duplication of efforts, foster cross-disciplinary exchange, and ensure long-term added value for the NFDI through its links to EOSC initiatives.

## Summary of the proposal in English and German

RDMTraining4NFDI aims to support consortia in developing tailored training programmes in the field of RDM. During the Integration Phase, we will provide generic, tested RDM training modules, consultancy on training skills and methodologies, and FAIR-compliant templates for scalable training materials. In addition, we will expand existing RDM terminologies to include explanations of terms related to training material development and pilot an RDM credentialing framework. This framework will encompass certification criteria developed through a standardised, community-driven review process, alongside a practical certification process for training units and courses, which will be tested and evaluated in a pilot with six participating partners.

RDMTraining4NFDI unterstützt Konsortien bei der Entwicklung bedarfsorientierter FDM-Schulungsangebote. In der Integrationsphase wird der Basisdienst generische, getestete Schulungsformate bereitstellen, Beratung zur didaktischen Vermittlung von FDM-Trainings anbieten, FAIR-implementierte Entwurfsvorlagen für skalierbare Schulungsmaterialien zur Verfügung stellen, vorhandene FDM-Terminologien durch Begriffserläuterungen aus dem Kontext der Erstellung von Schulungsmaterialien erweitern und einen Zertifizierungsprozess innerhalb der NFDI pilotieren. Dazu gehören die Entwicklung von Zertifizierungskriterien für Schulungsmaterialien in einem standardisierten, community-gesteuerten Review-Prozess und ein praktischer Zertifizierungsprozess für Schulungseinheiten und Kurse, die in einem Pilotprozess mit sechs Use-Case-Partnern getestet und evaluiert werden.

## 2 Summary of Initialisation Phase Results

### 2.1 Change in Background and Motivation since the Start of the Initialisation Phase

Ongoing dialogue with the community<sup>4</sup> has revealed two key shifts in requirements. First, **time constraints** mean that the planned summer school (Müller *et al.*, 2024b) would exclude many potential participants, so the decision was taken to offer it in a hybrid format. Second, feedback from the community revealed **content gaps**<sup>5</sup>, which will be addressed by providing consultancy on training skills in Work Package 1.2 (WP1.2), expanding RDM terminologies and operationalising training materials (WP2).

The Technical Expert Committee (TEC) made the following recommendations, which we have addressed as follows: **1) Definition of Key Performance Indicators (KPIs):** See section 3.1. **2)**

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<sup>4</sup> See: Requirement analysis (Wohltmann *et al.*, 2025d).

<sup>5</sup> regarding generic RDM topics and training skills, see Müller *et al.*, 2024b and Wohltmann *et al.*, 2025d.

**Contact with Stakeholders:** Regular contact with use cases<sup>6</sup>, state-level initiatives<sup>7</sup>, and stakeholders<sup>8</sup>, as well as participation in EduTrain WP2, WP3, and WP5. **3) Cooperation with data competence centres:** RDMTraining4NFDI has shared the findings of the content blueprint (WP1, M1.2) with WiNoDa & DALIA (Atemkeng, 2025) and has established initial contact with SODa, DKZ.2R, KODAQS, DACE, Come2Data, QUADRIGA and DataNord<sup>9</sup>. **4) Inclusion of Natural and Engineering Sciences consortia:** Consortia from the natural sciences and engineering have agreed to cooperate through use cases. **5) Letters of Commitment (LoC) from External Stakeholders:** RDMTraining4NFDI has formalised ongoing collaborations through LoCs.

## 2.2 Results of Initialisation Phase

Drawing on resources supplied by our use cases and community efforts, we identified initial quality criteria for scalable OER and FAIR<sup>10</sup>-compliant training materials (**D1.1**) and developed the first draft of a complementary good practice guide (**D1.2**). The content blueprint (**M1.2/Base4NFDI D1.4.4**<sup>11</sup>) has been finalised (**D1.3/M1.1**) and published (Bock and Kneib, 2025). Possible hosting solutions for the training materials have been identified (**Base4NFDI D1.4.2**). We have completed the development of training formats, as part of the hybrid pilot (Vandendorpe *et al.*, 2025b, **M2.2**) that ran from October to December 2025, followed by evaluation and reporting (Wohltmann *et al.*, 2025e, **D2.3/Base4NFDI D1.4.5**). We reviewed certification types and processes (**D3.1/ Base4NFDI D1.4.2**) and evaluated how quality standards can enhance certification (**M3.1/Base4NFDI D1.4.3**); recommendations for RDM training are published (Bock *et al.*, 2026, **D3.2**). Stakeholder engagement remains a central activity. Interviews and surveys have been completed and analysed (**Base4NFDI D1.4.1**). RDMTraining4NFDI contributed to the Base4NFDI Roadshow (Base4NFDI, 2025) and gave a presentation at the Conference on Research Data Infrastructure (CoRDI) 2025 (Wohltmann *et al.*, 2025a). To synergise joint efforts with NFDI, the stakeholder meeting (Wohltmann *et al.*, 2025b, **D4.1**) was conducted in autumn 2025. A report on the final results (**D4.2**) concluded the Initialisation Phase (**M4.2**). In addition, substantial effort was dedicated to avoiding duplicative structures and fostering synergies across the RDM landscape, evidenced by our active participation at 13 events within and outside the NFDI<sup>12</sup>, 21 exchanges with consortia, data competence centres and state-level initiatives (as described in Wohltmann *et al.*, 2025c), and more than 50 consultation meetings<sup>13</sup>.

<sup>6</sup> BERD@NFDI, KonsortSWD, NFDI4Memory, NFDI4Microbiota.

<sup>7</sup> fdm.nrw: <https://www.fdm.nrw>, FDM-NDS: <https://fdm-nds.de>, FDM-SH: <https://fdm-sh.de>, bwFDM: <https://bwfdm.de>.

<sup>8</sup> DINI/nestor-AG Forschungsdaten: <https://dini.de/ag/dininestor-ag-forschungsdaten>, Skills4EOSC: <https://learning.skills4eosc.eu/>.

<sup>9</sup> <https://forschungsdaten.info/fdm-im-deutschsprachigen-raum/deutschland/datenkompetenzzentren/>

<sup>10</sup> See: Wilkinson *et al.*, 2016.

<sup>11</sup> Base4NFDI deliverables (Wittenhorst, 2024) have been adapted. A full list is provided in the Appendix d).

<sup>12</sup> Events were only counted if they involved active participation (e.g. talks, presentations, posters).

<sup>13</sup> According to Base4NFDI a "consultation" is an event – typically informal in nature – that is based on the needs of an individual stakeholder or user (group).

### 2.2.1 Interim Report on Requirements for Finalisation of the Initialisation Phase

RDMTraining4NFDI is mostly non-technical; the templates of some Base4NFDI deliverables (Wittenhorst, 2024) have therefore been adapted accordingly. A full list is provided in the Appendix.

#### a) Requirements Analysis (D1.4.1)

**Due:** 3 months after start date | **Percent finished:** 100 % | **Status:** finished

**Overview of relevant outcomes:** Semi-structured interviews were conducted with the four cooperating use cases and analysed using Braun & Clarke's (2006) thematic approach. Based on the findings from the interviews, a quantitative approach was applied. The survey<sup>14</sup> was aimed at RDM multipliers involved in training; 113 people responded, providing a solid dataset that we analysed in Python. The results were published in Wohltmann *et al.*, 2025d.

#### b) Software Evaluation (D1.4.2)

**Due:** 6 months after start date | **Percent finished:** 90% | **Status:** running

**Overview of relevant outcomes:** The software evaluation of the current status of RDM training materials (Bock *et al.*, 2025b) provided by the use cases revealed that some of the training materials have gaps in terms of OER and FAIR-principles. To further evaluate identified gaps, **M.1.1** has been broadened to include training materials from additional stakeholders. Quality criteria for a certification scheme were assessed and validated (WP3) and opened for community discussion<sup>15</sup>. Certification options have been explored (Bock *et al.*, 2026, **D.3.1, Initialisation Phase, month 6**). The evaluation of hosting solutions for training materials revealed that currently no single platform satisfies all the requirements. RDMTraining4NFDI will therefore continue to support ongoing harmonisation efforts among stakeholders<sup>16</sup>.

**Outlook:** Reports will be published.

#### c) Service Design (D.1.4.3)

**Due:** 6 months after start date | **Percent finished:** 100 % | **Status:** finished

**Overview of relevant outcomes:** The results of the Requirements Analysis (a) and Software Evaluation (b) inform the development of the Basic Service, as described in Section 3. Potential collaborations with existing services have been identified (Table 3). We conducted 21 one-to-one meetings with stakeholders we had not previously consulted (11 consortia, 5 state initiatives, and 5 data competence centres). These insights informed the service design (Wohltmann *et al.*, 2025c). Feedback mechanisms (see Section 3.1) will be integrated into the development process (Integration Phase) to ensure continuous improvement and alignment with user needs.

#### d) Service Prototype (D.1.4.4)

**Due:** 12 months after start date | **Percent finished:** 90% | **Status:** running

**Overview of relevant outcomes:** Various RDM training formats are being developed to gauge their effectiveness. The first concept (Vandendorpe *et al.*, 2025a) was designed as a full week of in-person training, as planned in Müller *et al.*, 2024a. Since this format did not meet the current needs of the

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<sup>14</sup> Designed and conducted using the survey creation tool 2ask, orbiz Software GmbH. (n.d.). 2ask – Your Online Survey Tool: <https://www.2ask.com>.

<sup>15</sup> During RDMTraining4NFDI's training courses (WP2) and a stakeholder meeting (WP3, WP4) and with shared documents.

<sup>16</sup> Such as DALIA, Twillo: <https://www.twillo.de/oer/web> and the NFDI consortia's knowledge bases.

target group, a second concept (Vandendorpe *et al.*, 2025b) was therefore tested. Training materials have been published in Wohltmann *et al.*, 2025e.

**Outlook:** Technical templates will be developed for hosting RDM training materials in Git-based repositories, enabling collaborative development and version control<sup>17</sup>. The prototype will comply with OER principles<sup>18</sup>. Technical documentation of templates aligned with the ongoing work of the RDM community<sup>19</sup> will be extended to support sustainable maintenance of the materials.

#### e) Service Piloting and User Testing (D1.4.5)

**Due:** 12 months after start date | **Percent finished:** 100 % | **Status:** finished

**Overview of relevant outcomes:** The usability and effectiveness of various training formats was tested in pilot workshops. Structured user feedback from the use cases was collected and systematically analysed. The findings have been published (Wohltmann *et al.*, 2025e) and incorporated into the service development to better meet the needs of the target audience.

### 2.3 Update on Technical Readiness Level (TRL)<sup>20</sup> of the Proposed Basic Service

RDMTraining4NFDI is conceived as a socio-technical service/system<sup>21</sup> (Kienle & Kunau, 2014). During the Integration Phase, we will build our service upon a representative model and a prototype system (see 3.1), which will be tested in an RDM-community-driven environment. Our model and prototypes<sup>22</sup> correspond to TRL 5-6. We expect a TRL of 7-8 by the end of the Integration Phase.

## 3 Working Concept for the Development of the Basic Service

### 3.1 Service Integration Concept

The NFDI credentialing process for RDM competence is a new offering in the RDM landscape. Moderated by RDMTraining4NFDI, the criteria specifying the requirements that training materials must meet for use in certified training will be defined through an ongoing community process. The certification process for training units and courses will be tested and evaluated in a pilot with six participation partners.<sup>23</sup> RDMTraining4NFDI will work hand-in-hand with the community<sup>24</sup> to identify needs and refine requirements. This engagement will include one-on-one and group meetings, monthly feedback loops in EduTrain WG5, shared documents for feedback, and user studies. To maximise interoperability, we will adopt several strategic measures, starting with modular, customisable training concepts and alignment with EOSC classifications<sup>25</sup> and the TS4NFDI

<sup>17</sup> e.g. EUDAT GitLab: <https://gitlab.eudat.eu> or Codeberg.org: <https://codeberg.org/>.

<sup>18</sup> OERinfo: <https://open-educational-resources.de> and OER Metadata Group (Pohl *et al.*, 2024).

<sup>19</sup> e.g. Manske *et al.*, 2024, Biernacka *et al.*, 2025, and further efforts of the RDM community.

<sup>20</sup> See adapted TRL definition for RDMTraining4NFDI in Appendix D.

<sup>21</sup> A socio-technical system is a social system that uses the technical system to support communication processes. The technical system influences the social system and the social system shapes the technical system.

<sup>22</sup> By “prototype system” we mean training formats and materials which were tested and evaluated during the Initialisation Phase.

<sup>23</sup> See WP3 and Bock *et al.*, 2026.

<sup>24</sup> Collaboration will be expanded with the use cases as listed in Table 4.

<sup>25</sup> Skills4EOSC Recognition Framework (Bjerde and Filiposka, 2025).

incubator to map RDM terminology. We will cooperate with Jupyter4NFDI, DMP4NFDI, KGI4NFDI and PID4NFDI to streamline workflows<sup>26</sup>; while implementing Git-based integration to facilitate the collaborative development and reuse of training materials across NFDI initiatives<sup>27</sup>. RDMTraining4NFDI will embed its service technically, organisationally, and legally by integrating with consortia training activities and offerings<sup>28</sup>, applying community-driven standards<sup>29</sup>, establishing a certification process, organising cross-consortial workshops, and ensuring reusability through permissive licensing (e.g. CC-BY) together with full GDPR compliance. RDMTraining4NFDI will cover the essential requirements of Open Science and the FAIR principles and remain optimally aligned with the relevant findings of the EOSC initiative<sup>30</sup> (TRL 7). Service performance will be measured using the following KPIs: Usage data for published materials and repository activity on the Git-based software forge Codeberg will be collected regularly via APIs and GDPR compliant tracking using Matomo. Service quality and community engagement will be assessed using quantitative and qualitative metrics from issue trackers, user feedback, and community contributions. Key metrics include issue activity, training session registrations, participation in consultations, and community event attendance, complemented by selective manual monitoring and participant surveys (TRL 7-8).

### 3.2 Future Development and Ramp-Up Outlook

In accordance with the EOSC Interoperability Framework (IF) (European Commission *et al.*, 2021), RDMTraining4NFDI will ensure interoperability by cooperating with PID4NFDI<sup>31</sup> to facilitate the integration of PID-related content into training resources. Modular materials from RDMTraining4NFDI and others (e.g. Gonzalez Ocanto *et al.*, 2025) will be made openly accessible in Git-based repositories to support reuse and community engagement. Semantic interoperability will be supported through collaboration with TS4NFDI<sup>32</sup> on shared RDM training terminologies. The sustainability of the service will be ensured through reusable workflows and adaptable templates, community-driven use of generic training materials in the Git-based repository and RDMTraining4NFDI's Zenodo community<sup>33</sup>. To ensure organisational interoperability, RDMTraining4NFDI will align its services with Skills4EOSC. Legal interoperability will be ensured through standard licences (e.g. CC-BY). GDPR compliance will be maintained for the website<sup>34</sup>, which will also prioritise inclusive language and accessibility as described in Vishen *et al.* 2025.

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<sup>26</sup> See Table 3.

<sup>27</sup> FAIR-by-Design Methodology Templates: <https://github.com/FAIR-by-Design-Methodology/templates>.

<sup>28</sup> Such as Historical Insight and Skills Training Online Catalogue (HISTOCAT)

<https://4memory.de/unterstuetzung/lehren-lernen/histocat/>

<sup>29</sup> e.g. FAIR Principles (Wilkinson *et al.*, 2016), metadata schemas for training materials (Biernacka *et al.*, 2025a, Pohl *et al.*, 2023, Geiger *et al.*, 2024, and Palagi *et al.*, 2022), The Carpentries "Instructor Training", Train-the-Trainer modules (Biernacka *et al.*, 2023 and Biernacka *et al.*, n.d.).

<sup>30</sup> Outputs like the Minimum Viable Skillsets (<https://www.skills4eosc.eu/resources/publications/mvs>) and Skills4EOSC training courses (<https://www.skills4eosc.eu>) will be explored.

<sup>31</sup> PID4NFDI: <https://pid.services.base4nfdi.de>.

<sup>32</sup> TS4NFDI: <https://terminology.services.base4nfdi.de>.

<sup>33</sup> RDMTraining Zenodo: <https://zenodo.org/communities/rdmt4nfdi/>

<sup>34</sup> <http://rdmt.services.base4nfdi.de/>



During the ramp-up phase, we will continue to focus on harmonising RDM training across the NFDI consortia to strengthen RDM competencies, broadening the scope of training topics to include consortium-specific methods and tools (e.g. foundation of machine learning, Aruna<sup>35</sup>, Coscine<sup>36</sup>), and fostering widespread adoption of quality characteristics for a more coordinated and standardised development of training materials. These efforts will contribute to establishing a sustainable credential system with harmonised criteria for training. RDMTraining4NFDI will continue to support consortia in implementing the certification process for their training formats.

### 3.3 Risks and Challenges

An ongoing challenge is managing expectations for the developing service. Misaligned expectations could lead to user dissatisfaction. This risk will be mitigated through continuous community engagement and clear communication (WP4). To clarify the service scope: RDMTraining4NFDI will **not** create discipline-specific training materials, recommend specific resources, provide individual guidance on material selection, deliver a predefined list of quality indicators, or act as a certifying body. These deliberate exclusions will ensure the sustainability of the certification process beyond the project. The target group of RDMTraining4NFDI is heterogeneous, reflecting the consortia's diverse needs as well as their varying levels of expertise in RDM and training. This challenge will be addressed by generic training formats tailored to different proficiency levels, as well as recommendations and ready-to-use templates for storing, referencing, and managing versionable training materials (WP1 and WP2). A further challenge is implementing an RDM terminology that enables training materials to be reusable and scalable across disciplines. This will be addressed through a participatory process with TS4NFDI to create a consistent, shared vocabulary for the RDM-training landscape (WP2).

The NFDI credentialing process aims to certify training units and courses. Participants who successfully complete certified training receive a credential confirming completion. Establishing this process requires several steps: RDM training materials must adhere to transparently defined standards that are broadly accepted and continuously refined by the RDM community. A minimal set of transparently defined quality criteria for training materials is therefore essential. Broad agreement on quality assurance in RDM training already exists within the community (Wohltmann *et al.*, 2025c). The practical certification process for training units and courses will be tested and evaluated in a pilot with five consortia, Kiel University's central Research Data Management office, and WP 1.1.

For certifying successful completion, most of the consortia view micro-credentialing as more flexible than traditional certificate courses. However, some raise concerns about its perceived value relative to full certificates and potential added bureaucracy (Wohltmann *et al.*, 2025c). Our experience shows

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<sup>35</sup> <https://aruna-engine.org/>

<sup>36</sup> <https://about.coscine.de/>

that these concerns can be addressed through continuous, inclusive stakeholder engagement and other participatory methods to improve both the acceptance and the relevance of the resulting services.

Table 2: Risk Management

Risk Description	Likelihood	Severity	Mitigation Strategy
RDM training offerings do not meet the diverse needs of the target group	Low	High	Close exchange with the target group <sup>37</sup> ; focus on generic topics; training tailored to different knowledge levels; adaptable templates
Resources (expertise, infrastructure, and finances) for maintaining modularised training materials after funding period are not secured	High	High	To be discussed during onboarding of use case consortia. Hosting at consortia knowledge bases (where possible) and suitable open repositories (such as Zenodo or Twillo); registering resources in DALIA (NFDI funding ended)
RDM terminology will not be accepted across disciplines	Medium	Low	Participatory process; incubator project with TS4NFDI; cooperation with stated stakeholders; identified community need <sup>38</sup>
Not all interests and perspectives of the RDM community can be taken into account in decision-making and therefore quality standards will not be accepted by the community.	Medium	High	Standardised community review process will be explored. Participatory process; cooperation with stated stakeholders; identified need for quality assurance in the community <sup>39</sup>
Micro-credentialing leads to high bureaucracy	High	Medium to high	Documentation of first steps with pilot consortia; apply “lessons learned”

## 4 Support Actions from Base4NFDI / NFDI Sections, and Integrating NFDI Consortia / Efforts

Table 3: Support needed from Base4NFDI / Service Stewards / Section

Support from	Work package / Description of contribution	Contact person
Base4NFDI	Support in user study design and persona development, guidance on legal aspects and accessibility; alignment with EOSC initiatives, networking across consortia, and integration of RDMTraining4NFDI	base4nfdi-office@lists.nfdi.de
Service Stewards	Interface between Base4NFDI and RDMTraining4NFDI, deliverable monitoring, participation in internal/external meetings (e.g. coordination, technical input, documentation), and support for outreach and promotion.	base4nfdi-servicestewards@lists.nfdi.de
Section EduTrain	Support through service feedback (e.g. feedback loops, surveys), section meetings to identify cross-consortia needs, exchange with EduBricks (AP2) for integration, monthly meetings for feedback, consultation, and alignment with end-user needs (AP5).	section-edutrain@lists.nfdi.de

<sup>37</sup> As in the first phase; see Vandendorpe *et al.*, 2025b and Wohltmann *et al.*, 2025e

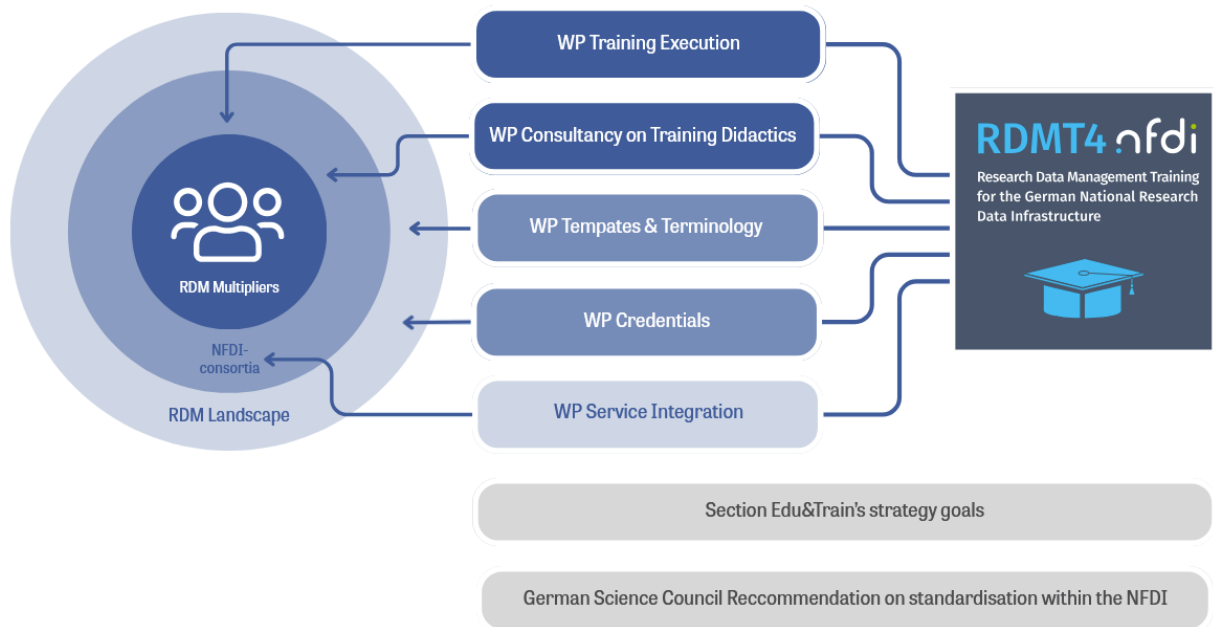
<sup>38</sup> Wohltmann *et al.*, 2025d, TS4NFDI use cases; e.g. NFDI4Memory, preliminary work of the community, such as LZM, KIM, DALIA, stakeholder event.

<sup>39</sup> Wohltmann *et al.*, 2025c

Support from	Work package / Description of contribution	Contact person
TS4NFDI	Supporting the development of a Skosmos <sup>40</sup> -based terminology service which builds on preliminary work developed within the RDM community (e.g. the glossary of the LZM-FDM <sup>41</sup> )	ts4nfdi@lists.nfdi.de
PID4NFDI	Offering expertise, supporting alignment with national and international PID policies, standards, and frameworks to ensure training materials reflect current good practices. Actively participating in selected training	pid4nfdi@lists.nfdi.de
Jupyter4NFDI	Providing access to the Jupyter4NFDI Hub for training, supporting notebook integration into materials, activities through an incubator project.	b.hagemeier@fz-juelich.de
DMP4NFDI	Supporting the integration of DMP-related materials and use cases into RDMTraining4NFDI's training infrastructure, participating in training	dmp4nfdi@lists.nfdi.de
KGI4NFDI	Contributing training material that offers a basic introduction to knowledge graphs and the underlying technologies, their application in RDM and ways to generate, host and query own knowledge graphs	kgi4nfdi@lists.nfdi.de

Table 4: Contributions required from the integrating consortia

Support from	Involved effort	Contact
BERD4NFDI*, NFDI4Cat*, NFDI4Memory*, NFDI4Biodiversity*, NFDI4ING*, MaRDI, NFDI4Microbiota, FAIRagro, NFDI4Objects, NFDI4Chem	Participating in a community process to agree on quality criteria for RDM training materials in preparation for a certification concept; supporting harmonisation of RDM training materials, methods, and tools; contributing expertise to co-development of community RDM training and knowledge exchange formats; involving in testing, feedback, and dissemination activities related to the developed services. *Serving as a pilot use case for the certification concept	See: Table 1



<sup>40</sup> <https://skohub.io/>.

<sup>41</sup> Repository "glossar" (<https://github.com/dini-ag-kim/glossar>) and DALIA (Steiner *et al.*, 2025), which also can be mapped with bwFDM's terminology (<https://forschungsdaten.info/praxis-kompakt/glossar>).

## 5 Work Programme

Figure 1: RDMTraining4NFDI work packages

Figure showing the work packages (WP) and target audiences planned for the Integration Phase of RDMTraining4NFDI. RDMTraining4NFDI builds on the strategic goals of the NFDI EduTrain section and aligns with the recommendations of the German Science and Humanities Council (Wissenschaftsrat, 2025).

### 5.1 Overview of Work Packages

Table 5: Overall work programme with work packages, deliverables, milestones, and responsible partner.

Work package	Deliverables (D) and milestones (M)	Responsible partner	Related work packages
<b>WP1 Training Execution &amp; Consultancy</b>			
WP1.1 Training execution	<b>M1.1.1</b> Evaluation results integrated in RDM modular training (month 4) <b>M1.1.2</b> Monitoring of RDM trends (month 24) <b>D1.1.1</b> Modular Training delivered (month 24)	ZB MED (Lead) TH Köln (Partner)	WP2 + WP3
WP1.2 RDM Training Consultancy	<b>M1.2</b> RDM training consultancy established (month 3) <b>D1.2</b> Consultancy on RDM training, skills, and methodologies (month 24)	ZB MED (Lead) TH Köln (Partner)	WP2
<b>WP2 RDM Templates &amp; Terminology</b>			
WP2	<b>M2.1:</b> Online workshop run on RDM template with use cases incl. documentation (month 6) <b>M2.2:</b> RDM templates for harmonising training materials (month 12) <b>M2.3:</b> Evaluation criteria defined for choosing research software / tools (month 16) <b>M2.4:</b> Incubator of TS4NFDI – Terminology RDM teaching and learning materials launched (month 24) <b>D2.1:</b> Documentation of key criteria for selecting software and tools for RDM workflows (month 18) <b>D2.2:</b> Technical documentation for RDM templates (month 24)	TH Köln (Lead) ZB MED (Partner)	WP1.1
<b>WP3 Credentials</b>			
WP3	<b>M3.1:</b> Alignment with Skills4EOSC Quality Assurance Framework and other initiatives (month 3) <b>M3.2:</b> Quality characteristics defined for training materials (month 6) <b>M3.3:</b> Evaluation of administrative and technical requirements for creating micro-credentials (month 9) <b>M3.4:</b> Onboarding of use cases for pilot micro-credential process concluded incl. documentation (month 12) <b>M3.5:</b> Pilot micro-credential process finalised incl. evaluation (month 22) <b>D3.1:</b> Recommendations on micro-credential process from NFDI including suggestions for a standardised review process and a set of quality characteristics for training materials (month 24)	TH Köln (Lead) ZB MED (Partner)	WP1.1 + WP2
<b>WP4 Base4NFDI Requirements, Service Integration and Results Management</b>			

WP4.1 Base4NFDI Items <sup>42</sup> and Service Integration	<b>M4.1. Service usability tested and integrated (month 20)</b> <b>D4.1.1 (=Base4NFDI D.Int.6) Documentation of usability (month 5)</b> <b>D4.1.2 (=Base4NFDI D.Int.1) Documentation of service integration and success (month 18-24)</b> <b>D4.1.3 (=Base4NFDI D.Int.2) Documentation of service maturity (month 18-24)</b> <b>D4.1.4 (=Base4NFDI D.Int.3) Documentation of sustainability (month 24)</b> <b>D4.1.5 (=Base4NFDI D.Int.4) Provision of service portfolio metadata (month 18-24)</b>	ZB MED (Lead)  TH Köln (Partner)	WP1-3
WP4.2 Results Management	<b>M4.2(=Base4NFDI D.Int. 9) Talks at Base4NFDI User Conference, Services Roadshow/Demo Sessions, and NFDITalk (month 24)</b> <b>D4.2.1 (=Base4NFDI D.Int. 8) Brief overview of Integration Phase outcomes compiled and presented at a section meeting (month 24)</b> <b>D4.2.2 Final report on Integration Phase (month 24)</b>	ZB MED (Lead)  TH Köln (Partner)	WP1-3

## 5.2 Detailed Work Programme

### 5.2.1 WP1 Training Execution and Consultancy

**Lead:** ZB MED (20 PM); **Partner:** TH Köln (4 PM); **Duration:** months 1–24 **Cooperation:** cooperating consortia (see Table 1), Jupyter4NFDI, PID4NFDI, DMP4NFDI, Galaxy Training!, ELIXIR-DE, den.bi, KODAS, de.KCD

#### 5.2.1.1 WP1.1 RDM Training Execution

WP1.1 will strengthen RDM competencies across the NFDI by providing RDM training to the target group. Modules piloted during the Initialisation Phase will be revised based on evaluation results (**M1.1.1**). These will be offered alongside new modules aligned with target group needs, provided in cooperation with stakeholders (**D1.1.1**). Following evaluation (Wohltmann *et al.*, 2025e) of the training execution in the Initialisation Phase, training will be delivered in modular, flexible formats on a quarterly basis<sup>43</sup>. Additional needs identified through exchanges with the consortia<sup>44</sup> will lead to expansion of generic RDM modules on core topics in close exchange with use case needs. These will be made available to researchers across consortia, supporting data stewards and RDM multipliers in their daily work and fostering consolidation of RDM training within NFDI, as the German Science and Humanities Council recommends (Wissenschaftsrat, 2025).

RDM trends will be monitored with community input to identify emerging training needs<sup>45</sup> (**M1.1.2**).

<sup>42</sup> Note: Base4NFDI D.Int.5 Self-assessments of software quality and Base4NFDI D.Int.7 User-centered documentation and training are not included in consultation with Base4NFDI

<sup>43</sup> On-site training is offered twice a year with travel support for NFDI RDM multipliers, initially for cooperating consortia and, where possible, extended to other consortia.

<sup>44</sup> During the BioMED workshop 2025; also see: Wohltmann *et al.*, 2025c

<sup>45</sup> e.g. in exchange with the Working Group RDM Helpdesk Network: <https://www.nfdi.de/section-edutrain/working-group-rdm-helpdesk-network> and Working groups of fdm-sh: [https://fdm-sh.de/en/working\\_groups](https://fdm-sh.de/en/working_groups).

For greater reusability and accessibility, RDMTraining4NFDI will use Git and the Codeberg software forge to deploy training materials automatically following conversion of the markdown source files into target formats such as HTML and PDF. Where requested, training will be provided to build Git skills. This training execution directly supports WP2 objectives by strengthening Git capacity among users.

### 5.2.1.2 WP1.2 RDM Training Consultancy

WP1.2 will establish a consultancy service to provide advice on training materials and methodologies in response to community needs (Wohlmann *et al.*, 2025d). This service will support NFDI consortia, RDM multipliers, and researchers who have developed consortium-specific tools and methods, helping them to structure and deliver effective RDM training<sup>46</sup> aligned with The Carpentries<sup>47</sup> and train-the-trainer methodologies (Biernacka *et al.*, 2023). Consortia will be encouraged to contact RDMTraining4NFDI via the mailing list for support with the pedagogical aspects of their training. Consultancy will be offered in one-hour online sessions (individual or group) or training workshops on teaching methods, depending on the topic and demand (**D1.2/M1.2**).

### 5.2.2 WP2 RDM Templates & Terminology

**Lead:** TH Köln (16 PM); **Partner:** ZB MED (2 PM); **Duration:** months 1–24; **Cooperation:** BERD4NFDI, BioSchemas, bwFDM, FAIRagro, FDM-NDS, MaRDI, NFDI4Biodiversity, NFDI4Cat, NFDI4Chem, NFDI4ING, NFDI4Memory, NFDI4Microbiota, NFDI4Objects, RDM@KIT, TS4NFDI, PID4NFDI

WP2 will continue to focus on standardising RDM training materials, combining and implementing existing didactic concepts, and advancing harmonisation across the NFDI. In close coordination with the consortia, PID4NFDI, and TS4NFDI (**M2.1**), it will develop RDM templates, implement them technically, and evaluate their use (**M2.2**). These templates follow the EduBricks (Helbig *et al.*, n.d.) principle and will be formally described using BioSchemas / Schemas.science<sup>48</sup>, following the approach used by ELIXIR TeSS<sup>49</sup>. This approach allows training modules to be aggregated by subject- and/or discipline-specific criteria (e.g. by topics/subjects, data type, research methods, etc.) while remaining scalable enough to maintain cross-domain quality and reusability. The resulting ready-to-use-templates, which can be combined as needed, will also aim to lower technical and accessibility barriers, increasing reusability (Filiposka *et al.*, 2025). Complementary outputs include the requested technical documentation for RDM templates<sup>50</sup> (**D2.2**), which will highlight evaluated key criteria for selecting software and tools for RDM workflows (**M2.3, D2.1**).

<sup>46</sup> e.g. with the use case MaRDI: the development of didactic training materials for the MaRDMO plugin

<sup>47</sup> The Carpentries, “Instructor Training”, <https://carpentries.org/instructor-training/>.

<sup>48</sup> See: BioSchemas training materials: <https://bioschemas.org/profiles/TrainingMaterial/1.0-RELEASE> and training materials from Schemas.science: <https://schemas.science/profiles/TrainingMaterial/>.

<sup>49</sup> ELIXIR TeSS: <https://tess.elixir-europe.org/>.

<sup>50</sup> Complementary to e.g. Manske *et al.*, 2024, Biernacka *et al.*, 2025b, and other community efforts.

RDMTraining4NFDI will become an incubator within TS4NFDI to develop a Skosmos<sup>51</sup> terminology service for RDM teaching and learning materials (**M2.4**). This service will be based on the preliminary work of the DINI/nestor Sub-Working Group Training/Further Education (Petersen *et al.*, 2025) and DALIA (Steiner *et al.*, 2025) and will be mappable to other terminologies<sup>52</sup>.

### 5.2.3 WP3 Credentials

**Lead:** TH Köln (14 PM); **Partner:** ZB MED (4 PM); **Duration:** months 1-24; **Cooperation:** FAIRagro, NFDI4Microbiota, MaRDI, NFDI4Objects, KGI4NFDI, FDM-NDS, KODAQs, ELIXIR-DE, bwFDM, RDM@KIT; **Pilot use cases:** Kiel University's central Research Data Management office, NFDI4Biodiversity, NFDI4Cat, NFDI4Chem, NFDI4ING, NFDI4Memory

Drawing on strong community support, WP3 will refine recommendations for a practical certification process for training units and courses. This process is described in detail in Bock *et al.*, 2026. WP3 will develop certification criteria and propose a standardised, community-driven review process, which will be first tested and evaluated in cooperation with use cases provided by BERD4NFDI, NFDI4Biodiversity, NFDI4Cat, NFDI4ING, NFDI4Memory, Kiel University's central Research Data Management office and WP1.1 (**D3.1**) and then reviewed by and refined with the entire RDM community.

Analysis of existing certification options and community consultation<sup>53</sup> indicate that awarding micro-credentials for training units is the most feasible option. They best meet the community's requirements for focused qualifications in a manageable timeframe.

The first step involves further consultation with consortia and other stakeholders, paying particular attention to alignment with the Skills4EOSC quality assurance framework (Sánchez Moreno *et al.*, 2025 and Sanchez Barrioluengo *et al.*, 2025b) (**M3.1**). Drawing on existing work in the RDM community (e.g. Castro 2025), a set of quality characteristics for training materials – such as compliance with FAIR principles and metadata standards – will be defined for this purpose (**M3.2**). Given strong community demand for a mechanism for issuing certificates and credentials, WP3 will establish a community-based credentialing process as a core component of RDMTraining4NFDI's basic service offering. WP3 will therefore evaluate the administrative and technical requirements for such a system in cooperation with the NFDI consortia and the NFDI head office, and will also explore the feasibility of establishing a community accreditation team (**M3.3**).

The process of awarding micro-credentials will be tested and evaluated in a pilot (**M3.4/M3.5**). Supervised and supported by WP3, each pilot use case will provide a use case for crediting different training formats – online or on-site, self-paced or trainer-led, depending on each consortium's needs. In consultation with each consortium, criteria for successful completion of the training (e.g. a task, a test, individual or group work, etc.) will be agreed upon. Participants who meet these criteria will

<sup>51</sup> See: Skosmos – TIB Labs: <https://labs.tib.eu/info/projekt/skosmos> and <https://skohub.io/>.

<sup>52</sup> See: DINI-AG-KIM glossary (<https://github.com/dini-ag-kim/glossar>), which also can be mapped with bwFDMs terminology (<https://forschungsdaten.info/praxis-kompakt/glossar>).

<sup>53</sup> Wohltmann *et al.*, 2025c. Also pointed out by the TEC in its assessment of the proposal for the Initialisation Phase.

receive a stackable micro-credential in line with the Council of the EU's European approach to micro-credentials<sup>54</sup>.

#### 5.2.4 WP4 Base4NFDI Requirements, Service Integration & Results Management

**Lead:** ZB MED (14 PM) **Partner:** TH Köln (2 PM) **Duration:** months 1-24; **Cooperation:** use cases

##### 5.2.4.1 WP4.1 Base4NFDI items and Service Integration

This sub-work package ensures that developed services are sustainably integrated and aligned with both user needs and the requirements of the relevant infrastructures (M4.1). It covers D4.1.1–D4.1.5 in alignment with the Base Deliverables (Schäfer-Neth *et al.*, 2025).

##### 5.2.4.2 WP4.2 Results Management

This sub-work package oversees the documentation and presentation of relevant outcomes in the Integration Phase (D4.2.1) and events (M4.2), culminating in a final Integration Phase report (D4.2.2).

RDM Training 4NFDI – Integration Phase	Start	End	2026		2027				2028		
			3.Q	4.Q	1. Q	2.Q	3.Q	4.Q	1. Q	2.Q	3.Q
			J	A	S	O	N	D	J	F	M
<b>WP1 – Training Execution &amp; Consultanc</b>	<b>01.08.26</b>	<b>31.07.28</b>									
M1.1.1 Evaluation results integrated in RDM training	01.08.26	30.12.26			M						
M1.1.2: Monitoring of RDM trends	01.08.26	31.07.28									M
M1.2: RDM training consultancy established	01.08.26	30.11.26		M							
D1.1.1: Modular Training delivered	30.12.26	31.07.28									D
D.1.2: Consultancy on RDM training, skills & methodologies	30.11.26	31.07.28									D
<b>WP2 – RDM Templates &amp; Terminology</b>	<b>01.08.26</b>	<b>31.07.28</b>									
M2.1: Online workshop on RDM template	01.08.26	28.02.27			M						
M2.2: RDM templates	28.02.27	01.08.27					M				
M2.3: Evaluation criteria for selecting software / tools	01.08.26	30.10.27						M			
M2.4: Incubator of TS4NFDI	01.08.26	31.07.28									M
D2.1: List of key criteria for selecting software / tools	01.08.26	31.12.27							D		
D2.2: Technical documentation for RDM templates	01.08.26	31.07.28									D
<b>WP3 – Credentials</b>	<b>01.08.26</b>	<b>31.07.28</b>									
M3.1: Alignment with Skills4EOSC & other initiatives	01.08.26	30.11.26		M							
M3.2: Quality characteristics defined for training materials	01.08.26	28.02.27			M						
M3.3: Evaluation of requirements for micro-credentials	01.08.26	01.05.27				M					
M3.4: Onboarding use cases; pilot micro-credential process	01.08.26	01.08.27					M				
M3.5: Pilot micro-credential process finalised	01.08.26	31.05.28								M	
D3.1: Recommendations on micro-credential process	01.08.26	31.07.28									D
<b>WP4.1 – Base4NFDI Items &amp; Service Integration</b>	<b>01.08.26</b>	<b>31.07.28</b>									
M4.1: Service usability tested and integrated	01.08.26	31.03.28								M	
D4.1.1: Documentation of usability	01.08.26	31.12.26			D						
D4.1.2: Documentation of service integration and success	01.01.28	31.07.28									D
D4.1.3: Documentation of service maturity	01.01.28	31.07.28									D
D4.1.4: Documentation of sustainability	01.08.26	31.07.28									D
D4.1.5: Provision of service portfolio metadata	01.01.28	31.07.28									D
<b>WP4.2 – Results Management</b>	<b>01.08.26</b>	<b>31.07.28</b>									
M4.2: Talks, Presentations	01.08.26	31.07.28									M
D4.2.1: Overview about the outcomes of Integration phase	01.04.28	31.07.28									D
D4.2.2: Final report on Integration	01.04.28	31.07.28									D

Figure 2: Work programme – GANTT

<sup>54</sup> European Commission, 2024.



## Appendix

### a) Acknowledgements

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### c) *Adaption of Deliverables*

#### **Deliverable D1.4.1 Requirements Analysis (Version 1)**

The requirements analysis can be implemented as specified in the Base4NFDI document for the completion of the Initialisation Phase.

#### **Deliverable D1.4.2 Software Evaluation (Version 1)**

This evaluation will classify existing training materials, identify gaps in the current landscape, explore certification possibilities by developing evaluation and quality criteria, and gather community feedback throughout the whole process. This deliverable also covers the selection of an appropriate platform for the distribution of training materials.

#### **Deliverable D1.4.3 Service Design (Version 1)**

The service design will describe the results of the requirements analysis and software evaluation and outline the criteria to be considered when developing the service. It will also address the relation to other basic and NFDI-wide services including technical and organisational interfaces, explain how training materials will be distributed inside and outside the NFDI, and specify relevant technical standards and components.

#### **Deliverable D1.4.4 Service Prototype (Version 1)**

This deliverable involves the development and planning of the training concept, preparation of the associated training materials, and, ideally, the establishment of a standard format that aligns with existing resources.

#### **Deliverable D1.4.5 Service Piloting and User Testing (Version 1)**

Service Piloting and User Testing covers implementation and evaluation of the developed training concept with four chosen use cases/consortia.

### ***d) Technology Readiness Levels (TRL) in the life-cycle of a certificate course for practical skills<sup>55</sup>***

#### **Concept Stage**

##### *TRL 1 - Basic Principles Observed*

This stage involves recognising the need for a new skill or course based on market trends or gaps.

Example: An educational institution identifies a growing demand for data analysis skills in the job market.

##### *TRL 2 - Concept Formulation*

The initial idea is developed into a more concrete course concept, including potential curriculum and learning outcomes.

Example: The institution outlines a course on "Regression Analysis: Simplify Complex Data Relationships" focusing on statistical analysis and Python programming<sup>56</sup>

##### *TRL 3 - Proof of Concept*

Initial testing of the course concept through surveys or pilot modules to gauge interest and feasibility.

Example: The institution conducts a survey among current students and professionals to assess

<sup>55</sup> This categorisation was created with the help of generative AI (perplexity.ai). Prompt available under: [https://www.perplexity.ai/search/please-try-to-transfer-the-ide-Awi.trP8Qym\\_rOY9pYenJA?1=d](https://www.perplexity.ai/search/please-try-to-transfer-the-ide-Awi.trP8Qym_rOY9pYenJA?1=d)

<sup>56</sup> 1-5: <https://www.coursera.org/courses?query=professional+skills>.

interest in a data analysis certificate program.

#### *TRL 4 - Validation in Controlled Environment*

The course is developed and tested in a controlled setting, such as a small pilot class or internal review.

Example: A small group of students is enrolled in a pilot version of the "Regression Analysis" course to provide feedback on the curriculum and teaching methods.

### **Development Stage**

#### *TRL 5 - Validation in Relevant Environment*

The course is refined and tested in conditions similar to its intended delivery format, such as an online platform.

Example: The course is offered as a beta version on an online learning platform like Coursera, with limited enrollment to gather user feedback<sup>[2]</sup>

#### *TRL 6 - Demonstration in Relevant Environment*

A more complete version of the course is demonstrated in conditions closely mimicking the intended market, including full-scale online delivery

Example: The "Regression Analysis" course is fully launched on Coursera, with all modules and assessments available to a wider audience for further validation.

### **Implementation stage**

#### *TRL 7 - Demonstration in Operational Environment*

The course is fully implemented and tested in its actual intended environment, such as a fully operational online learning platform.

Example: The course runs for several months on Coursera, with continuous monitoring and adjustments based on student feedback and performance metrics<sup>[3]</sup>

#### *TRL 8 - Service Complete and Qualified*

All aspects of the course are finalised and proven to work as intended, with positive feedback and successful completion rates.

Example: The "Regression Analysis" course receives high ratings and positive reviews, with a significant number of students completing the course and earning certificates<sup>[4]</sup>

#### *TRL 9 - Proven in Operational Environment*

The course has a track record of success and is ready for broader promotion or replication, such as offering advanced levels or related courses.

Example: Based on the success of the initial course, the institution develops and launches advanced data analysis courses and considers partnerships for wider reach.<sup>[5]</sup>

**Note.** The funding request, the signatures, letters of commitment and the open project report have been removed from the original proposal.