# D6.4 - Food Safety Risk Assessment Pilot Evaluation Report

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## ACRONYMS LIST

| | |
|---|---|
| VRE | Virtual Research Environment |
| WP | Work package |
| QMRA | Quantitative Microbial Risk Assessment |
| CV | Controlled Vocabulary |
| GUI | Graphical User Interface |
| API | Application Programming Interface |
| RSS | Rich Site Summary |
| DOI | Digital Object Identifier |
| FSK-ML | Food Safety Knowledge Markup Language |
| FSKX files | Food Safety Knowledge Exchange File |
| OS | Operating System |

**EXECUTIVE SUMMARY**

This report describes the results of the first evaluation carried out for the use-case specific VREs in WP6 (food safety risk assessment). The evaluation has been carried out according to the assessment methodology and schedule described in the Food Safety Risk Assessment Community-Centred Assessment Plan (D6.3).

As a result of this assessment it can be stated that the established use-case specific VREs already provide a high number of useful and highly valuable functionalities for the two scientific communities. The high interest of these communities in these new VRE resources already becomes evident by the number of non-AGINFRA+ scientists that registered as VRE members (DEMETER VRE: 16; RAKIP VRE: 19). Further WP6 also successfully promoted the AGINFRA+ VRE technology in additional scientific communities besides those addressed in the two WP6 use cases. As a result the AGINFRA+ project supports an additional VRE for the ORION project which is funded under the European One Health Initiative research project (currently 31 external members).

In summary the mid-term evaluation of current use-case specific AGINFRA+ resources resulted in very positive results and feedback by the corresponding research communities. Also, it can already be anticipated that both use-case communities will be interested in maintaining their VREs over the duration of the AGINFRA+ project.

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# 1 INTRODUCTION

For the area of Food Safety Risk Assessment, there are two different use cases outlined in order to deploy and validate AGINFRA+ resources.

In the first use case, WP6 will create solutions aiming at supporting the "Emerging risk identification" (DEMETER) community. In this community, the early identification of emerging risks in the food (and feed) chain is the main objective. Regarding this, the VRE supports a critical element of the strategy to protect European consumers through timely and effective preventive measures. The use of new data mining and data science solutions (digital technologies) are crucial to achieve this. Specifically, the identification of emerging food or feed safety issues at an early stage is of high importance. Therefore, this use case will illustrate how a VRE can facilitate the exchange of knowledge on emerging risk identification between risk assessors and how KNIME-based data mining technologies can be applied to identify those risks. Furthermore, it is planned to illustrate the benefits of general VRE-based resources.

The second use case is directed to support data-intensive applications in the area of food safety modelling. This includes the extension of the community capabilities to share mathematical models, to create simulation results and to deploy generated data processing workflows as web-based services. Through the envisaged VRE-based resources, risk assessors and modellers will be able to share their knowledge (data, mathematical model, software code, simulation results) in a harmonized way. Specifically, it will be demonstrated how community-driven food safety model repositories, which contain mathematical models from the area of predictive microbial modelling and quantitative microbial risk assessment (QMRA), can be developed and maintained through AGINFRA+ resources. Finally, the use case will also illustrate the benefits of VRE-based computational resources in computational intensive risk assessment simulations.

An important element for assessing the effectiveness of AGINFRA+ resources is an active promotion of the underlying VRE concept within the different scientific communities. Regarding this, WP6 will actively promote VREs in upcoming national and international research projects, e.g.in order to support the needs for project management and knowledge exchange resources in these research activities.

# 2 PILOT EVALUATION - OBJECTIVES

The objective of this intermediate pilot execution and evaluation exercise is to provide a status report on current AGINFRA+ achievements on providing VRE based research collaboration resources to two independent food safety risk assessment communities. As the technical development of several use-case specific VRE features is still ongoing this evaluation does not include the evaluation of aspects like “usefulness”, “usability” or “future development needs”.

The objective of theassessment in the case of the DEMETER community is to verify that the VRE has the potential to serve as an “Emerging Risk and Knowledge Exchange Portal” in the future. To accomplish this, it will be evaluated if the generated AGINFRA+ VRE infrastructure can be used in order to share information, data and data-analysis pipelines developed by different VRE members. Among others, opportunities to visualize results of calculations performed by data mining and data analysis operations will be provided.

The objective of theassessment in the case of the RAKIP community is to verify that the VRE has the potential to serve as a “Risk Assessment Knowledge Integration” platform in the future. To accomplish this, it will be evaluated if the generated AGINFRA+ VRE infrastructure can be used in order to share models in a harmonized format, share data and data-analysis pipelines and perform user-driven computational-intensive simulations in a cloud-based computational infrastructure. Furthermore, it will be evaluated if there is support for the open source data analytics platform KNIME through the VRE.

# 3 EVALUATION RESULTS

## 3.1 CRITERIA 1: AVAILABILITY OF COMMUNITY CENTRED VRE FEATURES AS LISTED IN D6.1

The status of provisioning VRE-based features to the two food safety risk assessment communities is described in Table 1:

Table 1: Status of provisioning VRE-based features

| Requested VRE Feature | DEMETER VRE | RAKIP VRE |
|---|---|---|
| **Data and Relevant Semantics Needs** | | |
| 2.1.4_1. Easy access to open scientific literature and other free online information sources on the WWW | available | - |
| 2.1.4_2. Easy access to social media data (Twitter, Facebook) | available | - |
| 2.1.4_3. Easy access to RSS feeds from community information providers | available | - |
| 2.1.4_4. Access to ontologies to support automated knowledge generation and extraction | partly available | - |
| 2.1.4_5. A service to develop and maintain controlled vocabularies (CV) / ontologies e.g. a combination of an ontology browser with a mind map | partly available | - |
| 2.2.4_1. A service to develop and maintain controlled vocabularies / ontologies | - | partly available |
| 2.2.4_2. Online resource to store / upload and create new models | - | available |
| 2.2.4_3. A service that allow the user to visualize metadata or reconfigure FSKX model files from the model repository / workspace before execution / simulation | - | available |
| **Data Analytics and Processing Needs** | | |
| 2.1.5_1. KNIME workflow execution including support for R and Python extensions | available | - |
| 2.1.5_2. API access to integrated emerging risk identification services | partly available | - |
| 2.1.5_3. Should “integrate” / “talk” with EFSA’s IT infrastructure “Zenodo” | available | - |
| 2.1.5_4. Execution of a data mining workflow on a high-performance computing infrastructure (if necessary) | partly available | - |
| 2.1.5_5. Docker functionalities for data mining workflows | not available | - |
| 2.2.5_1. Need for KNIME workflow execution inside the VRE. | - | available |
| 2.2.5_2. A service for model execution (simulation) | - | available |
| 2.2.5_3. A service to use high-performance computing infrastructure in case computational expensive simulations need to be performed | - | partly available |
| 2.2.5_4. API access to model simulation services | - | available |
| 2.2.5_5. Provide Docker functionalities inside the VRE to guarantee future re-execution of current models. | - | not available |
| 2.2.5_6. A service to connect to EFSA’s data portal “EFSA Knowledge Junction” | - | available |
| 2.2.5_7. A service that checks if a FSKX model is still executable | - | not available |
| 2.2.5_8. Creation of URIs for each shared model | - | available |
| **Data Visualization and Publishing Need** | | |

| | | |
|---|---|---|
| 2.1.6_1. A service to streamline the publishing of models / data mining workflows to the scientific community | partly available | - |
| 2.1.6_2. A public service to search / filter for emerging risk identification models / workflows in a model / workflow catalogue | partly available | - |
| 2.1.6_3. Interactive online data and knowledge visualisation features | partly available | - |
| 2.1.6_4. Support for community-driven curation processes for uploaded emerging risk identification models / workflows | partly available | - |
| 2.1.6_5. Visualization of Bayesian network models and predictions | not available | - |
| 2.2.6_1. Interactive visualisation service for models | - | available |
| 2.2.6_2. A service that read a FSK-ML formatted file with information on the QMRA model input and output parameters | - | available |
| 2.2.6_3. A service to combine model modules into new models | - | partly available |
| 2.2.6_4. Establish a system for the curation of models | - | not available |
| 2.2.6_5. Interactive and user-friendly GUI of the model repository | - | available |
| **Other Needs** | | |
| 2.(1/2).7_1. User management system | available | available |
| 2.(1/2).7_2. Data inventory / workspace | available | available |
| 2.(1/2).7_3. Tracing of documents | available | available |
| 2.(1/2).7_4. Software inventory | not available | not available |
| 2.(1/2).7_5. Information resource inventory / knowledge base | available | available |
| 2.(1/2).7_6. General messaging dashboard / chat function | available | available |
| 2.(1/2).7_7. Project management, planning and controlling features | available | available |
| 2.(1/2).7_8. Video conferencing / conference calls | not available | not available |
| 2.(1/2).7_9. Collaborative online document editor | not available | not available |
| 2.(1/2).7_10. Online search and filter of documents | available | available |
| 2.(1/2).7_11. Educational resources | available | available |
| 2.(1/2).7_12. System administration and monitoring front end | partly available | partly available |
| 2.(1/2).7_13. Data management policy is important: data storage and calculations should not be done on US server | - | available |

## 3.2 CRITERIA2: DISSEMINATION ACTIVITIES CARRIED OUT TO PROMOTE THE USE OF VRE

The dissemination activities carried out to promote application of VREs on the use-case specific communities are described in Table 2:

**Table 2: Dissemination activities that promote application of VREs**

| | | | | | | |
|---|---|---|---|---|---|---|
| RAKIP Workshop | Workshop | Panel | Berlin | Germany | 12.7.2017 | 20 |
| BfR Workshop – FoodRisk-Labs | Workshop | Presentation | Berlin | Germany | 10.-11.7.2017 | 30 |

| | | | | | | |
|---|---|---|---|---|---|---|
| COMBINE 2017 | Forum | Presentation | Milan | Italy | 09-13.10.2017 | 100 |
| BfRMinisymposiumGlobaleWarenketten | Workshop | Presentation | Berlin | Germany | 22.11.2017 | 40 |
| Joint Workshop on Food Risk Assessment Research & Practice | Workshop | Presentation | Wageningen | Netherlands | 24.11.2017 | 17 |
| 2nd eROSA Stakeholders Workshop | Workshop | Presentation | Wageningen | Netherlands | 27-28.11.2017 | 30 |
| EOSC Stakeholder forum | Workshop | Panel | Brussels | Belgium | 28-29.11.2017 | 400 |
| Joint International Symposium | Conference | Presentation | Berlin | Germany | 30.11-1.12.2107 | 250 |
| Technical Workshop FDA-iRISK | Workshop | Presentation | Greenbelt, MD | USA | 7-8.12.2017 | 40 |
| EJP One Health Pre-Kick-Off-Meeting | Workshop | Panel | Brussels | Belgium | 15.12.2017 | 40 |
| Technical Workshop RAKIP project | Workshop | Presentation | Berlin | Germany | 22.03.2018 | 15 |
| ORION-Kick off Meeting | Workshop | Presentation | Berlin | Germany | 18-20.04.2018 | 30 |
| ORION VRE workshop | Workshop | Presentation | Web | N/A | 28.05.2018 | 8 |
| RAKIP-EFSA Webmeeting | Workshop | Presentation | Web | N/A | 21.06.2018 | 6 |
| EFSA-BfR Workshop | Workshop | Presentation | Parma | Italy | 27.06.2018 | 10 |

Publications with contributions from AGINFRA+ project work:

- Haberbeck, L.U., Plaza Rodriguez, C., Desvignes, V., Dalgaard, P., Sanaa, M., Guillier, L., Nauta, M., Filter, M., 2018. “Harmonized terms, concepts and metadata for microbiological risk assessment models: the basis for knowledge integration and exchange”. Microbial Risk Analysis. In press
- Miguel de Alba Aparicio, TasjaBuschhardt , Ahmad Swaid, Lars Valentin, Octavio Mesa-Varona, Taras Günther, Carolina Plaza-Rodriguez, Matthias Filter, 2018. “FSK-Lab - an open source Food Safety Model integration tool”. Microbial Risk Analysis Submitted

# 4 CONCLUSIONS

As a result of this assessment it can be stated that the established use-case specific VREs already provide a high number of useful and highly valuable functionalities for the two scientific communities. The high interest of these communities in these new VRE resources has already become evident by the number of non-AGINFRA+ scientists that registered as VRE members (DEMETER VRE: 16; RAKIP VRE: 19). Furthermore, WP6 also successfully promoted the AGINFRA+ VRE technology in additional scientific communities, besides those addressed in the two WP6 use cases. As a result, the AGINFRA+ project supports an additional VRE for the ORION project which is funded under the European One Health Initiative research project (currently 31 external members).

In summary, the mid-term evaluation of current use-case specific AGINFRA+ resources resulted in very positive results and feedback by the corresponding research communities. It can already be anticipated that both use-case communities will be interested in maintaining their VREs over the duration of the AGINFRA+ project too.