

RAKIP

risk assessment modelling & knowledge integration platform

anses
French agency for food, environmental
and occupational health safety



BfR
Bundesinstitut für Risikobewertung

DTU Food
National Food
Institute

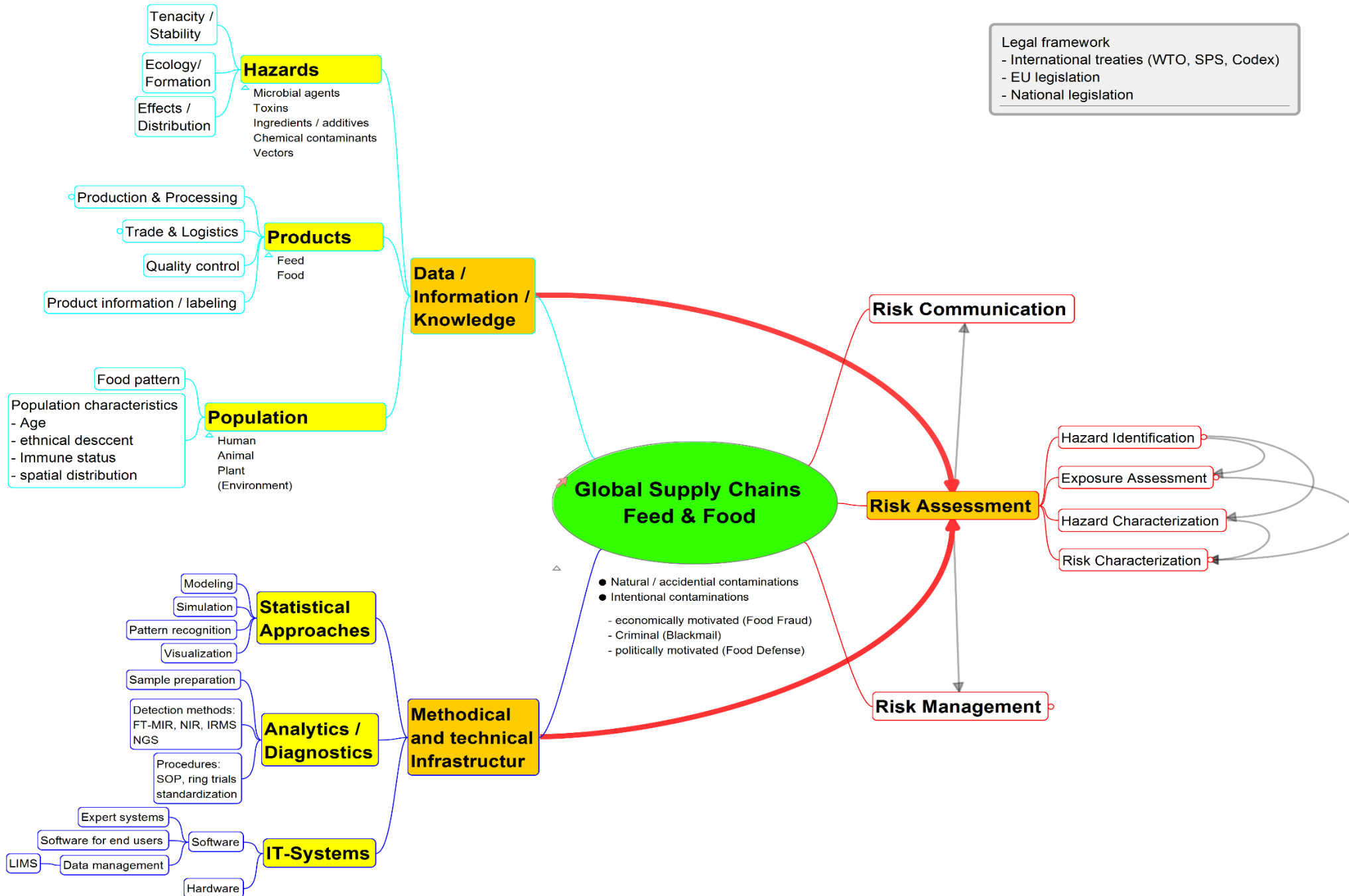


RAKIP: Resources for harmonized annotation and efficient exchange of risk assessment models

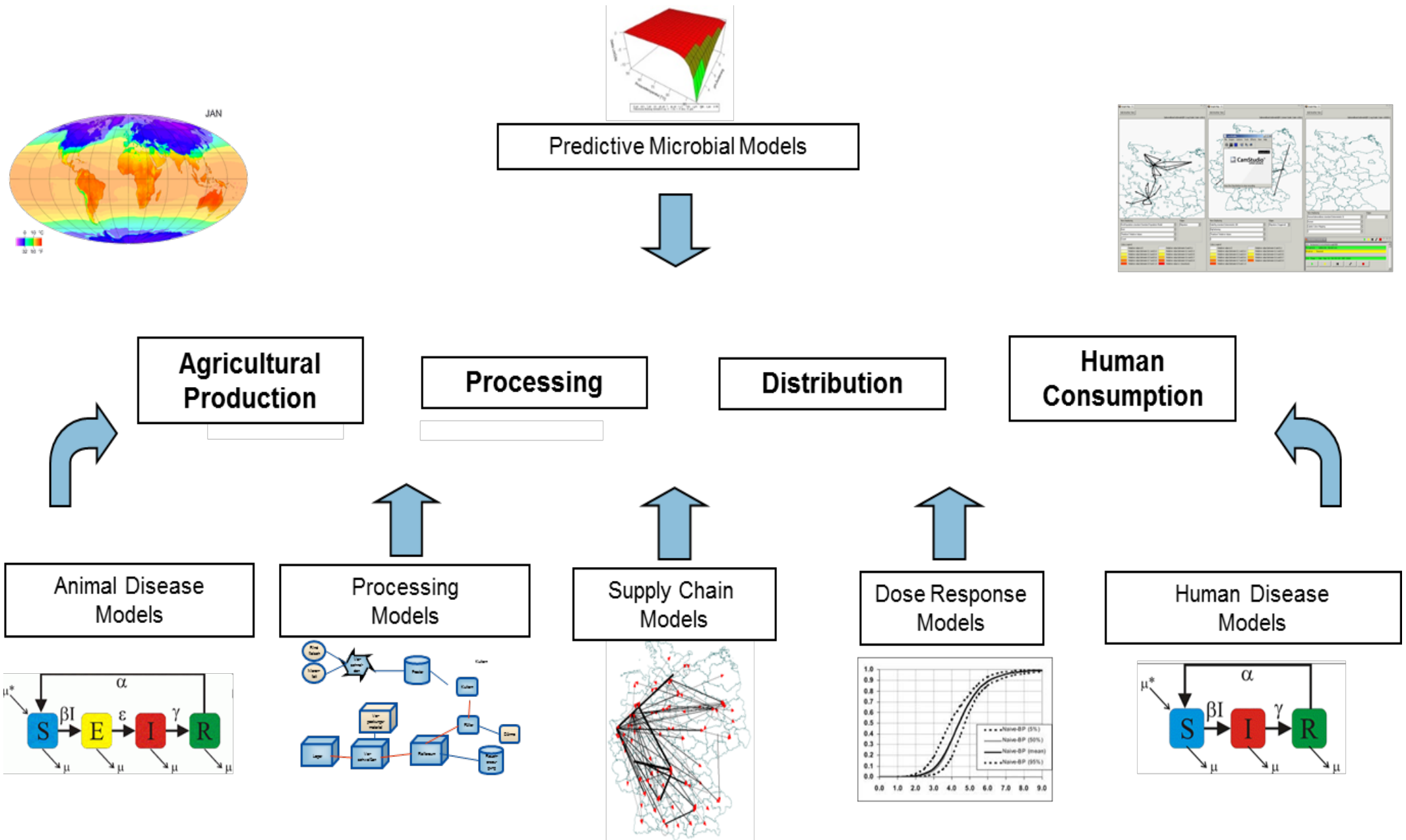
Matthias Filter



The Risk Assessment Challenge

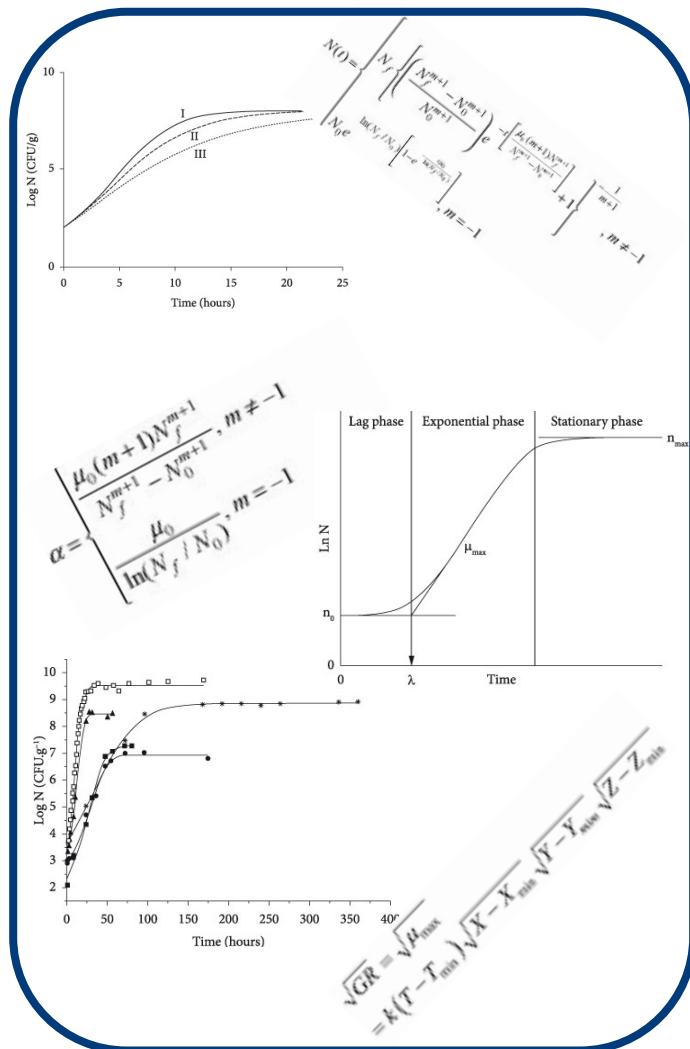


Risk Assessors Need DATA, MODELS and TOOLS !



Current Situation in Microbial Risk Assessment

1. Plenty of data and models published



2. Several software tools available



3. However...

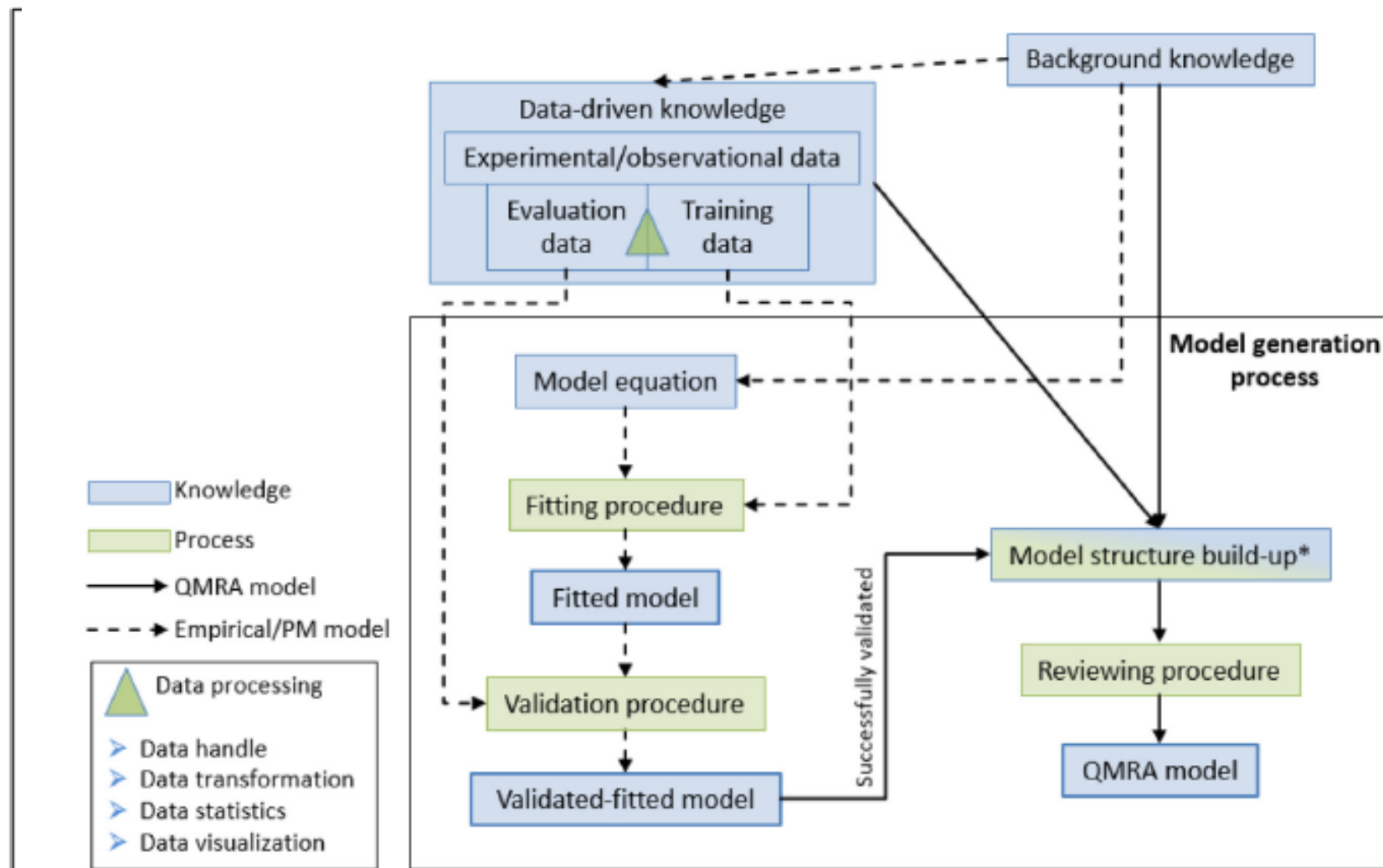
- No agreed information exchange format supporting knowledge exchange
 - If tools are available, only few of them are open source
- => **Hampered re-use of EXISTING knowledge**
 => **Limited transparency / reproducibility / quality control**
 => **No BRIDGE between research and application**

RAKIP Project

- September 2015 ... a discussion at the ICPMF9 conference
- October 2016 ... a proposal for a tri-lateral funded collaboration project between ANSES, DTU, BfR
- January 2017: start of RAKIP !



RAKIP - Process Analysis



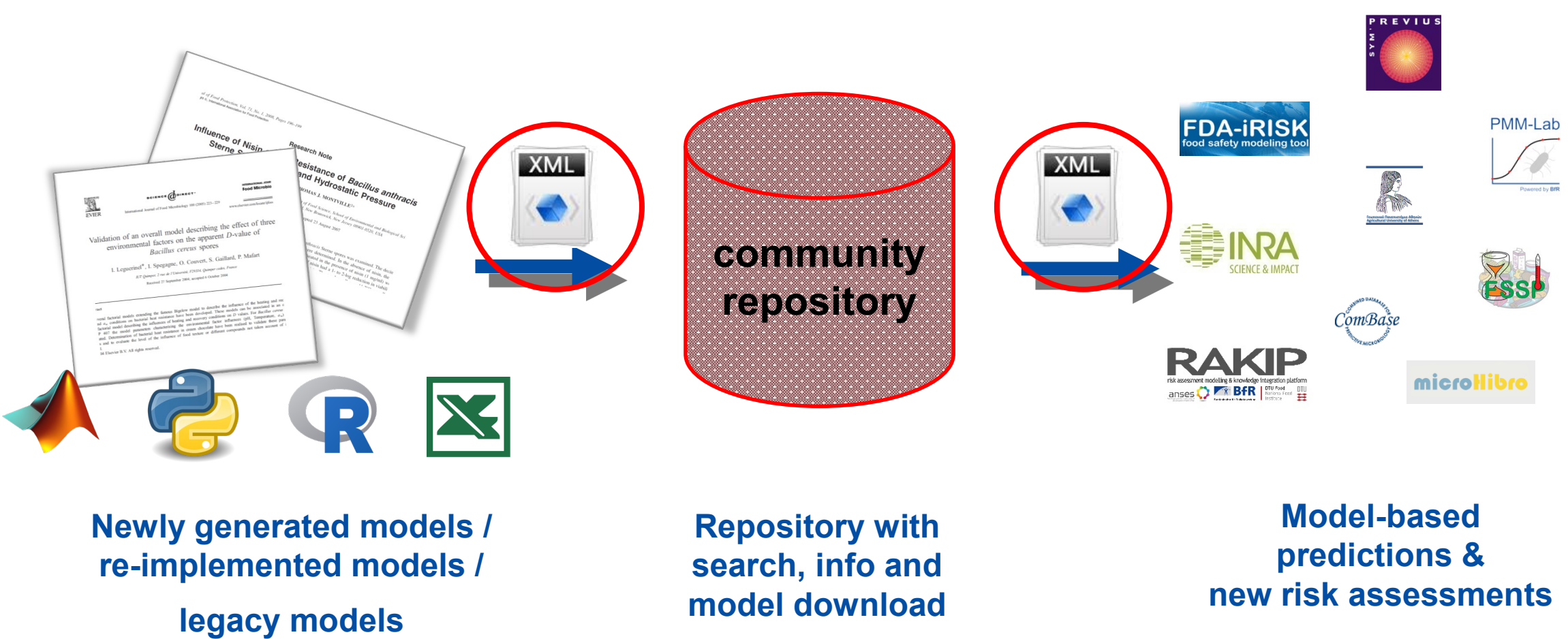
*Model structure build-up is detailed in Figure 3.

Fig. 2. The model generation process for QMRA, Empirical model and PM model.

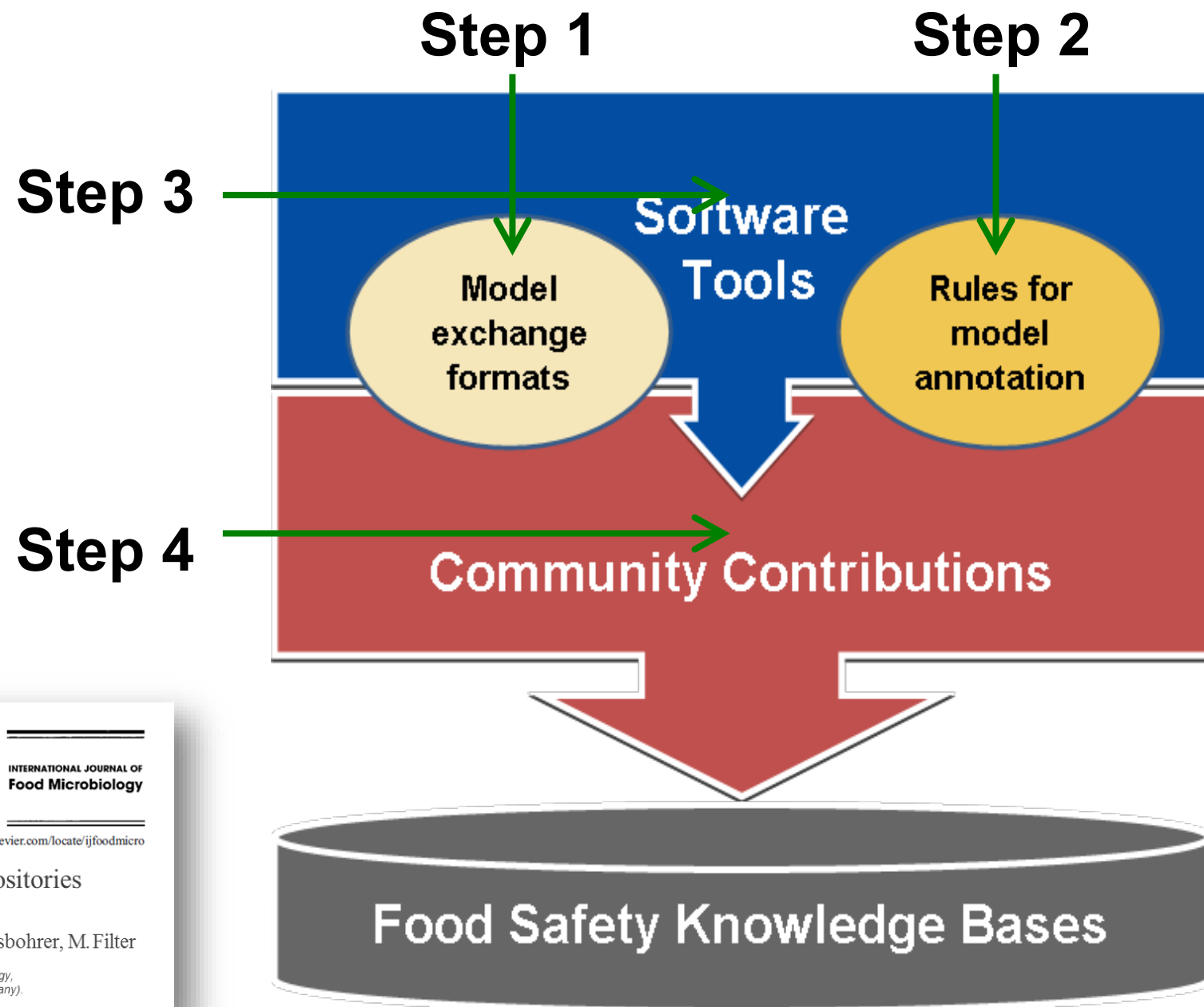
Fig. 1.

RAKIP - VISION

Community-driven, curated repository of food safety models / model modules (Food Safety Knowledge Base)



RAKIP - Strategy



<http://www.researchgate.net/publication/273791203> A strategy to establish Food Safety Model Repositories

FSK-ML – An Open Information Exchange Format

Food Safety Knowledge Markup Language (FSK-ML)

Software Developer Guide

Version 2.0 (under review)

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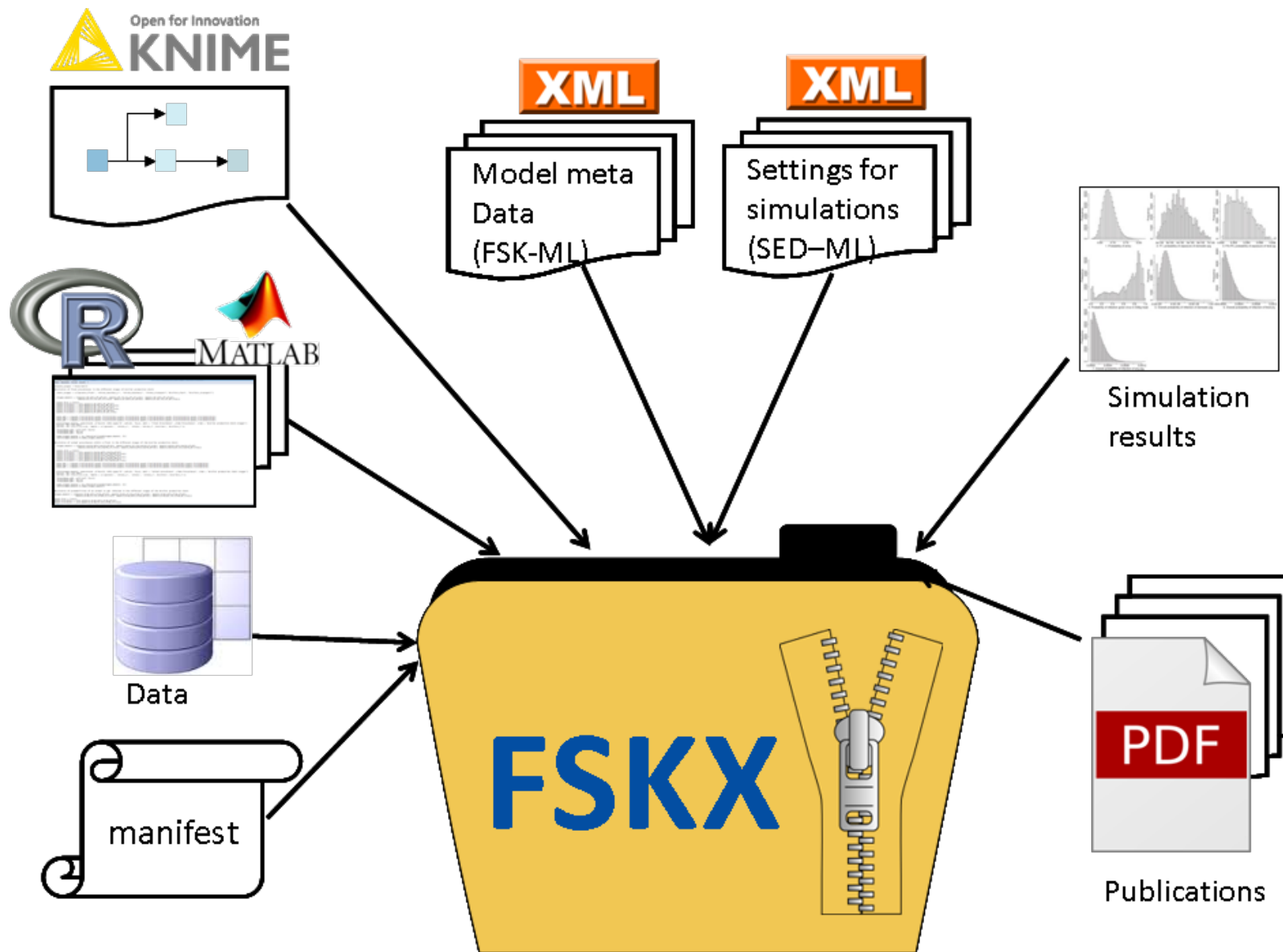
Alumni contributors:

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General Information	1	Study / Data / Model Name	1				
		Source	0:1				
		Identifier	1				
		Creator(s)	1:N	vCard 4.0 standard	1		
		Date	1:N	Creation date	1		
				Last modified date	0:N		
		Rights	1	Rights	1		
		Availability	1				
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		Format	0:1				
		References	1:N	Is reference description?	1		
				Publication type	0:1		
				Publication date	0:1		
				PubMed ID	0:1		
				Publication DOI	1		
				Publication Author List	0:1		
				Publication Title	1		
Publication Abstract	0:1						
Publication Journal / Vol / Issue, etc.	0:1						
Publication Status	0:1						
Publication website	0:1						
Comment	0:1						
Language	0:1						
Software	0:1						
Programming language	0:1						
Model category	0:1	Model Class	1				
		Model Sub-Class	0:N				
		Model Class comment	0:1				
		Basic process	0:N				
Status	0:1						
Objective	0:1						
Description	0:1						
Scope	Product / matrix	0:1	Product/matrix name	1			
			Product/matrix description	0:1			
			Product/matrix unit	1			
			Method of production	0:N			
			Packaging	0:N			
			Product treatment	0:N			
			Country of origin	0:1			
			Area of origin	0:1			
			Fisheries area	0:1			
			Date of production	0:1			
			date of expiry	0:1			
			Hazard	0:1	0:1	Hazard type	1
						Hazard name	1
	Hazard description	0:1					
	Hazard unit	1					
	Adverse effect	0:1					
	Source of contamination	0:1					
	Benchmark Dose (BMD)	0:1					
	Maximum Residue Limit (MRL)	0:1					
	No Observed Adverse Effect Level (NOAEL)	0:1					
	Lowest Observed Adverse Effect Level (LOAEL)	0:1					
	Acceptable Operator Exposure Level (AOEL)	0:1					
	Acute Reference Dose (ARFD)	0:1					
	Acceptable Daily Intake (ADI)	0:1					
	Hazard ing/sum	0:1					
	Population	0:1	0:1	Population name	1		
				Target population	0:1		
Population Span (years)				0:N			
Population description				0:N			
Population age	0:N						

<https://foodrisklabs.bfr.bund.de/rakip-harmonization-resources/>

FSKX – A file format for the exchange of models (and data)



RAKIP - Portal

FoodRiskLabs

- FoodChain-Lab
- Predictive Microbial Modeling Lab (PMM-Lab)
- FoodProcess-Lab
- Food Safety Knowledge Lab (FSK-Lab)
- Open Food Safety Model Repository

BfR & EFSA Safety Tools




RAKIP Web Portal

- RAKIP Model Repository & Web Services
- RAKIP Harmonization Resources
- FSK-ML (Food Safety Knowledge Markup Language)
- RAKIP Roadmap
- Predictive Microbial Modelling and QMRA Software Directory

RAKIP Web Portal

RAKIP

risk assessment modelling & knowledge integration platform

anses  **BfR**  **DTU Food** 
National Food Institute

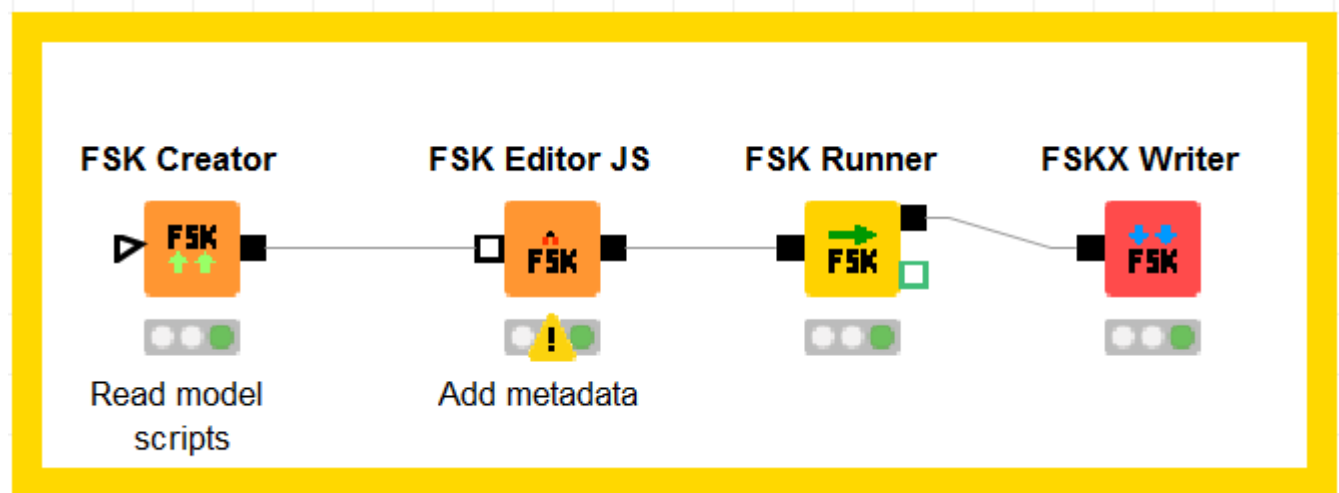
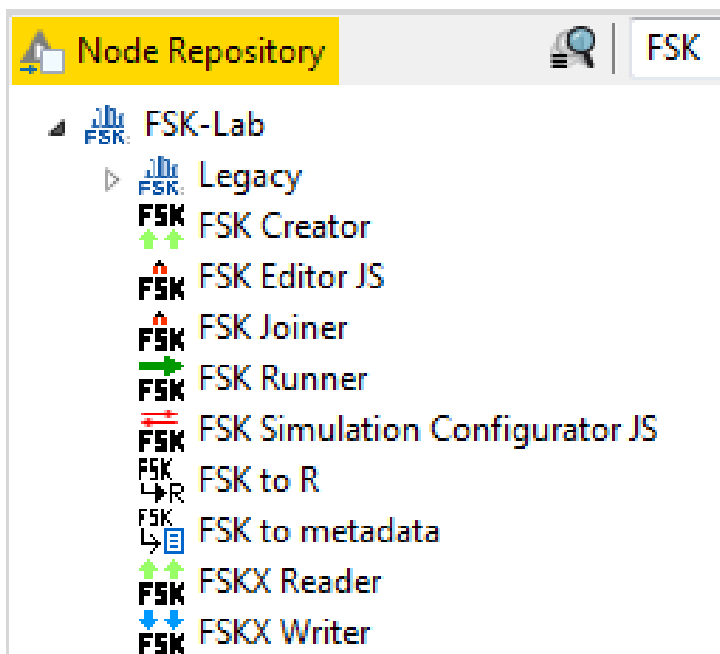
The food safety community is generating a variety of scientific knowledge (e.g. scientific publications, experimental data and mathematical models) and resources (databases and software tools for model generation and application). However, the access to this knowledge and the exchange of information between databases and software tools are currently difficult and time consuming. Therefore, three European institutions specialized in food safety risk assessment (ANSES, BfR and DTU Food) initiated a joint project to establish new community resources facilitating the efficient knowledge integration and exchange into and between IT-based applications and resources. The envisaged "Risk Assessment Modelling and Knowledge Integration Platforms" (RAKIP) will be based on harmonized data formats and consistent rules for knowledge annotation. The feasibility of this concept will be exemplified through an RAKIP Web Portal allowing users to access and download risk assessment models, modules thereof and related data in a harmonized file format. These files can then be imported and executed by software tools supporting the proposed harmonized file format. The RAKIP Web Portal therefore also contains supporting resources needed for the harmonized

RAKIP – Software Tools

Food Safety Knowledge Lab (FSK-Lab)



- Open source software supporting FSK-ML
- Extends the open source KNIME Analytics Platform
- Allows to document and archive all data processing steps incl. intermediate results
- Graphical programming tool



RAKIP Model Repository

RAKIP-Web FSKX Model Downloader FSKX Model Joiner Upload of Harmonized Models Online Creation of Harmonized Models

Search: Campyl Your search returned 5 models

Check	Model Name	ModelID	Software	Environment	Hazard	Execution Time	Upload Date	Details
<input type="checkbox"/>	Brynstad consumer phase model for Campylobacter in chicken meat	CPM2011Br	R	Poultry — chicken, geese, duck, turkey and Guinea	Campylobacter jejuni	00:00:53	2018-10-19 17:44	Details
<input type="checkbox"/>	Christensen consumer phase model for Campylobacter in chicken meat	CPM:risten				00:00:11	2018-10-19 18:10	Details
<input type="checkbox"/>	FAO/WHO consumer phase model for Campylobacter in chicken meat	CPM:OWH				00:00:07	2018-10-19 18:12	Details
<input type="checkbox"/>	Nauta consumer phase model for Campylobacter in chicken meat	CPM:uta				00:00:06	2018-10-19 18:12	Details
<input type="checkbox"/>	Dose-response model for Campylobacter in chicken meat	DR20	Sical			00:00:03	2019-03-18 19:43	Simulation

Feature	Value
Model name	ESBL E.coli in Broiler
Model id	horizontal_transmi_flocks_R
Organism	Escherichia coli o157:h7
Environment	Broiler
Model creator	Carolina Plaza-Rodriguez, Guido Correia Carreira
Software	R
Model reference description	C. Plaza-Rodriguez, H. Sharp, U. Roesler, A. Friese, A. Kaesbohrer (2015), Development of a model for the spread of ESBL/AmpC E.coli in broiler production. Poster presented at the National Symposium on zoonosis Research, Berlin, Germany
Created date	11.18.2015
Modified date	06.09.2016
Rights	Public
Notes	This module calculates how the prevalence among flocks changes due to horizontal transmission of ESBL E.Coli between flocks on a given stage (hatchery, transports or broiler farm) of the modelled production chain. The impact of horizontal transmission on the prevalence among flocks is modelled by a generalized linear model.

Search for the available models

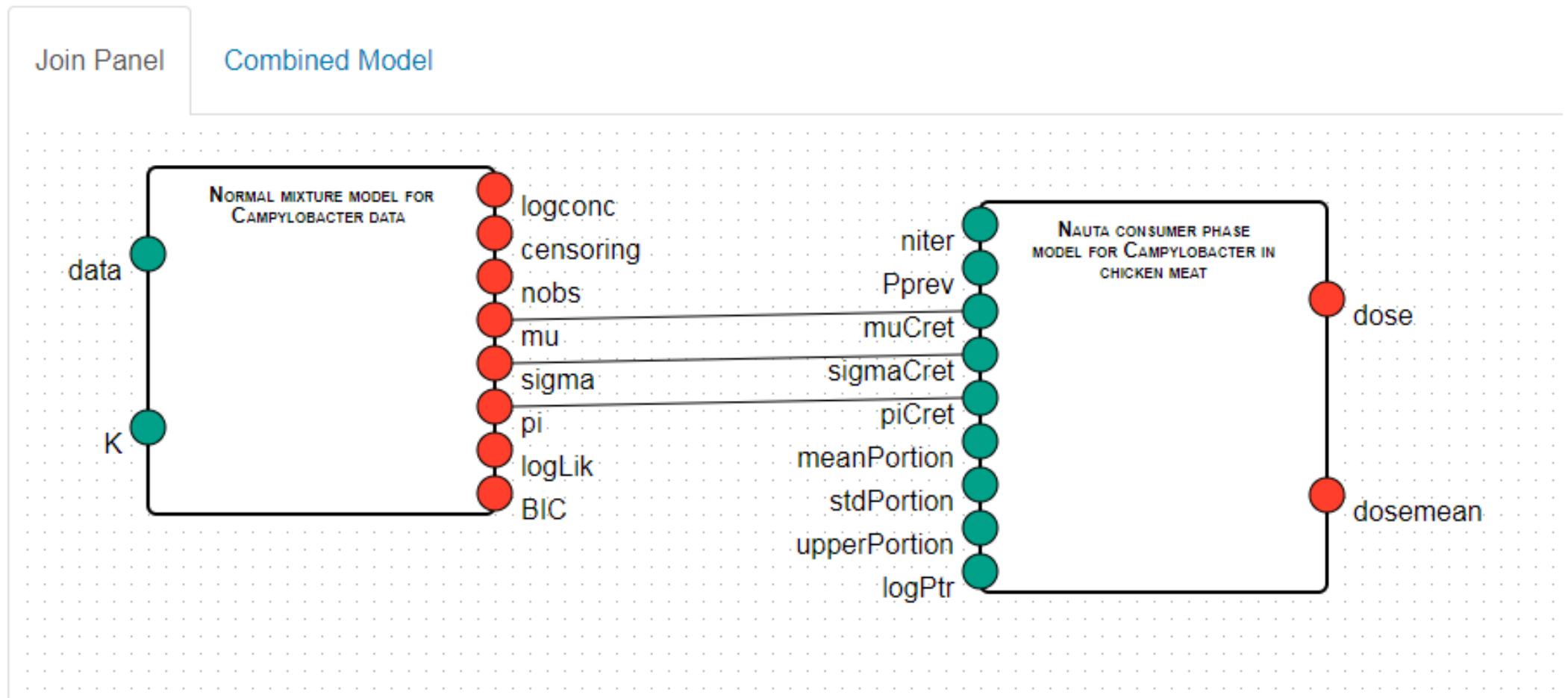
Look into model metadata

Select models

Run the models

RAKIP Web Services

Combined FSK Object



Community Benefits

Modellers:

- Sharing and deploying models / model scripts / code becomes much easier, e.g. via RAKIP model repository or as supplement to your publications

Software developers:

- An open information exchange format is available and can be jointly improved
- Implementation of Machine-to-Machine communication features becomes possible

Risk assessors and researchers:

- Domain knowledge becomes more easily available and “applicable” in future risk assessments and research

RAKIP Outlook

- **RAKIP Initiative** will be established facilitating broader collaboration
- RAKIP model repository will go into “**production mode**”
- **New tooling** support for the harmonized information exchange format “FSK-ML” becomes available, e.g. in “R”
- Minimum Information guidelines (**MIRARAM**) will be published
- **Content** in the RAKIP model repository will grow
- Other model classes will be addressed, e.g. source attribution, AMR, RBA, CRA, **WGS models**

Acknowledgement

RAKIP Co-Initiators:

Paw Dalgaard (DTU)
Laurent Guillier (ANSES)
Maarten Nauta (DTU)
Moez Sanaa (ANSES)

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ANSES
DTU
BfR
EFSA
AGINFRA+ project
FoodAuthent project

RAKIP team and co-workers:

Carolina Plaza Rodríguez (BfR)
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Virginie Desvignes (ANSES)
Miguel de Alba Aparicio (BfR)
Ahmad Swaid (BfR)
Taras Günther (BfR)
Lars Valentin (BfR)
Stylianos Georgiadis (DTU)
Octavio Mesa Varona (BfR)
Tasja Buschhardt (BfR)
Thomas Schüler (BfR)
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Shengling Ning (ANSES)

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Thank you for your attention

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