



# Rethinking Data Management Planning: Introducing Research Output Management Planning (ROMPi) Approach

ESSAY

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## ABSTRACT

Data management plans (DMPs), designed to adhere to Findable, Accessible, Interoperable, Reusable (FAIR) principles, were introduced to enhance research data management (RDM) but have encountered challenges in implementation. This essay calls for a paradigm shift by introducing the ‘Research Output Management Planning (ROMPi)’ approach, aiming to integrate traditional research project management practices promoting a holistic perspective of RDM. In its essence, ROMPi reframes the DMP in the conventional project management work breakdown structure in work packages (WPs), with research outputs going through their lifecycle. It also advocates reimagining the concept of data into research outputs, acknowledging a holistic perspective of the research outcomes. We demonstrated that the research project management perspective at the early implementation stage could ultimately align DMP within the research process. ROMPi offers a practical research output management approach, fostering a holistic project-researcher-centric perspective.

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Research data management (RDM) is a strategic topic for research (Abraham et al. 2019; Boyan Angelov 2020) and requires proper institutional strategic planning (Hartmann et al. 2019). Paraphrasing Kanza and Knight (2022), there is a great research project planning behind every great research project. Data management plans (DMPs) promote data sharing and data reuse (Tenopir et al. 2020), address the enormous costs of not having Findable, Accessible, Interoperable, Reusable (FAIR) data (European Commission 2018) and the pressing need for practical integration of RDM in researcher's workflow (Smale et al. 2020). Nowadays, DMPs are envisioned to align with the Findable, Accessible, Interoperable, Reusable (FAIR), Transparency, Responsibility, User focus, Sustainability, and Technology (TRUST) and Collective Benefit, Authority to Control, Responsibility, and Ethics (CARE) principles (Carroll et al. 2020; Lin et al. 2020; Wilkinson et al. 2016). Often, their efficacy is hampered because of the multifaceted challenges, including governance within academic institutions and alignment with research project management (Smale et al. 2020). The transformative RDM can be initiated only after rethinking the top-down bureaucratic nature of data management plans (DMPs) currently designed 'by funding bodies for funding bodies', which ultimately constrains their effectiveness and functional management (Smale et al. 2020; Ugochukwu & Phillips 2024; Vitale & Moulaison Sandy 2019). The research community is moving toward machine-actionable DMP that can be interoperable across various research systems and tools (Jones et al. 2020; Miksa et al. 2019; Philipson et al. 2023). This contribution aligns with these approaches that promote streamlining the research process. We propose to critically rethink DMP by merging the research project management approach (Huljenic et al. 2005) and the research output lifecycle (Higgins 2008), encapsulated by the term 'ROMPI', which serves as both the new acronym for 'Research Output Management Planning' and translates to 'break it' in Italian. The concept of 'breaking' in this context involves adopting the well-known established work breakdown structure (WBS) of a project into work packages (WPs) and research outputs, often referred to as 'deliverables' (Haugan 2013; Huemann & Turner 2024; Huljenic et al. 2005). This process streamlines the implementation of RDM requirements from project proposal writing to execution, seamlessly integrating operational RDM into a standard research project management framework.

## BACKGROUND PERSPECTIVES OF THE ROMPI APPROACH

The ROMPI approach derives from four main perspectives: 1) project implementation planning should integrate RDM components with a bottom-up researcher-centric perspective; 2) focus on overall project outputs rather than the reductive data-only perspective; 3) data stewardship should be recognised as a strategic consulting dimension within the data governance of a research organisation; 4) transition current top-down obligation of DMP with funder-centred detailed requirements (questionnaires and templates) approach toward a holistic perspective for merging to the research project management.

1. Contemporary data management planning (DMP) framework is treated as a disentangled standalone process. Instead, historically, the initial approaches to RDM were characterised by a project management orientation focused on project objectives. Therefore, the data management goals were integrated into the overarching research project implementation planning (Smale et al. 2020). Adopting a project-centric approach ensures that all aspects of the research process are linked.
2. Bechhofer et al. (2010) introduced the term 'research objects' as a 'semantically aggregation of interoperable entities supporting the research objectives'. Our approach aligns with this concept, promoting the shift from the traditional 'research data' notion towards a broader conceptualisation of 'research outputs'. The process of achieving FAIR research output starts with the project implementation planning. Throughout the lifecycle of a project, a DMP should be intended as a project output governance tool, where the researchers' work spans across several diverse activities, such as project planning, data collection, data analysis, scientific communication, dissemination, and scientific publication. Every activity constitutes the research outputs of a project and enriches each other.
3. The Research Infrastructure Self-Evaluation Framework - Deutschland (RISE-DE) highlights RDM and data stewardship as strategic institutional relevance, with the need

to define appropriate governance and create a supportive environment for implementing the FAIR principles (Hartmann et al. 2019; Ugochukwu & Phillips 2024). It also provides comprehensive guidelines through strategic governance, operational steps, challenges, and opportunities in research data management. Similarly, Krause et al. (2024) suggested that the data stewardship professional should facilitate the strategic dimension of RDM by active involvement in the project planning and implementation, ensuring FAIRness of all the project outcomes.

4. DMP has been imposed on the research community by funders top-down rather than emerging organically from a bottom-up effort by researchers involving supportive professional services of the institutional research infrastructure. We acknowledge the importance of the funder data management requirements, and in principle, they are fundamental for addressing strategic goals. However, the funder also defined the DMP templates and their practical implementation as a standalone ‘data-only’ driven process disentangled from the research project planning workflow.

Therefore, ROMPi calls for a paradigm shift in DMP implementation, starting from the need to redefine the funder requirement. It emphasises a bottom-up approach that incentivises researchers, considers holistic research outputs, and focuses on integrative project management and research data governance.

## A PARADIGM SHIFT IN RDM PRACTICE

### RESEARCH PROJECT PLANNING OVER DATA MANAGEMENT PLANNING

By looking at the structure of the project proposals, the operative project planning, the practical project execution, and ultimately looking at how RDM and DMP are embedded within the project life cycle, it emerges clearly that RDM and DMP have primarily strategic and governance issues rather than a stewardship (operative) problem. DMPs are treated as a disentangled standalone process, and consequently, data stewards’ support is often unstructured and comes into play on request without proper embedding within a broad institutional research data strategy and governance (Boyan Angelov 2020). Despite their intentions, the DMPs lack operative *management* and *planning*-related activities. This highlights the necessity for effective, efficient and streamlined data management strategies that go beyond awareness raising, moving toward research data governance (Borgman 2018; Ugochukwu & Phillips 2024) and higher-end support models, such as data stewards helping the researchers FAIRly plan the entire research outputs, linking proposal writing through kick-off till the project ends and beyond (Krause et al. 2024). Therefore, switching from a classical DMP approach (as a tedious formal bureaucratic burden) to a research output management planning approach (as a bottom-up approach integrating the individual workflow of the research project and researchers’ requirements) is fundamental. To envision this, the role of data stewards within the research institutional structure should be seamlessly aligned into the broader research project governance; therefore, the consultive role has to be integrated by bridging individual researchers’ requirements or by having more active interactions depending on their profiles, data literacy, project complexity and institution requirements.

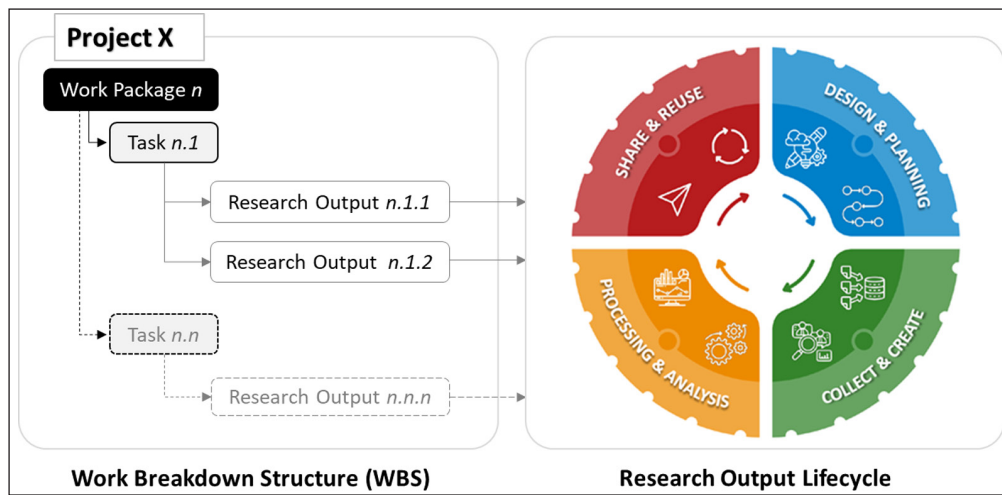
### FROM RESEARCH DATA TO RESEARCH OUTPUTS

In the context of RDM and DMP acronyms, the letter ‘D’ represents ‘data’. However, the data definition still confuses several researchers depending on their subject domain, and it is reductive because it overlooks the importance of the highly heterogeneous research outputs produced during a research project and their pivotal contribution to open science (Leonelli 2022). This narrative strongly argues that the solution is rooted in a bottom-up holistic approach, starting by adopting the broader term ‘research output’ or ‘research object’ (Bechhofer et al. 2010, 2013). This conceptual shift implies that Data Stewards hold a more holistic role within a project (Specht et al. 2023), shifting finally from FAIR data toward a FAIR research output workflow approach (Peer et al. 2022) that is aligned to the concept of FAIR Digital Objects (De Smedt et al. 2020) supporting ultimately linked research outputs (Cousijn et al. 2021). Despite being a slight change in definition, it has a cascade of positive effects, such as it automatically promotes the importance of the diversity of outputs (Leonelli 2022; Rahal et al. 2022), attribution and

citation (Borgman 2012), which are the backbone of open science and for the implementation of initiatives such as the Coalition for Advancing Research Assessment (CoARA <https://coara.eu>) in reforming the research assessment and the Barcelona Declaration on Open Research Information (<https://barcelona-declaration.org/>). Furthermore, by advocating for the diversity of research outputs, we enhance knowledge dissemination, addressing a broad spectrum of societal impacts.

## ROMPi WORKFLOW, COMPONENTS AND OPERATIONAL EXAMPLE

ROMPi is rooted in the simple but well-established project management best practices and documentation. ROMPi entails carefully breaking the research project and activities into discrete WPs and the smallest research outputs, linking the latter to its lifecycle (Figure 1). This approach resonates with the intrinsic WBS researchers adhere to when writing project proposals or planning a project, fostering a seamless transition from project proposal to project kick-off where more detailed research project planning takes place and should be rigorously documented. Central to the ROMPi approach is reframing the traditional DMP questionnaires into the research output lifecycle (Higgins 2008; Williams et al. 2017) linked ultimately to the respective WP and research output (Figure 1). This holistic framework extends the principles outlined in the proposal, delineating each WP and research output through its stages. Each stage of the research output life cycle serves as a focal point for scrutinising the diverse facets of RDM. This comprehensive evaluation ensures that the FAIR principles and RDM best practices are consistently upheld throughout the project lifecycle. ROMPi is a comprehensive approach designed to be adaptable across various levels of detail granularity. At its core, ROMPi serves during the *research proposal writing phase*, offering an overview of planned outputs and all the actions related to RDM, ensuring compliance with funder requirements. During the *project planning phase*, ROMPi links all the research outputs with their RDM activities and considerations to the smallest decomposable research output. This approach allows for a thorough understanding of the steps required to meet the overarching goals outlined in the research proposal. Ultimately, at the *project implementation phase*, ROMPi links actions taken throughout the project lifecycle. This includes but is not limited to all the documentation of naming conventions, backup procedures, anonymisation processes, adherence to metadata standards, and more. Instead of consolidating all information into a singular document or a spreadsheet, ROMPi's approach involves referencing additional documentation. In Della Chiesa (2024a), a ROMPi template is proposed. Additionally, in Della Chiesa (2024b), the research output lifecycle guidance offers insights throughout the lifecycle component within the ROMPi approach. ROMPi's practical implementation starts with restructuring the data management section within research proposals. Instead of focusing solely on textual descriptions of data management strategies as typically required by the various funder templates, researchers are encouraged to exploit the work program of the project proposal, highlighting the WPs and research output (deliverables). Already at the proposal phase, the research outputs can be broken down into their smallest (possibly standalone) components, accompanied by a brief analysis of the envisaged data management strategies by going through the main aspects of the research output life cycle (see sheet 2 in Della Chiesa 2024a). By adopting this approach, researchers provide the project proposal reviewers with a simple, clear and sufficiently comprehensive understanding of the most relevant research output management actions and interdependencies for effective research output reuse, sharing, and preservation. With ROMPi, transitioning from proposal to project execution entails extending the data management section from a project proposal, starting from the already articulated breakdown of WPs and research outputs. During the planning phase, each work package and deliverable can be thoroughly elaborated in detail, assessing not only the RDM best practices and FAIR requirements but also in terms of simple project management aspects such as human resource availability, infrastructure, hardware, software, competencies training, budget and more (see sheet 3 in Della Chiesa 2024a). The alignment between the proposal phase and project execution while adopting well-known project management best practices ensures researchers can better understand the link between the WPs management, their related RDM actions and best practices, as well as the link to other planning activities such as risk and stakeholder analysis, communication and transfer planning.



**Figure 1** ROMPi approach links the WBS with the Research Output Lifecycle. The WBS breaks down the project into work packages, and tasks are broken down into concrete research outputs. To address the RDM best practices and FAIR principles, each research output (deliverable) goes through the research output life cycle. A practical ROMPi example has been given in a spreadsheet template in Della Chiesa (2024a), while a research output lifecycle guidance is in Della Chiesa (2024b).

## REFLECTIONS AND IMPLICATIONS

The ROMPi approach promotes the current FAIR Data Stewardship profile development (Förstner et al. 2023; Oladipo et al. 2022) as an agent of change through effective project management, promoting institutional strategy and governance development. ROMPi implicitly assumes that professional data stewardship is strategically embedded into the research organisation to translate and guide the researchers through the implementation process. A critical reflection relies on the funder's requirements that need to change to allow ROMPi to unlock its full potential. The funder's top-down demand for FAIR research outputs is fundamental but, in today's form, is not fulfilling its aims. In fact, despite all the efforts in guiding the development of DMPs (Michener 2015) and in assessing the fitness for the purpose of DMP solutions (Becker et al. 2023; Gajbe et al. 2021), the existing DMP guidance and software solutions are inherently based on funder's requirement that mandate DMP as standalone obligation unlinked to project management. Moreover, the ROMPi approach intends to switch from the former ineffective disentangled DMP requirements (Vitale & Moulaison Sandy 2019; Williams et al. 2017) into merging and linking research project management, work packages, the smallest decomposable research outputs and their life cycle. Our approach proposes merging existing project management concepts (Gantt chart, work packages, deliverables) and RDM workflows (research output life cycle) to provide a simple demonstration to establish a pathway for successful project outcomes. It could be argued that if project management tools and maDMPs are fully interoperable, somehow, it could resemble the ROMPi approach. maDMPs promote better interoperability, streamlining the exchange of information across solutions and systems. Nevertheless, maDMP is still 'data-centric', while ROMPi is more project-management-centric and holds a holistic perspective regarding the overall research outputs and their semantic link. Finally, it is our opinion that we need software solutions tailored for research project management embedding the ROMPi approach open source solutions like the Open Project (<https://www.openproject.org/>) might be the starting point for build upon a minimalistic tailored solution for an integrated machine-actionable Research Output Management Planning.

## CONCLUSION

DMP approaches are top-down and cannot address the intricate relationships among research project deliverables in favour of the practical research workflow and comprehensive scientific output. In such a background, the comprehensive realisation of DMP is often challenged; therefore, the broader impact of a diverse set of scientific outputs remains unseen, like many white elephants in the institutional disk space. We are asking for a paradigm shift to a bottom-up, holistic, researcher-centric strategy in DMP implementation, embodied in our proposed ROMPi approach. ROMPi is seamlessly aligned with standard research project management practices, empowering researchers' incentives to engage in comprehensive research output management that resonates with the multifaceted nature of contemporary research undertakings and can fulfil funder requirements of monitoring funding impacts. Integrating ROMPi within institutional research data governance should be a timely step toward enhancing long-lasting scientific good practice. Furthermore, our proposed approach will enhance scientific credibility and impact assessment transparency. The proposed approach should have a higher potential in institutions

that strategically embed data stewardship within the organisational structure, ensuring RDM initiatives are integrated seamlessly with the institution's governance structure. Conversely, its implementation in institutions, where data stewardship tasks are distributed across various organisational units without central coordination, may not be effective. In essence, the ROMPI approach represents a proactive project-researcher-centric holistic response to the limitations of traditional DMPs, offering a comprehensive strategy that integrates seamlessly with project management practices, addresses governance issues, and contributes to the broader goals of open science in the evolving research landscape.

## COMPETING INTERESTS

The authors have no competing interests to declare.

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