

16th International Conference on Current Research Information Systems (CRIS 2024)

Funding organization uses the regional CRIS as source for reporting research: the case of FWO and FRIS

Pascale B. Dengis^a, Jan Mertens^b, Evy Neyens^c and Ils De Bal^{a*}

^a*Economy, Science and Innovation Department, Flemish government, Koning Albert II-laan 35, 1030 Brussels, Belgium*

^b*FWO, Leuvenseweg 38, 1000 Brussels, Belgium* ^c*UHasselt, ECOOM-UH, Martelarenlaan 42, 3500 Hasselt, Belgium*

Abstract

FWO launched a pilot where data from FRIS, the regional CRIS of Flanders, were used to capture information on the outputs of the FWO funded research projects. The pilot of this quite unique approach was implemented in a few steps: defining the scope of the pilot (peer-reviewed scientific publications only), establishing definitions of the concepts in collaboration with the research stakeholders, building golden records of projects and publications in FRIS, and developing API's to harvest the data.

This method as well as the outcome of the pilot proved to be successful. The information on publications linked to FWO-projects was harvested from FRIS and used to prefill the FWO reporting template. The benefits and lessons learned of this pilot are described. Establishing definitions for the research output categories was time-consuming but necessary for obtaining more uniform and more qualitative data.

The administrative burden for researchers was reduced in the sense that the information was prefilled in the reporting template. On the other hand, researchers and research institutions had to invest time and effort into the change of the reporting process. Once this process will become mainstream, the real reduction in administrative burden will become obvious. Also research institutions will benefit from the FRIS golden record service, as they will be able to harvest information that was already provided by other research institutions.

As the overall outcome of the pilot was positive, FWO has already started the next phase in which the same method is used and the scope is extended to non-peer-reviewed publications, papers in proceedings of scientific conferences, dissertations, books, book chapters, patents, datasets and other outputs. For FRIS this pilot and the next phase contribute to its ambition to become the unique and complete hub for all research information in Flanders.

* Corresponding author. Tel.: +32-496-22-08-36.

E-mail address: ils.debal@vlaanderen.be

© 2024 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0>)

Peer-review under responsibility of the scientific committee of the 16th International Conference on Current Research Information Systems

Keywords: FRIS; regional CRIS; funding agency; FWO; Research Foundation-Flanders, reporting; reducing administrative burden

1. Introduction

This contribution elaborates on how a funding organization uses a regional CRIS as a primary data source for research reporting. This leads to less administrative burden for the researcher and more complete and correct information in the database of the Flanders Research Information Space (FRIS) and within the scientific reports collected by the funder. We describe the pilot case developed by the Research Foundation – Flanders in collaboration with FRIS and the research institutions: the set-up of the pilot, the developments needed, and the lessons learned.

2. FRIS as regional CRIS in Flanders

In Flanders, research institutions have a long tradition of using a current research information system (CRIS) and providing information to the regional CRIS, called FRIS (Flanders Research Information Space). Since its launch in 2006, FRIS has been steadily expanding as well in depth (more information objects) as in width (more than 70 research institutions) [1]. From 2013 on, the architecture of FRIS was completely redesigned to enable the flow of research information from research institutions to FRIS using webservices. The idea behind it in this particular use case, is to reduce administrative burden on the side of the institutions and concomitantly having higher quality results on the side of FRIS.

FRIS captures information to make it publicly available, to shorten the innovation chain, to report and to use it for policy preparation and monitoring purposes. Up-to-date and high quality data is therefore key. For that reason, FRIS handles the following principles:

1. Research institutions are the owners of the information. If information is not correct; research institutions need to rectify it and resubmit it to FRIS.
2. This implies another principle: research information is captured and stored in silo's whereas it remains clear that information is delivered by a particular research institution.
3. Nevertheless, FRIS will link information from different research institutions (silo's) via persistent identifiers so information is interconnected.
4. FRIS has contracts with the research institutions and not with individual researchers. This means that researchers cannot change information directly in FRIS and cannot be held responsible in a direct way. Instead, research institutions are held accountable.
5. Therefore FRIS doesn't manipulate data itself, but it enriches where possible. E.g. for publications FRIS will add information on the open access source as an enrichment via Unpaywall; (e.g. <https://researchportal.be/nl/publicatie/burnout-among-surgeons-and-during-sars-cov-2-pandemic>)
6. All research information in the database will be kept in silo's as it is delivered in such a way by the research institutions but will be presented on the public website as merged files whereas the same (complementary) information is delivered by the different research institutions and possibly enriched with other external sources.

In 2019 the span of research information to be provided to FRIS was widened (also infrastructure, patents and datasets were added) [2, 3] and FRIS was also used to monitor Open Science in Flanders [4].

The goal is to have all research institutions in Flanders deliver research information to FRIS. The delivery of research information to FRIS by the research institutions is enforced by law: the so called “W&I decree” [5], which regulates the organization and financing of Science and Innovation policy, obliges the institutions covered by the decree, as well as the universities and colleges, to supply research information to the FRIS-platform since 2019.

In 2021 a new type of provider was connected to FRIS: a research funder. The Research Foundation – Flanders (FWO) is the first research funding organization sending information about all the projects and mandates they are funding. This information is not shown directly on the research portal, but is stored in the back-end and is used as an authority source when building so called golden records of projects. In the coming years, FRIS will add information of other funding organizations like the European Commission and the Flemish funding agency for innovation and entrepreneurship (VLAIO).

As FRIS evolved during the years, the architecture changed to tailor to the contemporary requirements. The main goal remains the same: aggregating research information from all research institutions in the region using standard compliant technology. In order to facilitate this, the main system interfaces with SOAP web services with research data payload in the CERIF 1.5 XML standard and JSON/REST services.

Research information can be ingested through several channels: automated via webservices or manual via a user interface for those research institutions that don't have a CRIS-system. As soon as information enters, FRIS will do a referential check and an automated data quality check through a validation engine. When information complies with the requirements, it is saved in the database (FRIS backend).

This FRIS backend contains public and private information, e.g. personal information (GDPR) and budget information. The public information is being used for the researchportal.be via a REST API, or used by FWO for the researchers' report via a golden record API, or used by several other organizations which can retrieve the data via several other webservices, and retrieved by other – European – aggregators such as Open Aire and EOSC (European Open Science Cloud).

The public and the private information in the FRIS backend/database is used for analyses and reporting purposes on budgets, for policy monitoring and policy preparation.

A high level overview of the architecture of FRIS is shown in Figure 1.

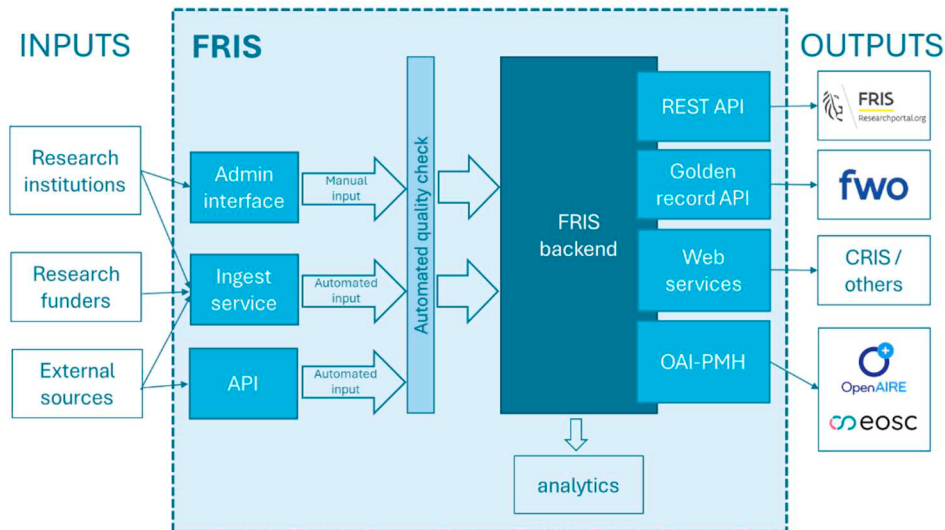


Fig. 1. High-level overview of the architecture of FRIS and the relation with inputs and outputs.

3. Research Foundation – Flanders: reporting on research

FWO (Research Foundation – Flanders) is a public research funding organization whose main mission is to fund fundamental and strategic (i.e. use-inspired) basic research in Flanders. FWO offers a variety of funding schemes for researchers at each stage of their scientific career. Individual researchers can apply for pre- and postdoctoral fellowships as well as grants enabling international mobility whereas research teams can apply for different types of project funding. FWO also runs programs to fund research infrastructure, international scientific cooperation and awards scientific prizes. Research Applications enter an inter-institutional competition and are selected for funding based on scientific excellence after a thorough peer-review process performed by scientific experts. Core values such as transparency and equal opportunities are central during the entire process.

From beneficiary researchers is expected that they report about their progress and the research results emanating from their FWO project or fellowship. This report should comprise among others a description of the status on reaching the objectives, a full publication list and the impact the research has had. While reporting previously was done using a word template, FWO launched an online reporting tool with a new reporting template in 2023. The purpose of this new tool was to have a more structured and simplified manner of reporting that allows a better and more consistent evaluation, that facilitates monitoring the output and impact generated by their funds and to diminish the administrative burden for researchers. The information in FRIS about research output offered new opportunities to further enhance the FWO reporting procedure.

Over the years, FWO has taken several efforts to generate the information flow between FRIS and FWO and to optimize the information quality and completeness in FRIS. Since 2021, FWO supplies information about its funded research to FRIS which is used by FRIS as reference data. They serve a purpose for monitoring, quality control and the construction of golden records. Since 2022, FWO requires from their beneficiaries that all research output needs to be registered in FRIS and linked to the FWO project they stem from. Thereby FWO created a first strong incentive for researchers to further enrich the information in FRIS [6]. In 2023, FRIS and FWO started a trajectory to use the information on publications in FRIS, which originates from the research institutions, in the FWO reporting templates. A second version of the online reporting template that utilises the information in FRIS to prefill the publication list, was launched in 2024.

4. Reporting pilot FWO

FWO started a pilot, in collaboration with FRIS, ECOOM and the Flemish research institutions. The process to achieve this is described below:

4.1. Scoping and definitions of concepts

Via the FWO research reports, scientists have to report on several types of outputs like peer-reviewed journal publications, non peer-reviewed publications, papers in conference proceedings, dissertations, books, book chapters, patents, datasets and other outputs. The scope of the pilot was limited to one of these types: “peer-reviewed journal publications” (also known in Flanders as “A1-publications”).

In order to get precise and consistent results by the different stakeholders, a clear definition of the A1-category was put forward by the FRIS Research Output working group (FRISTO RO). This working group of FRIS, led by ECOOM Hasselt, works on definitions and semantics related to FRIS and involves all research institutions that deliver data to FRIS.

Then this definition had to be translated to certain parameters available in FRIS like publication type, peer-review status and publication status. Regarding the publication type, FRIS has a more fine-grained research output taxonomy for journal contributions than FWO. In the FRISTO RO, a definition was put forward for each of these concepts and every institution mapped its own research output taxonomy onto the FRIS research output taxonomy and the FWO

A1-concept. During this exercise it became clear that different institutions can have different views on how to classify their research outputs. The result of this exercise is shown in Table 1.

Thanks to the discussions in this working group, better alignments of the classifications among institutions were achieved.

Table 1. Mapping of the FWO publication category A1 onto the FRIS journal contribution types.

FWO publication category	FRIS journal contribution types	FRIS definition
A1: Peer reviewed articles in scientific journals	Journal Article	A journal article is a self-contained nonfiction prose composition on a fairly narrow topic or subject, written by one or more authors and published under a separate title in a collection or periodical containing other works of the same form (source: https://cerif.eurocris.org/vocab/html/OutputTypes.html#JournalArticle)
	e-pub	e-only version of a Journal contribution
	Letter	A letter (also known as "communication") is a brief description of important new research (source: https://w3id.org/cerif/vocab/OutputTypes#Letter)
	Research Note	Research notes are not full academic papers but are discussion notes, seeking to advance a new idea, theoretical perspective, research program, or methodological approach in organization studies (source: https://www.journals.elsevier.com/scandinavian-journal-of-management/policies/instructions-for-research-notes-and-book-reviews/) or "A paper that mentions or remarks on a published paper on a specific subject." (source: Web Of Science)
	Review Article	Review articles in academic journals analyze or discuss research previously published by others, rather than reporting new experimental results. Review articles are an attempt to summarize the current state of understanding on a topic. A review article re-presents previously published material, rather than reporting new facts or analysis. Review articles are sometimes also called survey articles or, in news publishing, overview articles. Academic publications that specialize in review articles are known as review journals. (source: https://en.wikipedia.org/wiki/Review_article)
	Letter to Editor	A letter written to a journal or other periodical about issues of concern to readers, and published in the journal or periodical. A letter to the editor is a letter sent to a publication about issues of concern from its readers. Usually, letters are intended for publication. In many publications, letters to the editor may be sent either through conventional mail or electronic mail. In academic publishing, letters to the editor of an academic journal are usually open postpublication reviews of a paper, often critical of some aspect of the original paper. (source: https://en.wikipedia.org/wiki/Letter_to_the_editor)

Finally the conditions were set that a publication in FRIS needs to fulfill in order to be taken up automatically in the A1-section of the FWO-report:

- The publication has to be of one of the FRIS journal contribution types that map onto the FWO A1-category (journal contribution type, see table 1),

- The publication has to be peer-reviewed (peer-review status),
- The publication has to be published (publication status),
- The publication has to be linked to the FWO-project that it is resulting from.

After reception of the information on publications from FRIS but prior to listing them in the scientific reports, FWO applies a filter that selects the A1-publications based on these set conditions.

4.2. Creating golden records in FRIS

As research institutions often collaborate and co-publish, and as each of the research institutions is sending the information on their publications to FRIS, it is obvious that FRIS will contain a lot of publication duplicates. To avoid duplicates in the FWO-reports, FRIS needed to build golden records of publications.

This is also true for projects involving collaboration among research institutions. Each institution reports on its involvement in the project, providing details such as the portion of the grant they received, the researchers that participated and the publications that emerged from their contributions.

FRIS therefore needed to build golden records for both projects and publications, ensuring that each record included links to its associated entity (projects with links to publications and vice versa). Links between publications and projects in FRIS are captured via the CERIF element <cerif:cfProj_ResPubl> [7].

To build golden records of projects, the persistent identifier that was used, is the FWO grant ID (e.g. “GOA0321N”). In FRIS, this contract number is captured as a federated identifier of the project funding (<cerif:cfFedId>) combined with the funder type “FWO Contract Id” (<cerif:cfClassSchemeId>Funder Identifier) [7]. All the projects delivered to FRIS containing the same grant ID and funder type, are merged into one golden record. All the publications that have a link to this project are also merged into the project golden record.

An example is illustrated in Fig. 2a en b below. FWO granted institutions 1 and 2 to perform a research project with Grant ID = GOA0321N. This project led to the production of several research papers. Institution 1 is involved in 2 publications which are sent to FRIS with a link to project with Grant ID GOA0321N. Institution 2 is also involved in 2 publications, one of which is in collaboration with institution 1 and the other is not; they are also linked to the same project with Grant ID GOA0321N. Institution 3 is not directly involved in the project, but is co-author in 1 publication (Fig. 2a).

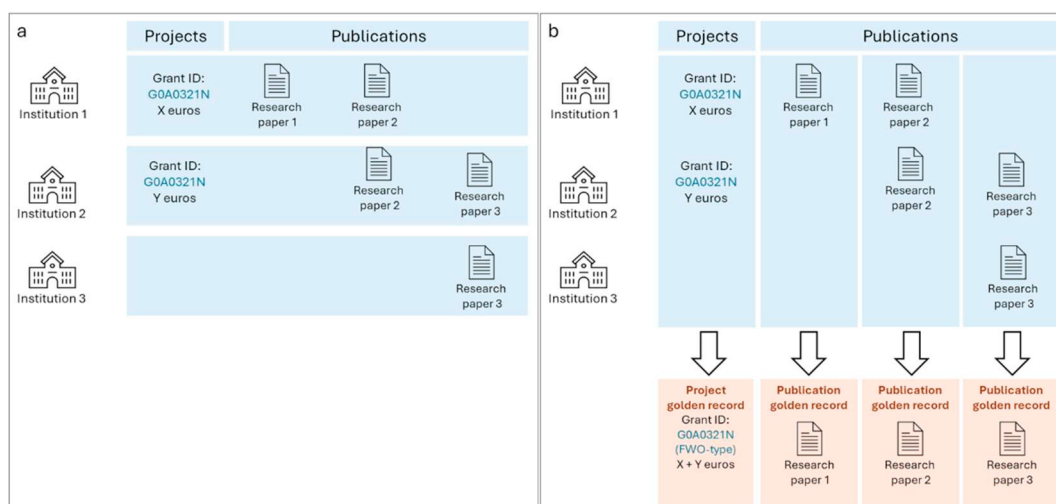


Fig. 2. (a) schematic representation of two institutions delivering information about a project and its linked publications; (b) building golden records of multiple records of projects and publications

In FRIS a golden record is built for the project with Grant ID GOA0321N and this project contains a link to 3 publications, 2 of which have duplicates. Then for the publications, all duplicates are merged into golden records based on federated identifiers like DOI, Handle, Institutional repository URL and Web of Science Id (Fig.2b).

In order to build the golden records, some logic has to be applied to make choices when the information in the original records is not identical. For each attribute, one of the following methods was used:

- Applying a logic through a (cascade of) conditions
- Merging the values of the original records
- Choosing the value of one of the providers (main provider)

The method that was applied was different for the various attributes of the publication record (the complete list of attributes for journal contributions in FRIS is available in the FRIS integration guide [7]). For some attributes like the publication open access label, the applied logic is a cascade of conditions:

- if at least one of the original records has a certain value (“open” in the case of open access label), then the golden record gets this value;
- if none of the records has the value “open”, but at least one of the original records has the value “embargoed”, then the golden record gets this value;
- finally, if none of the records has the value “open” nor “embargoed”, then the golden record gets the value “closed”.

For some other attributes like publication type, the values of the original records are merged. E.g. if one provider delivers a publication as a “review article” and another provider as a “journal article”, then the golden record will have the two types “review article” and “journal article”.

Finally for the other attributes like title, volume, issue, page numbers... the value of one provider was chosen, since it has no added value to store multiple values. The provider that was the first to deliver the information to FRIS was appointed as the main provider in these cases.

4.3. Operational phase

In FRIS a golden record service was built disclosing golden records of projects and of publications. FRIS built an API to expose information that is used by FWO. The retrieval from FRIS by FWO (illustrated in Fig. 3) is a two-step process: first, FWO calls the FRIS golden project service, entering the Grant ID from which they want to retrieve the publications. This call returns the UUID’s of the golden publication records of this specific grant. In the second step, FWO calls the FRIS golden project service, entering the UUID’s of the golden publication records and then they retrieve all the information about these golden publication records. That information is then used to automatically fill in the reporting form of the grant, more specifically the section of A1-publications (Fig. 4).

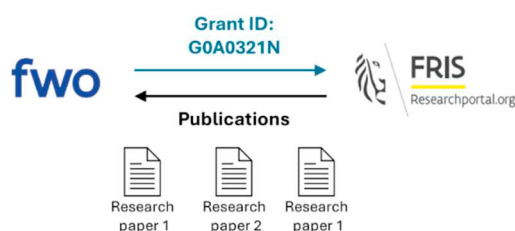


Fig. 3. Schematic representation of the retrieval of publication information by FWO from FRIS on the basis of a FWO Grant ID.

The researcher does not have to fill in this reference information in the reporting template anymore; it is already prefilled in a fixed format. If a publication is missing, or if information is not correct, the researchers cannot change the info in the report, but they will have to make sure that the info is corrected at the source (e.g. mostly the library or

CRIS-system of the research institutions), after which the updated info will be sent to FRIS and then be retrieved by FWO. This procedure guarantees that the correct information is maintained by the owner i.e. the research institution at which the research is taking place.

Peer-reviewed scientific articles
Other publications
Published data
Other academic output

Peer-reviewed scientific articles (optional)

Please press the button 'retrieve publications' to generate a list with all your peer-reviewed articles in scientific journals (i.e. A1 articles) that are related to your FWO-funded research. Your publication list is composed of all your published articles (i.e. online and/or printed) that are available in the [FRIS](#) database. Only peer-reviewed journal articles that are correctly registered in the FRIS database will be considered by the FWO. To add articles to FRIS, make sure your publications are registered in your institution's repository and refer to the correct FWO project number. After registration of additional publications in FRIS, you can press the 'retrieve publications' button again to generate your newly updated publication list. Please take into account that synchronisation between your institution's repository, FRIS and FWO's reporting tool may take up to 1 week so make sure you register the articles timely. Peer-reviewed articles that are accepted but not yet published will not appear in your publication list. You may refer to these accepted publications in the scientific progress section of the report by including a reference in the description of the relevant goal.

If one or more referable datasets are available, please add them in the published data section.

Retrieve publications

Bibliographical reference. ↑↓	Publication type. ↑↓	Open Access status of the publication. ↑↓	
Dietmar Rudolf Thal, Klara Gawor, Sebastiaan Moonen. (2024). Regulated cell death and its role in Alzheimer's disease and amyotrophic lateral sclerosis. <i>Acta Neuropathologica</i> . 147(1). https://doi.org/10.1007/s00401-024-02722-0 .	A1	Under embargo	 
Stephanie JB Vos, Aurore Delvenne, Clifford R Jack, Dietmar Rudolf Thal, Pieter Jelle Visser. (2024). The clinical importance of suspected non-Alzheimer disease pathophysiology. <i>Nature Reviews. Neurology</i> . 20(6): 337 - 346. https://doi.org/10.1038/s41582-024-00962-y .	A1	Under embargo	 
Nikolaos Louros, Martin Wilkinson, Grigoria Tsaka, Meine Ramakers, Chiara Morelli, Teresa Garcia, Rodrigo Gallardo, Sam D'Hayer, Vera Gossens, Dominique Audenaert, Dietmar Rudolf Thal, Ian R Mackenzie, Rosa Rademakers, Neil A Ranson, Sheena E Radford, Frederic Rousseau, Joost Schymkowitz. (2024). Local structural preferences in shaping tau amyloid polymorphism. <i>Nature communications</i> . 15(1). https://doi.org/10.1038/s41467-024-45429-2 .	A1	Open	 
Grzegorz Walkiewicz, Alicja Ronisz, Rita Van Ginderdeuren, Sophie Lemmens, Femke H Bouwman, Jeroen JM Hoozemans, Tjaco HJ Morrema, Annemieke J Rozemuller, Frederique J Hart de Ruyter, Lies De Groef, Ingeborg Stalmans, Dietmar Rudolf Thal. (2024). Primary retinal tauopathy: A tauopathy with a distinct molecular pattern. <i>Alzheimers Dement</i> . 20(1): 330 - 340. https://doi.org/10.1002/alz.13424 .	A1	Open	 
Jessica Alber, Femke Bouwman, Jurre den Haan, Robert A Rissman, Lies De Groef, Maya Koronyo-Hamaoui, Imre Lengyel, Dietmar Rudolf Thal. (2024). Retina pathology as a target for biomarkers for Alzheimer's disease: Current status, ophthalmopathological background, challenges, and future directions. <i>Alzheimers Dement</i> . 20(1): 728 - 740. https://doi.org/10.1002/alz.13529 .	A1	Open	 
Sandra O Tome, Klara Gawor, Dietmar Rudolf Thal. (2023). LATE-NC in Alzheimer's disease: Molecular aspects and synergies. <i>BRAIN PATHOLOGY</i> . https://doi.org/10.1111/bpa.13213 .	A1	Open	 
Sandra Oliveira Tomé, Grigoria Tsaka, Alicja Ronisz, Simona Capitaleri, Klara Gawor, Luis Aragao Gomes, Markus Otto, Christine AF von Arnim, Philip Van Damme, Ludo Van Den Bosch, Estifanos Ghebremedhin, Celeste Laureysen, Kristel Slegers, Rik Vandenbergh, Frederic Rousseau, Joost Schymkowitz, Dietmar Rudolf Thal. (2023). TDP-43 pathology is associated with increased tau burdens and seeding. <i>Molecular neurodegeneration</i> . 18(1). https://doi.org/10.1186/s13024-023-00653-0 .	A1	Open	 
Jimmy Beckers, Arun Kumar Tharkeshwar, Laura Fumagalli, Matilde Contardo, Evelien Van Schoor, Raheem Fazal, Dietmar Rudolf Thal, Siddharthan Chandran, Renzo Mancuso, Ludo Van Den Bosch, Philip Van Damme. (2023). A toxic gain-of-function mechanism in C9orf72 ALS impairs the autophagy-lysosome pathway in neurons. <i>Acta Neuropathologica Communications</i> . 11(1). https://doi.org/10.1186/s40478-023-01648-0 .	A1	Open	 

Fig. 4. Screenshot of the reporting tool of FWO, showing the list of peer-reviewed journal articles based on the information received from FRIS.

5. Benefits

The FWO pilot is the first of its kind in Flanders where a funding organization (re)uses data from a CRIS – in this case the regional CRIS FRIS – to capture information on the outputs of the research it is funding. This way of working has several benefits.

Researchers do not have to re-enter information that was already previously entered or captured in the institutional repository or CRIS of the research institution they are working at. The information about publications flows automatically from the institutional repository or CRIS to FRIS and subsequently to FWO. FWO uses this information to prefill the researchers' report, which benefits researchers as they don't have to manually enter their publication list in the report.

FWO now captures information on the output of its research in an automated and structured manner. A clear advantage is the increased quality of the information in the report. For instance, references are more complete and have a uniform format, which was not the case when they were added manually. In addition, information present in

the report (e.g. the Open Access status) has been validated at the level of the research institution which has led to an increased reliability of the information in the reports. More reliable and complete information enables FWO to monitor and analyze the outcomes of their research projects, which can be used to support or improve their funding policies.

FRIS also benefits from this pilot by collecting more uniform and thus more qualitative data. The quality of the data is further increasing by the growing awareness by the researchers and the research institutions of the importance of correct and complete information. As they now know that the information in the institutional repositories and CRIS's is reused for reporting purposes by funders, more attention is drawn to collecting correct information from the start. This improvement of data quality was obvious when comparing the results of publications before and after the launch of the pilot. Nine months after the launch of the pilot, there was a fivefold increase in the amount of publications in FRIS that are linked to a FWO project. The total number of publications in FRIS only increased with a few percent during the same time span, so this fivefold increase was not due to an increase in publications, but to an increase in the number of links between publications and projects.

Finally, research institutes will also benefit from the golden record information offered by FRIS. They can harvest this information from FRIS and use FRIS as a referential and high quality source to complete the information in their own CRIS or institutional repository. For instance, a research institute can check in FRIS if a project already has links to certain publications or vice versa, if a publication has links to projects. If a researcher is working in more than one research institution, it suffices that the link between his project and the resulting publications is registered in the systems of one institution. That information flows to FRIS and can be harvested by the other institutions he is working at. This contributes to the reduction of the administrative burden.

6. Lessons learned

Whereas the benefits of this pilot are clear, there were also some lessons learned.

As with any change of a process, time and effort is needed for researchers and research institutions to adapt. Research institutions had to revise their registration and validation procedures in order to be sure that the information necessary for the report of the funder was flowing correctly and timely. As the course of this pilot was quite short and the reporting deadline was fixed, this proved to be quite demanding.

Researchers had to make changes to the way of reporting they were familiar with. They could no longer wait until the final day before the deadline to fill out their report, as the publications had to follow a fixed flow that could take time. The process consists of the following steps: entering the information in the institutional repository and/or CRIS, validation by the research institution, sending the information to FRIS, harvesting the information by FWO and the insertion of the information in the reporting template. As this procedure cannot be bypassed, researchers cannot make manual changes to the report just a few moments before the deadline. They have to follow the fixed order of steps and make additions or corrections at the source of the information, not in the reporting template.

The need to link the publication to the project it resulted from, was something that not all researchers were already aware of. Publications missing this explicit link to the project, were not included in the reporting template. The mentioning of the Grant ID in the acknowledgements of the publication was not sufficient to comply with this requirement. Some research institutions are harvesting funder data from publishers where possible, albeit sometimes manually based on the publications, and offer this information to their researchers. That information is harvested from the acknowledgements of the publication and should contain names of funders and/or Grant ID's. Providing this info in the institutional repository or CRIS can help researchers to make the links to the projects more easily. FWO will explore together with FRIS whether the adoption of a grant PID, like a Crossref Grant ID, would be helpful for researchers and research institutions to facilitate the process of linking research projects with research output.

Finally, this pilot revealed that quite some time had to be invested in the definition of concepts and achieving agreements on these with all the stakeholders involved. However, this time was considered very useful as it helped to get everyone aligned and this will result in more uniform data across institutions.

FWO, FRIS and ECOOM have already initiated the next phase to extend the scope to other research output than peer-reviewed scientific journal publications and will follow the same process as in the pilot phase: agreeing on semantics with all stakeholders, building golden records in FRIS and developing API's to make data available for harvesting..

7. Conclusion

FWO launched a pilot in which data from FRIS, the regional CRIS of Flanders, were used to capture information on the outputs of FWO funded research projects. This pilot was implemented in a few steps.

First, the scope of the pilot was defined (limited to peer-reviewed publications only) and the definitions of the concepts used were established in collaboration with ECOOM and all the Flemish research institutions. This phase was time-consuming but proved necessary and useful to obtain more uniform and more qualitative data.

Then information on projects and publications resulting from these projects was collected in FRIS from the research institutions and merged into unique golden records. These records were harvested by FWO, the peer-reviewed publications were selected, references were assembled according to a fixed format and then inserted into the publication list of the FWO report. The method of the pilot and the operational outcome of it proved to be successful.

The administrative burden for researchers was reduced in the sense that the information was prefilled in the reporting template. On the other hand, researchers and research institutions had to invest time and effort into the change of the reporting process. Research institutions had to revise their registration and validation procedures in order to be sure that the information necessary for the report of the funder was delivered correctly and timely. Researchers had to make sure that all the necessary info about their publications was present and appropriately linked to their research projects in the institutional repository or CRIS in time, as the data follows a predefined flow prior to being loaded into the FWO reporting template. Adjusting to a new process takes time and effort. Eventually, this flow will become mainstream and then the real reduction in administrative burden will become apparent. Also research institutes can now use FRIS as a source to enrich their own data. If links between projects and publications have already been provided by one institution, it can be harvested by other institutions as well.

Making the registration of research output in FRIS mandatory helps to have more complete and correct information. Using the information in the FWO reports was a big incentive for researchers to keep their records updated and complete. Whereas the number of publications of an institution before and after the launch of the pilot was comparable, the number of links between publications and FWO projects increased substantially (5 times) since the launch of the pilot.

As the overall outcome of the pilot was positive, FWO has already started the next phase in which the same method is used and where the scope of the reporting will be extended to non-peer-reviewed publications, papers in conference proceedings, dissertations, books, book chapters, patents, datasets and other outputs.

For FRIS this pilot and next phase contribute to its ambition to become the unique and complete hub for all research information in Flanders.

Acknowledgements

This work would not have been possible without the collaboration of many stakeholders, in particular the members of the FRISTO Research Output, coordinated by ECOOM Hasselt.

References

- [1] Van Campe, Leen (2019) “How opening up data on publicly funded research became a driver of innovation in Flanders. The use case of FRIS” *Spring 2019 euroCRIS Membership Meeting Serie*, <https://dspacecris.eurocris.org/handle/11366/994>
- [2] De Bal, Ils, Poelmans, Hanne and Pascale Dengis (2021) “Research infrastructures: metadata model & data capturing in FRIS” *Autumn 2021 series of euroCRIS webinars*, <https://dspacecris.eurocris.org/handle/11366/1867>
- [3] Dengis, Pascale and De Bal, Ils (2022) “Monitoring Open Science policy using a regional CRIS – the Flanders case with FRIS” *Procedia Computer Science* **211**: 101-110, <https://doi.org/https://doi.org/10.1016/j.procs.2022.10.181>
- [4] Neyens, Evy and Sadia Vancanwenbergh (2021) “Towards a Semantic Interoperable Flemish Research Information Space: Development and Implementation of a Flemish Application Profile for Research Datasets” *Int. Journal of Digital Curation*, **16** (1)
- [5] The “W&I decree”, a decree of the Flemish government which regulates the organization and financing of Science and Innovation policy. It was first issued in 2009 and amended with a clause on FRIS in 2019 which was updated in 2022, <https://codex.vlaanderen.be/PrintDocument.ashx?id=1018085&datum=&geannoteerd=false&print=false>
- [6] FWO general regulations article 2, §4; 5 and 6. <https://www.fwo.be/en/support-programmes/regulations/general-regulations/>
- [7]: FRIS Integration Guide, a document that acts as a guide for creating the XML dataset that will be imported into the FRIS system, available via <https://researchportal.be/en/how-do-i-get-my-data-fris>