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A cost benefit analysis framework for Open Science

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Pathos

— Open Science Impact Pathways

Programme: Horizon Europe

Call: HORIZON-WIDERA-2021-ERA-01

Type of Action: Research and Innovation

Topic: Modelling & quantifying the impacts of Open Science practice

Grant Agreement No.: 101058728

Duration: Sep 2022 – Aug 2025 (36M)

Budget: €2M



Funded by
the European Union

CBA in the PathOS impact framework

OS impact pathways

SPHERE OF CONTROL

RESOURCES

-  Money
-  Legal frameworks
-  Skills
-  Infrastructure

ACTIVITY

- ✓ Data repositories
- ✓ Publisher agreements/copyright
- ✓ Data mining tool

OUTPUT

- Open access to research
- Early, open sharing
- Peer-review participation
- Ensuring reproducibility
- Involving citizens and end-users in R&I

SPHERE OF INFLUENCE

SHORT-TERM OUTCOMES

-  Easier and cheaper access to research
-  New ideas and innovations
-  Better use of researchers. Cost savings

LONG-TERM OUTCOMES

-  New products, startup and patents
-  More transparent and ethical science
-  Better teamwork, efficiency and citizens engagement

SPHERE OF INTEREST

IMPACTS

-  More innovation and economic growth
-  More scientific outputs
-  Better solutions for societal challenges



The CBA framework shows how **selected indicators and an assessment framework** can support strategic decision-making. It quantifies, in **monetary terms**, the net effect of OS-related changes that can be directly attributed to the intervention.

CBA in a nutshell

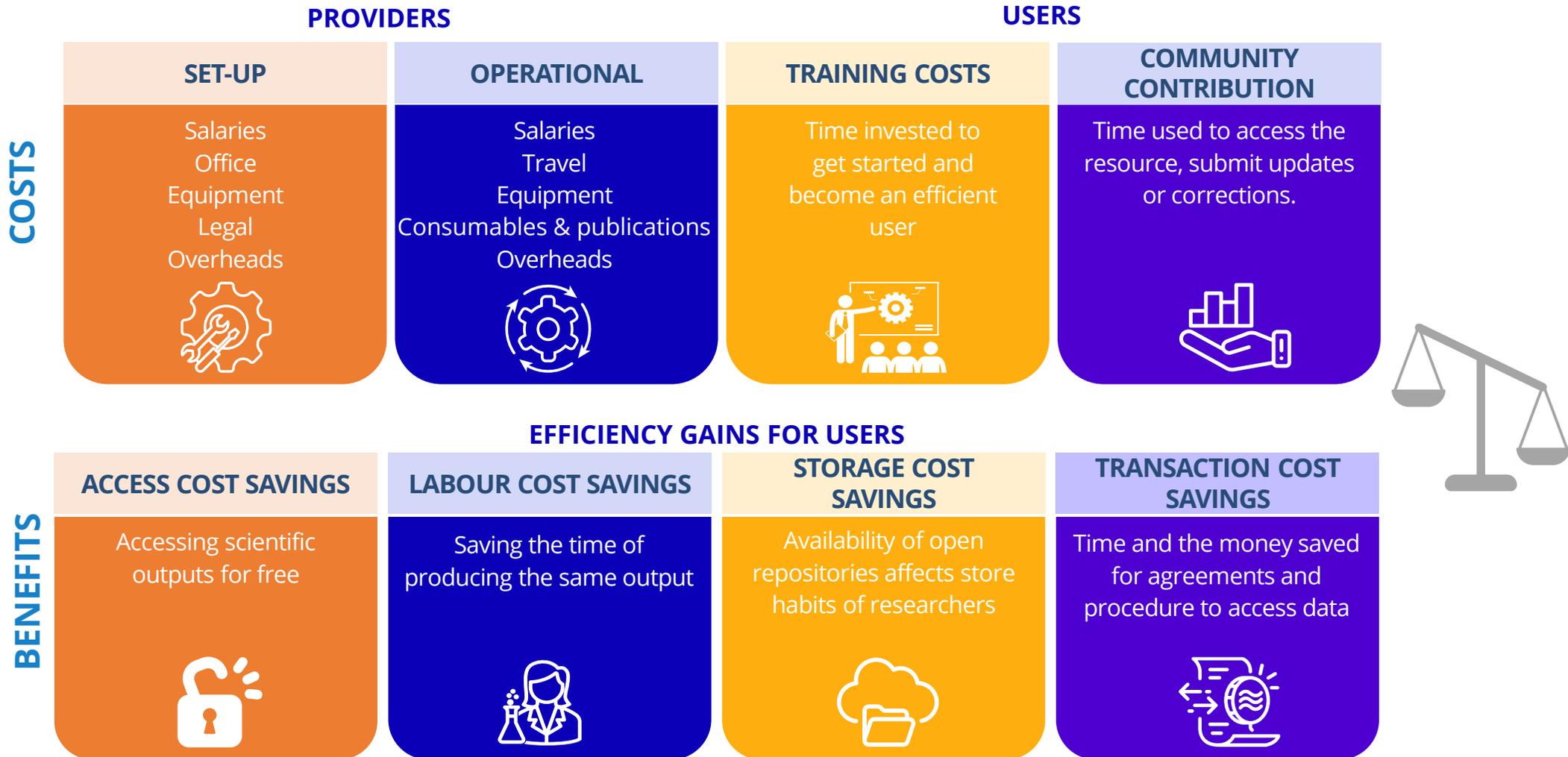
- An **analytical tool** to appraise the merits of an intervention (project, practice...) regarding how it changes welfare

If (Total Benefits > Total costs) → desirability

- **Systematic approach** for evaluating decisions based on their consequences
- **Long tradition** in EU and beyond to assess public investments in many sectors and fields:
 - *European Structural and Investment Funds (ESIF),*
 - *Connecting Europe Facility (CEF),*
 - *Impact Assessment Guidelines for policy proposal (SWD(2021) 305 final)*
 - *ESFRI socioeconomic impact assessment*
 - *European Investment Bank*
 - *Many national agencies*

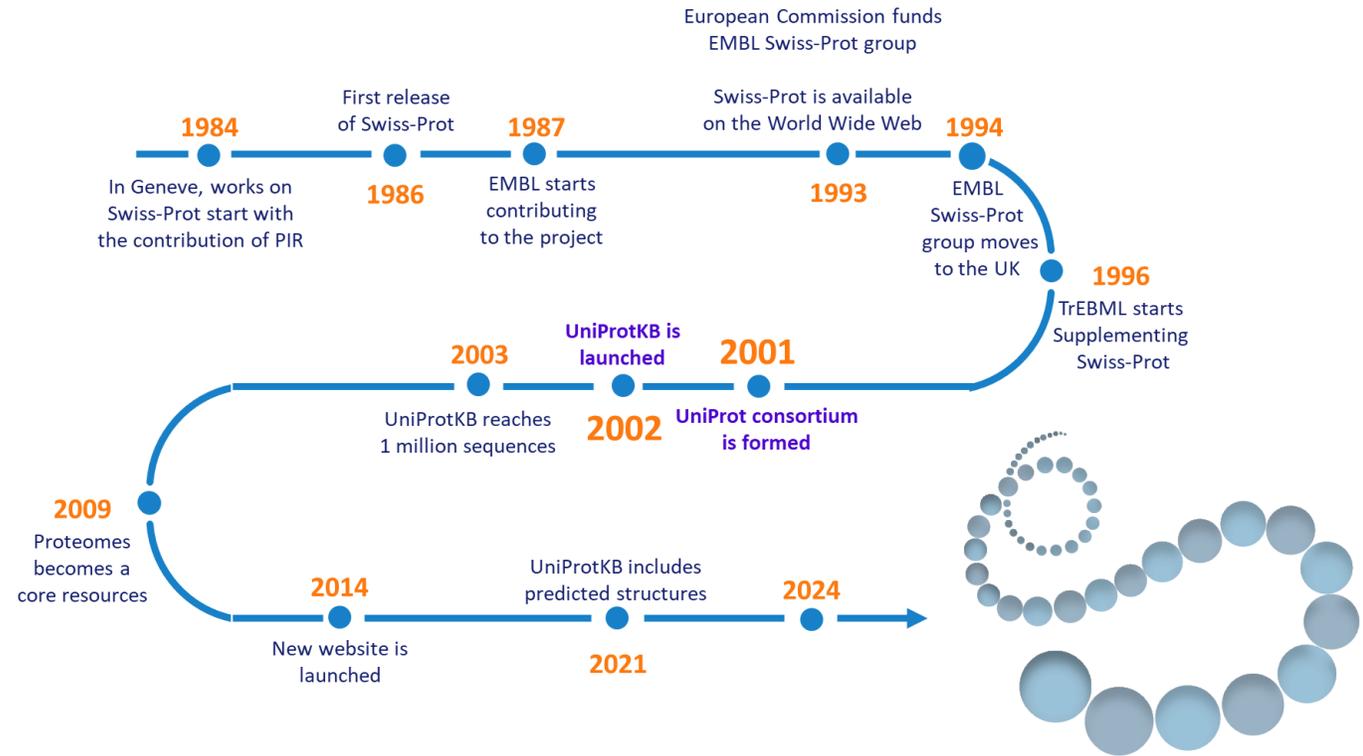
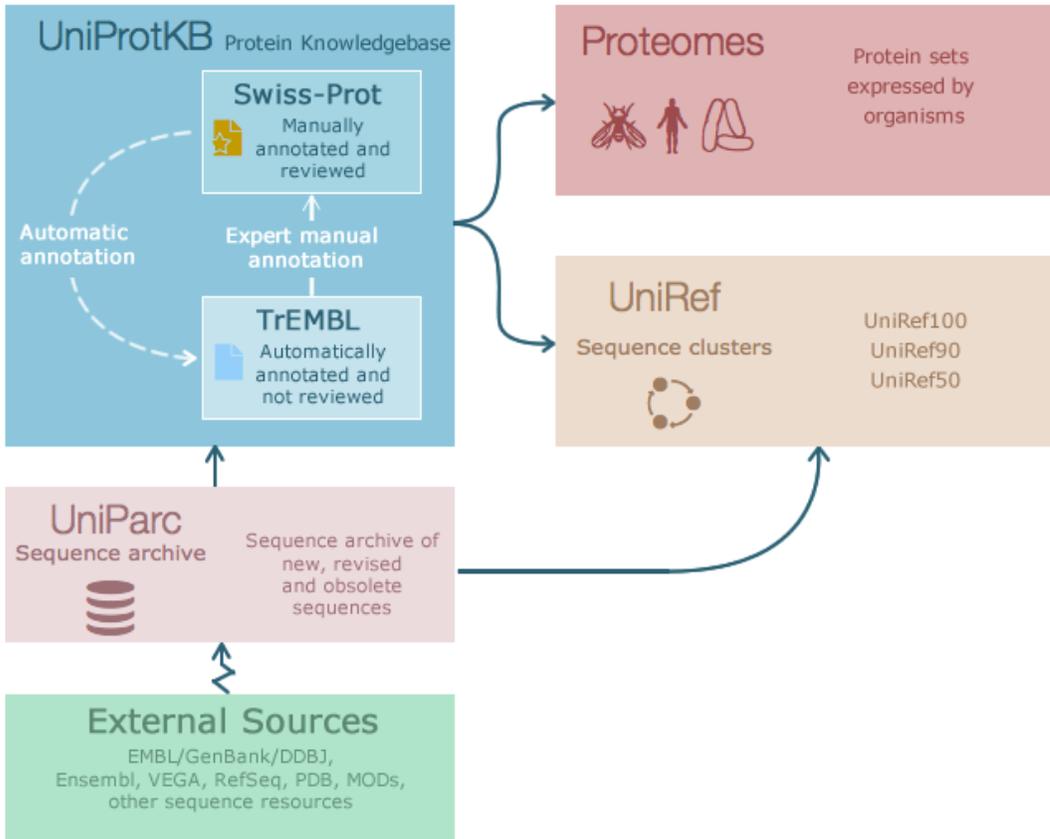


CBA framework for OS



Delugas, E., Catalano, G., & Vignetti, S. (2025). PathOS - D4.2 Methodological note on the CBA of Open Science practices (update). Zenodo. <https://doi.org/10.5281/zenodo.17091711>

Putting the framework in practice: UniProt



Setting the scene for the CBA



Scope of the analysis



Identification of the counterfactual



Estimation of the user population

■ Agree/Strongly Agree
 ■ Neutral
 ■ Disagree/Strongly Disagree

I WOULD HAVE ACCESSED THE SAME DATA THROUGH ANOTHER OS RESOURCE



I WOULD NOT HAVE BEEN ABLE TO CONDUCT MY WORK AND/OR RESEARCH.



I WOULD HAVE BEEN ABLE TO COLLECT AND RECREATE THE SAME DATA

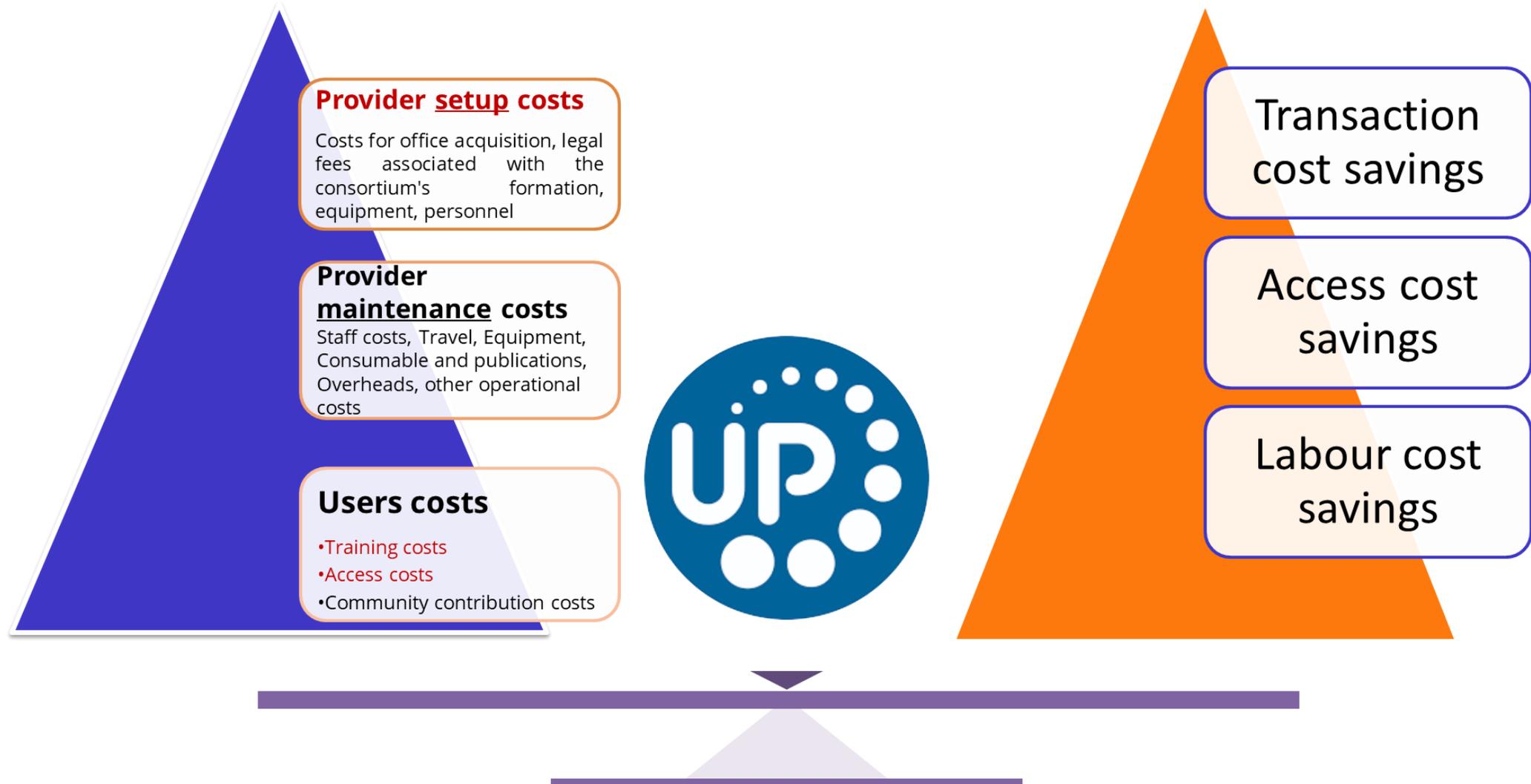


I WOULD HAVE ACCESSED THE SAME DATA THROUGH A CLOSED SOURCE

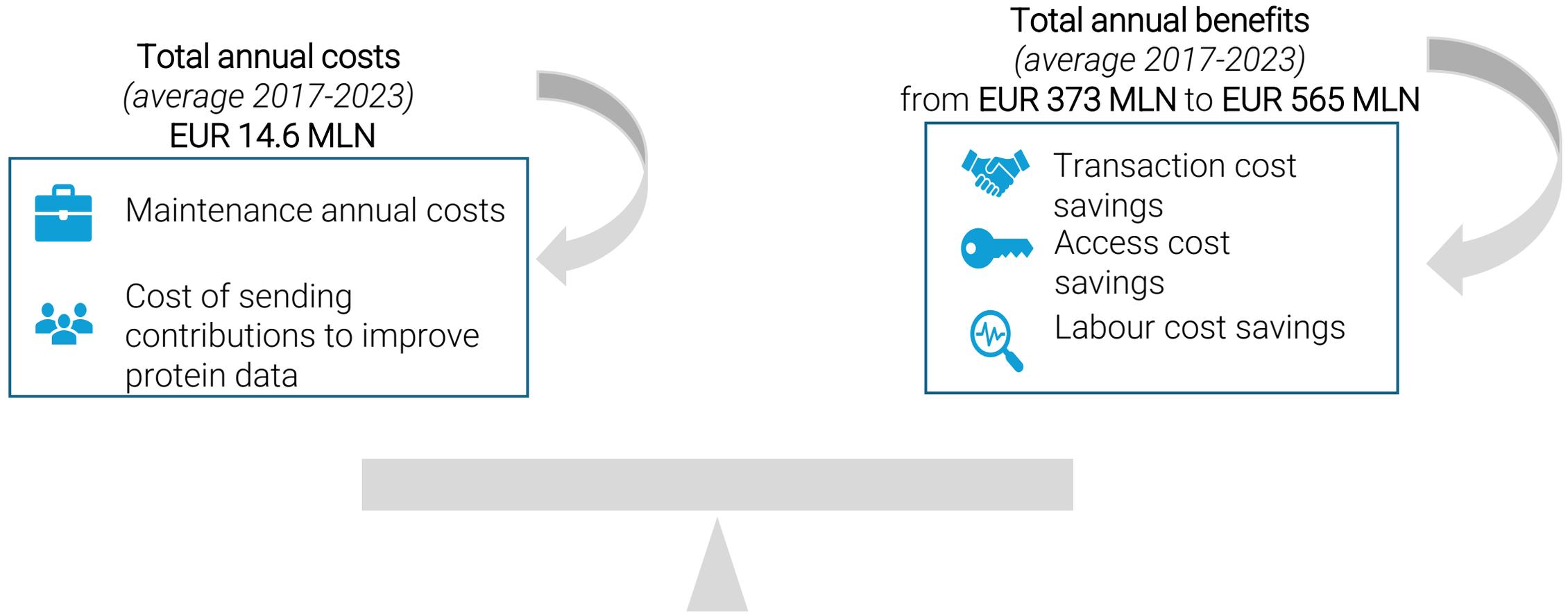


There is no single comparable alternative to UniProt.

Costs and benefits in a nutshell

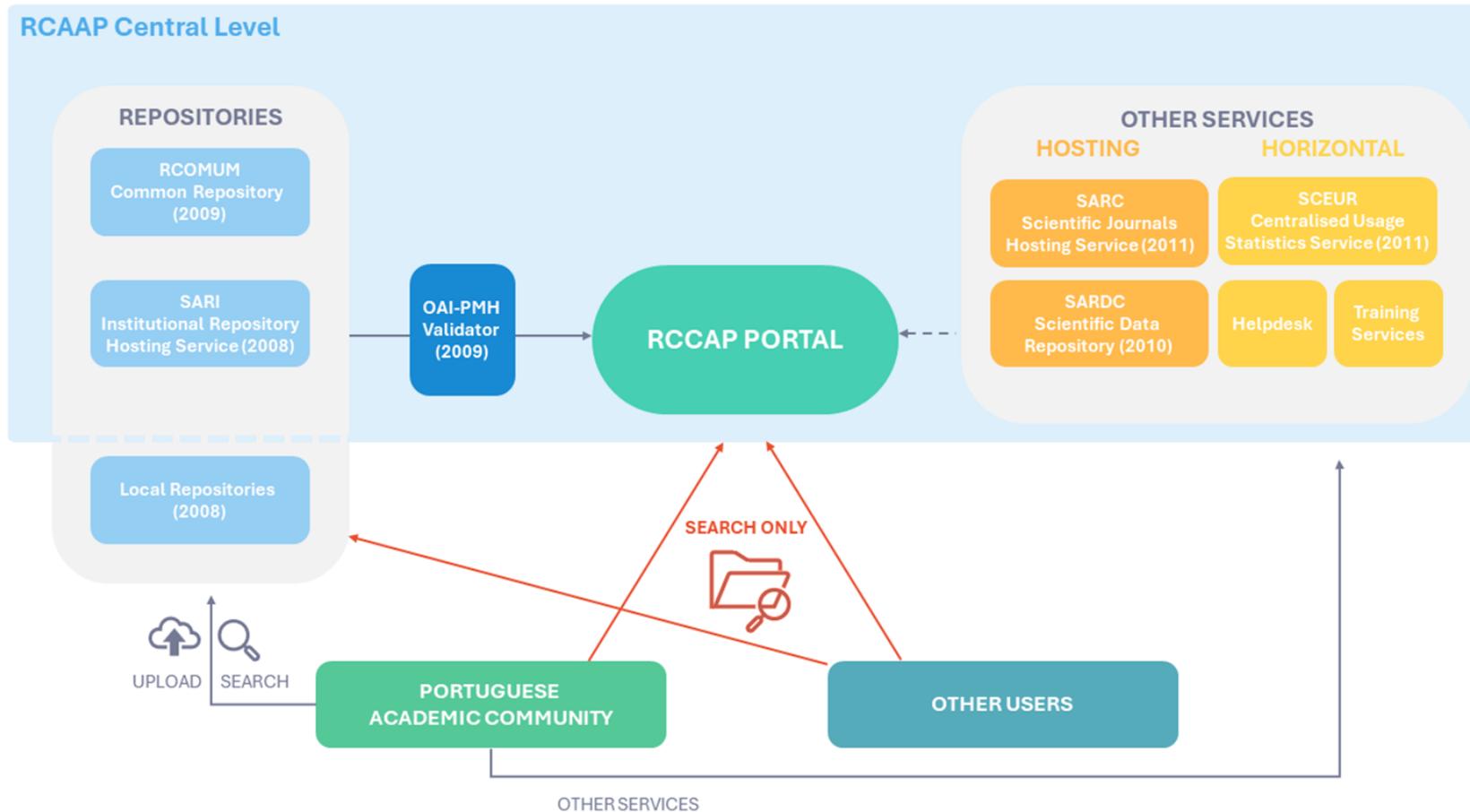


Overview of Results

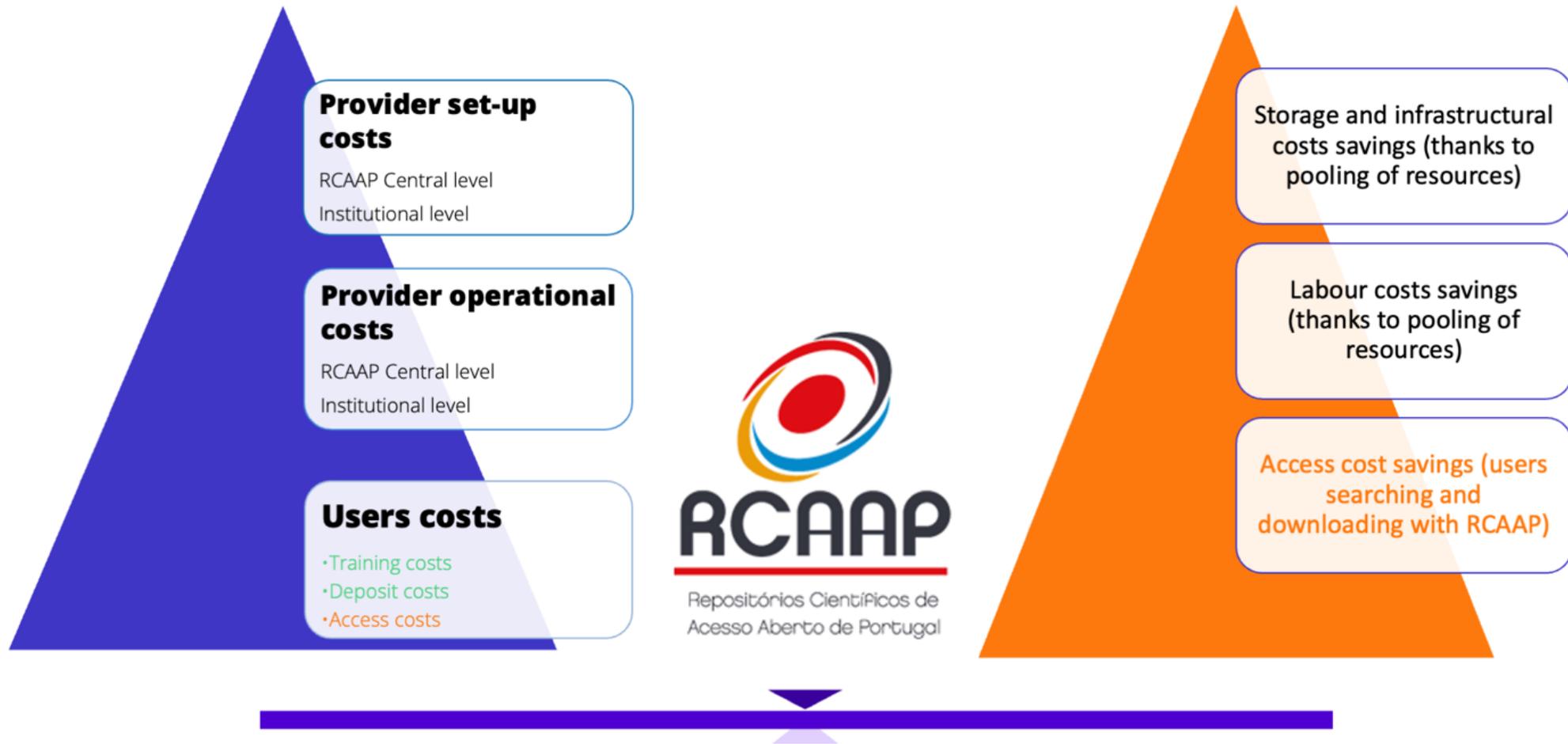


Putting the framework in practice: RCAAP

Portugal Open Access Science Repository (Repositório Científico de Acesso Aberto de Portugal - RCAAP)



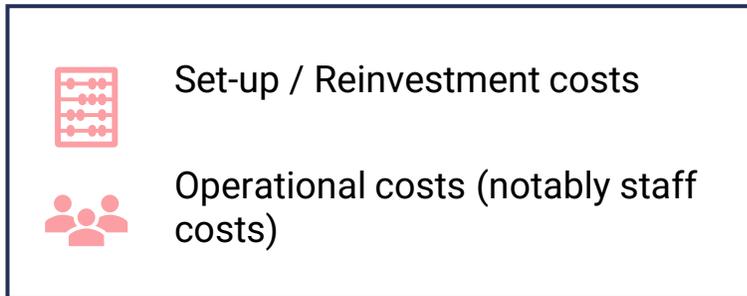
Costs and benefits in a nutshell



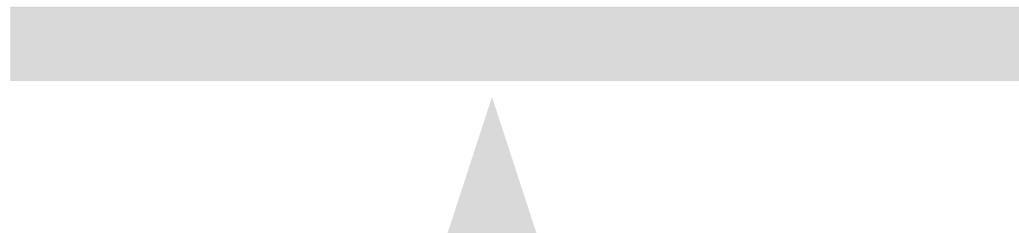
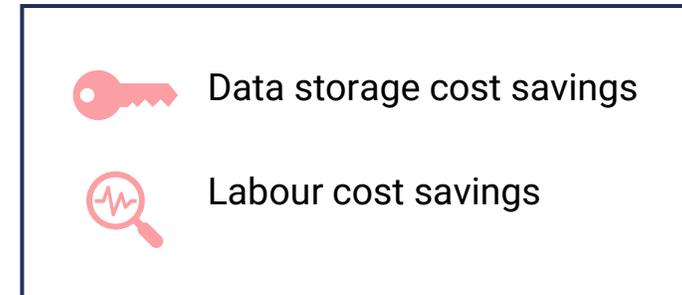
Overview of results

Estimated benefits of RCAAP are 32% higher than its costs
(2006-2026 period)

Total costs: EUR 3.6 million



Total benefits: EUR 4.8 million



The CBA framework for OS aspires to become a benchmark tool for assessing the costs and benefits of different OS practices.

Our roadmap



- OS initiatives are inherently collaborative, so it's essential to clearly define the roles and contributions of each partner to properly scope the analysis.
- Ask: **What if the OS resource didn't exist?** This reveals its true value and what would be lost without it. Modular scenarios can help capture this in the OS context.
- **Measuring impact is tricky** since OS is freely accessible but doable, especially with AI-powered tools and methods. Tracking use requires granularity and accuracy of usage metrics as well as expertise for interpreting these data.

Future avenues

To maximise the effectiveness of the OS CBA framework in evaluating OS investments



Promote systematic data collection of usage patterns, user profiles, operational costs, and observed impacts. Even in the absence of in-house capacity to perform a full CBA, this lays the groundwork for future analysis by experts.



Strengthen institutional capacity for CBA, including training and tools to enable effective CBAs, combining economic evaluation with domain expertise. Resource managers need practical tools for routine implementation. Simplified, user-friendly templates for different OS resources (repositories, platforms, software) would further support this effort.



Embed CBA into project evaluation, selection, and reporting. This can improve transparency and accountability. Ex-post assessments can use CBA metrics to evaluate outcomes and guide future resource allocation.

To learn more...

- Delugas, E., Catalano, G., & Vignetti, S. (2025). PathOS - D4.2 Methodological note on the CBA of Open Science practices (update). Zenodo. <https://doi.org/10.5281/zenodo.17091711>
- Catalano, G., Caputo, A., Colnot, L., Delugas, E., Vignetti, S., Sousoni, D., Martins Grapengiesser, I., Pappas, D., Balsyte, E., Correia, A., Príncipe, P., Lopes, P., & Seminaroti, E. (2025). **Deliverable 4.4 – Cost-Benefit Analysis of Open Science: Case Study Synthesis and UniProt and RCAAP case studies**. Zenodo. <https://doi.org/10.5281/zenodo.15731712>
- Catalano, G., Delugas, E., Vignetti, S., Caputo, A., Martins Grapengiesser, I., Sousoni, D., Balsyte, E., & Pappas, D. (2025). **UniProt case study and factsheet**. Zenodo. <https://doi.org/10.5281/zenodo.15732022>
- Catalano, G., Colnot, L., Vignetti, S., Correia, A., Príncipe, P., Lopes, P., & Seminaroti, E. (2025). **RCAAP case study**. Zenodo. <https://doi.org/10.5281/zenodo.15732145>
- PathOS: Cost-Benefit Analysis - the Impact of UniProt, https://www.youtube.com/watch?v=SUTvw_zRBBQ
- <https://pathos-project.eu/>

Thank you

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