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Deliverable 7.4: Interim Sustainability and Commercialisation Roadmap for HOLiFOOD

**D7.4 Interim Sustainability and
Commercialisation Roadmap for HOLiFOOD****D7.4**

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Index of contents

.....	2
Table of acronyms	5
Glossary	6
1 Introduction.....	8
2 Material and Methods	10
2.1 Purpose.....	10
2.2 Key Activities.....	10
2.3 Channels & Tools.....	11
3 Results	12
3.1 Key Exploitable Results.....	12
3.2 Market Research	19
3.2.1 Public market Research.....	19
▪ Drivers.....	19
▪ Restraints	19
▪ Potential Public Sector Users of HOLIFOOD Outputs.....	20
▪ Strategic Recommendations for Engaging Public Sector Entities	20
3.2.2 Private Market Research.....	20
4. Final words	22

Index of tables

Table 1	11
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Index of figures

Figure 1 Identified KERs	13
Figure 2 Scope of exploitation	13
Figure 3 Possible IPRs of each partner	14
Figure 4 Individual or joint effort	14

Table of acronyms

AI	Artificial Intelligence
AGK	Agroknow
BFR	Bundesinstitut für Risikobewertung
CNR	Consiglio Nazionale delle Ricerche
CREME	Creme Global
DIA	DIALOGIK Gemeinnützige Gesellschaft für Kommunikations- und Kooperationsforschung mbH
DTU	Danmarks Tekniske Universitet
EFSA	European Food Safety Authority
FAO	Food and Agriculture Organization of the United Nations
GA	Grant Agreement (in EU project contexts)
HRMS	High-Resolution Mass Spectrometry
IPR	Intellectual Property Rights
KER	Key Exploitable Results
LL	Living Lab

NRL	National Reference Laboratory
TRL	Technology Readiness Level
UN	United Nations
UVMB	Universität für Veterinärmedizin Budapest (University of Veterinary Medicine Budapest)
WUR	Wageningen University & Research
WP	Work Package

Glossary

Artificial Intelligence (AI): A branch of computer science dedicated to creating systems capable of performing tasks that typically require human intelligence, such as learning, decision-making, and problem-solving.

Big Data: Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions.

Commercialisation: The process of bringing new products or services to the market. In the context of research and development, it refers to the process of turning scientific findings into marketable products or services.

Food Safety: Practices and precautions that prevent foodborne illnesses and ensure that food is stored, prepared, and handled in a way that reduces risk and maintains quality.

Hazard Detection: The identification and assessment of biological, chemical, and physical agents in food that may cause harm to the consumer.

Intellectual Property Rights (IPR): Legal rights granted to the creator(s) of original works, including patents, copyrights, trademarks, and trade secrets, protecting against unauthorized use by others.

Key Exploitable Results (KERs): Significant outcomes or findings from a research project that have potential for further development and exploitation, including commercial and societal applications.

Living Lab: A research concept which involves co-creation, user involvement, and experimentation in real-world settings, allowing for the testing and improvement of innovations in situ.

Market Research: The process of gathering, analyzing, and interpreting information about a market, including potential customers and competitors, to inform business decisions.

Predictive Models: Statistical models or algorithms that use historical data to predict future outcomes or behaviors.

Public Sector: The part of the economy composed of both public services and public enterprises, including government agencies and entities.

Risk Assessment: The process of identifying potential hazards and analyzing what could happen if a hazard occurs; in food safety, it refers to the evaluation of the likelihood and severity of adverse effects resulting from the presence of hazards in food.

Stakeholder Engagement: The process by which an organization involves people who may be affected by the decisions it makes or can influence the implementation of its decisions.

Sustainable Food Production: Agricultural and food production practices that do not deplete natural resources or harm the environment, ensuring food security for future generations.

Technology Readiness Level (TRL): A system used to estimate the maturity level of a particular technology. The scale ranges from 1 (basic principles observed) to 9 (actual system proven in operational environment).

Work Package (WP): A group of related tasks within a larger project, designed to achieve specific objectives within a specified time frame.

1 Introduction

The overall objective of HOLiFOOD is to improve the integrated food safety risk analysis (RA) framework in Europe to i) meet future challenges arising from Green Deal policy driven transitions in relation to climate driven changes, ii) contribute to the UN's Sustainable Development Goals and iii) support the realization of a truly secure and sustainable food production. HOLiFOOD will apply a system approach, which take the whole environment into account in which food is being produced, including economic, environmental, and social aspects. Three supply chains will be considered (i.e. cereals [maize], legumes [lentils] and poultry [chicken]). Artificial Intelligence (AI) and big data technologies will be used in the development of early warning and emerging risks prediction systems for known and unknown food safety hazards. In addition, tools, methods and approaches will be developed for hazard detection and will be targeted and non-targeted and new holistic risk assessment methods will be developed in which food safety risk will be embedded in a comprehensive cost-benefit analysis of the food system including positive and negative health, environment and economic dimensions. An effective impact pathway will be developed and implemented through integration of the HOLiFOOD outputs into the legal framework associated with the food risk analysis process. The impact pathway will be supported by an electronic data and knowledge sharing platform aiming at the full digitalization of food (safety) systems and supporting transparency and impact for all stakeholders. To align with stakeholder priorities, preferences and user requirements, the HOLiFOOD innovations will be designed and tested in a multi actor approach (i.e. Living Lab) involving all stakeholders (e.g. authorities, food producers and citizens).

One of the aims of WP 7 of the HOLiFOOD is to design a sound exploitation strategy for the innovations developed and build the necessary agreements between the parties needed for effective, fast post-project exploitation.

This Deliverable 7.4 report aims to compile and document the Key Exploitable Results (KERs) developed over the course of the HOLiFOOD project and maps out market research in support of moving these KERs onto their next stages of adaptation. This Deliverable has been written as part of WP7.

KERs are critical outcomes that hold potential for exploitation and further development within the food safety domain. A Key Exploitable Result (KER) refers to a significant outcome or finding of a research or innovation project that has the potential to be exploited commercially, economically, or socially. Key Exploitable Results are characterized by their potential for practical application, which may include:

1. **Commercialization:** They can be developed into products, services, or technologies that have market value and can be commercialized by businesses or startups.
2. **Industrial Application:** They may offer solutions to industry challenges or improve industrial processes, leading to increased efficiency, productivity, or competitiveness.
3. **Social Impact:** They may have implications for societal benefits, such as improving public health, enhancing environmental sustainability, or addressing societal challenges.
4. **Intellectual Property:** They may involve intellectual property assets, such as patents, trademarks, or copyrights, which can be protected and monetized.
5. **Knowledge Transfer:** They often involve the transfer of knowledge, expertise, or

technology from research institutions to industry or other stakeholders.

The market research examines entities potentially interested in the outputs of the HOLiFOOD project, which aims to leverage AI and Big Data to improve food safety outcomes and detect emerging food risks. These technologies present an opportunity for public sector agencies, including food safety regulatory agencies, health departments, and agricultural departments, to enhance their overall effectiveness in safeguarding public health, as well as private industries looking to adapt to a landscape of emerging risks.

2 Material and Methods

2.1 Purpose

The primary purpose of our methodology is to systematically gather, analyse, and interpret data related to the KERs within the HOLiFOOD project. This involves identifying significant outcomes or findings from the project that have potential for commercial, economic, or social exploitation. Additionally, the methodology aims to conduct market research to explore viable avenues for the application and commercialisation of these results.

2.2 Key Activities

Key activities can be broken into two groups – gathering KERs and performing market research. Information on KERs was gathered first from each partner through an online (Google) form and then by convening an online workshop, to discuss these results and explore opportunities for interoperability.

KERs of HOLiFOOD project (from GA):

- Novel Food Safety Prediction Model
- New Targeted and Untargeted Methods for Hazard Detection
- Cheaper and Earlier Detection of Hazards
- Comprehensive Interlinked Data and Knowledge Infrastructure
- Validated Generic Adaptive Holistic Risk Assessment Methods and Tools
- Other

The online workshop itself was facilitated by **AGK**, who prepared the survey and then collected the results for presentation, after which a multi-partner discussion on the KERs took place (see **Table 1**).

The market research performed was split into two bodies of work with **CREME** preparing the market research targeting public entities and **AGK** preparing market research aimed at private businesses. The public approach looked to identify both drivers and restraints in promoting the outcomes of the HOLiFOOD project, derived from **CREME**'s commercial experience in conjunction with industry reports for validation. From that point, specific target agencies were defined and a set of recommendations were made for engaging public entities in follow-ups to the HOLiFOOD projects.

The private approach looked at a broader approach to market research, providing an overview of how market research would be conducted in the event of commercial outcomes.

2.3 Channels & Tools

During the data collection phase, partners contributed their respective KERs via an online (Google) form, prepared by **AGK**. Partners were prompted to provide detailed descriptions of their Results/Exploitable assets, outlining the scope of exploitation, and identifying the target groups for whom these results are relevant. Additionally, partners were encouraged to specify the means through which they intended to exploit these results, including potential intellectual property considerations where applicable. Furthermore, partners were asked to clarify the origin of the results, distinguishing between individual efforts developed solely by one partner and collaborative endeavours shared among multiple partners (**Figure 1-4**). This distinction was essential for understanding the collaborative dynamics and ensuring proper attribution of contributions within the project framework.

Market research was performed by **CREME** and **AGK** on Public and Private routes of exploitation respectively.

Key activity	Channels	Tools
Ambassadors	n/a	n/a
Stakeholder engagement	KER Workshop	Doodle Poll Google Forms Microsoft Teams
Social media	n/a	n/a

Table 1 Key activities

3 Results

3.1 Key Exploitable Results

A series of KERs were collected via a Google Forms survey ahead of the KERs workshop. When filling out this survey, participants were asked:

- to define the nature of the KER.
- to define the scope in which these KERs could be exploited.
- to define the nature of any intellectual property rights developed as part of the project.
- to declare the development as collaborative or independent.

Figure 1 provides an examination of these different KERs with the majority of the KERs relating to the development of methods for either detecting contaminants in food outright or performing risk assessment based on these refined methodologies. Furthermore, the former would tie together with the development of new food safety-related prediction models which could then in turn inform the latter.

The other component of the graphic is then dominated by the “Other” category which captured avenues of exploitation like targeting specific health professionals and legislators but also captured responses where participants were unable to define a clear KER at this time.

Please report the identified KERs

14 απαντήσεις



Figure 1 Identified KERs

The bulk of KERs seemed to focus on exploitation in the scope of academic work, per Figure 2. The key avenue of exploitation identified in the subsequent workshop was via academic publications based either directly on the results of the HOLiFOOD project or on methodologies derived from the work undertaken by the project partners.

Scope of exploitation

14 απαντήσεις

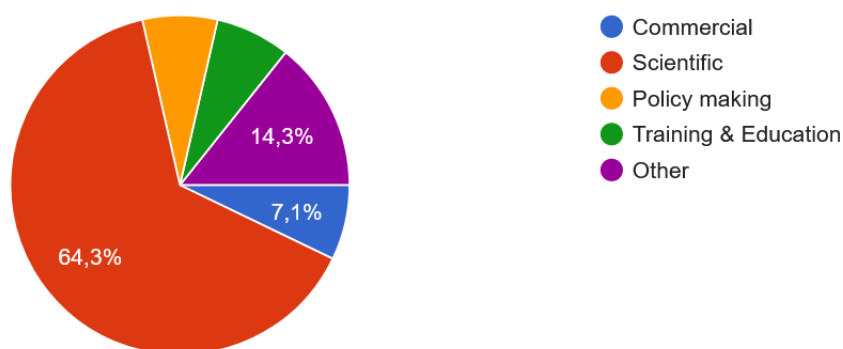


Figure 2 Scope of exploitation

The intellectual property rights results as described in Figure 3 note a high degree of agreement between the involved parties, primarily splitting between the development of copyright protected work and the "Other" category, which again acted as a catchall and so when considering the scope displayed in Figure 2 it would be reasonable to expect that many of these "Other" responses may have been null as academic work may broadly speaking not require protections as strict as copyright, instead receiving acknowledgement in future publications.

Please indicate what might be the possible IPRs, where relevant

14 απαντήσεις

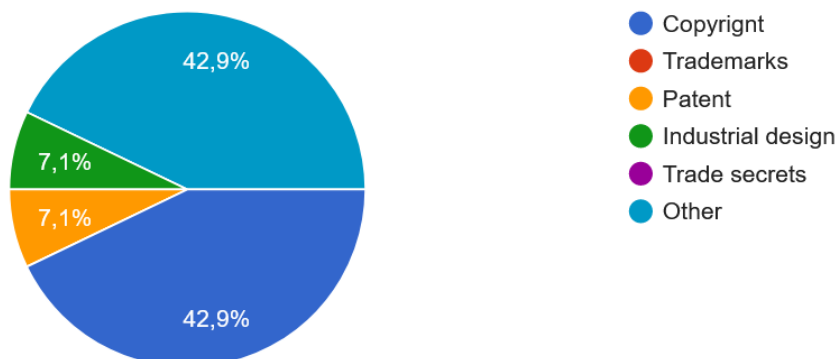


Figure 3 Possible IPRs of each partner

Finally Figure 4 captures the division of effort in the creation of these KERs. As expected for a project with many partners, the bulk of the KERs are produced by collaborative effort but it is notable that a not insignificant portion of the KERs are also listed as the product of partners working independently from others.

Please clarify whether the result is solely developed by one partner (individual) or is a collaborative effort shared among multiple partners (joint).

14 απαντήσεις

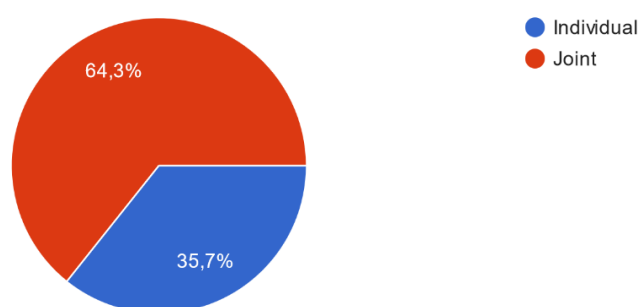


Figure 4 Individual or joint effort

Below is an overview of the responses gathered through the Google Form:

- Within **AGK's** initiatives, KER revolves around the development of a robust, **interlinked data and knowledge infrastructure** tailored specifically for enhancing food safety measures. This infrastructure includes the sophisticated Time Series Management & Forecasting Engine, along with a powerful data scraping platform, both strategically designed to gather, analyse, and forecast trends crucial for ensuring food safety. Additionally, AGK's KERs include the creation of **predictive models, such as the Mycotoxins Model**, which leverages advanced algorithms and data analytics to forecast and mitigate risks associated with mycotoxin contamination in food products. Exploitation avenues for these KERs are multifaceted, with a primary focus on **commercialisation**. AGK aims to capitalise on these innovations by offering commercial solutions tailored for **stakeholders in the food industry**. Simultaneously, scientific publications, and presentations at conferences will serve as channels for sharing insights, methodologies, and findings derived from AGK's initiative. IPRs associated with AGK's KERs include copyrights, particularly given the innovative nature of the developed infrastructure and prediction models. AGK's KERs are categorised as an **individual** endeavor, underscoring their sole responsibility for its development and subsequent exploitation.
- In the Google Form, **BFR** provided a comprehensive description of their KER which entails the development of **new targeted and untargeted methods for detecting both known and unknown chemical and biological hazards**. These methods utilise High-Resolution Mass Spectrometry (HRMS) based approaches, specifically tailored to screen for emerging contaminants, such as mycotoxins. The exploitation scope primarily targets the **scientific community and official control laboratories**, aiming to disseminate findings through scientific publications, presentations at scientific conferences, and within the NRL (National Reference Laboratory) network. Additionally, BFR identified 'Other' means of exploitation, which could encompass collaborations with industry partners or technology transfer initiatives. This result was classified as a **joint effort**, indicating collaborative input and shared ownership among multiple partners within the HOLIFOOD project.
- **WFSR** detailed their KER involving the **development of novel food safety prediction models**. These models are currently in the developmental phase, aimed at predicting food safety risks effectively. The exploitation scope targets **scientific dissemination, particularly towards food inspection agencies and food manufacturers**. However, there was uncertainty expressed regarding the intended meaning of this aspect. Additionally, under the "Other" means of exploitation, WUR indicated a yet-to-be-defined approach, possibly suggesting further strategies or avenues beyond the scope of scientific dissemination. This indicates potential for collaboration with industry stakeholders or technology transfer initiatives, although specifics were not provided. Similar to BFR's response, WUR's KER was classified as a **joint effort**, signifying collaborative input and shared ownership among multiple partners within the HOLIFOOD project.
- In the Google Form, **CREME GLOBAL** outlined their KER involving the development of a **comprehensive, interlinked data and knowledge infrastructure for food safety**. However, it was noted that this infrastructure is still in the developmental stage. The exploitation scope for this result is **commercial**, targeting **risk managers** within the food industry. The intended means of exploitation involves licensing the developed infrastructure to these stakeholders. Additionally, under "Industrial design," it appears CREME GLOBAL may be considering specific design aspects or user interfaces as part of their exploitation strategy. Unlike the previous responses marked as joint efforts, CREME

GLOBAL's KER was categorised as an **individual effort**, indicating that they are primarily responsible for its development and subsequent exploitation.

- In the Google Form, **APRE** detailed their KER involving **the co-design of a comprehensive, interlinked data and knowledge infrastructure for food safety**, specifically tailored for the participatory approach within Living Labs (LLs). The exploitation scope for this result extends to training and education, targeting individuals involved in research directly and indirectly, including SMEs, research institutions, universities, and policymakers. APRE intends to disseminate this knowledge through a guide or booklet, facilitating broader understanding and utilization of the developed infrastructure. Under "**Copyright**," APRE aims to protect their intellectual property rights associated with this result. It's marked as a **joint effort**, indicating collaborative input and shared ownership among multiple partners within the HOLIFOOD project.
- **ANSES** provided detailed information about their KER, which involves the **development of new targeted and untargeted methods for detecting both known and unknown chemical and biological hazards**. Additionally, ANSES highlighted their work on new molecular and cellular approaches for virus detection and viral persistence studies. The exploitation scope for this result is primarily **scientific, targeting the scientific community**. ANSES intends to disseminate their findings through scientific papers, contributing valuable insights to scientific literature. Under "Other," ANSES did not specify additional means of exploitation, but it suggests that there may be other avenues beyond scientific publications. This result was categorised as an **individual effort**, indicating that ANSES is primarily responsible for its development and subsequent exploitation.
- **UNIVIE** described their KER as a **legal analysis of the AI tools and elements implemented in the project**. This analysis provides insights from a legal perspective, which can be utilised to develop articles, publications, or guidelines. The exploitation scope for this result is categorised as "Other," targeting **lawyers, technicians, and researchers** who may benefit from the legal insights provided. UNIVIE aims to disseminate their findings through various means, including articles, publications, regulation guidelines, and commentaries. Under "**Copyright**," UNIVIE intends to protect their intellectual property rights associated with this result. This KER is classified as an **individual effort**, indicating that UNIVIE is primarily responsible for its development and subsequent exploitation.
- **UVMB** provided a detailed description of their KER, which focuses on **improving the detection of both known and unknown food safety hazards**. Specifically, UVMB has developed an emerging risk identification pipeline using text mining and topic detection from news and scientific publications. The exploitation scope for this result is primarily scientific, targeting **authorities and food business operators (FBOs)** who are involved in food safety. UVMB intends to disseminate their findings through **a platform, app, or dashboard**, providing a user-friendly interface for accessing and utilising the emerging risk identification pipeline. Under "**Patent**," UVMB intends to seek patent protection for their innovative approach, highlighting the potential for commercialisation and market exclusivity. This KER is classified as a **joint effort**, indicating collaborative input and shared ownership among multiple partners within the HOLIFOOD project.
- **DTU** outlined their Key Exploitable Result (KER), which involves **validated generic adaptive holistic risk assessment methods and tools**. Specifically, DTU has conducted a Risk Benefit Assessment of Foods and its Role to Inform Policy Decisions, with outcomes stemming from an international workshop. The exploitation scope for this result is focused on **policymaking, targeting policy makers and the scientific community**. DTU intends to disseminate their findings through a report and published paper, providing valuable

insights into the role of risk-benefit assessment in informing policy decisions. Under "Copyright," DTU aims to protect their intellectual property rights associated with this result. This KER is classified as a **joint effort**, indicating collaborative input and shared ownership among multiple partners within the HOLIFOOD project.

- **CNR** has provided two distinct Key Exploitable Results (KERs) in the Google Form for gathering project outcomes within HOLIFOOD. Firstly, CNR is developing **new targeted and untargeted methods to detect both known and unknown chemical and biological hazards**, focusing specifically on pathogenic bacteria in poultry and legumes, glyphosate detection in maize, biogenic amines in poultry, and mycotoxins in maize. CNR is devising a rapid and fully automated assay based on lateral flow test technology, intended for use in official and auto-control purposes to assess maize compliance with regulatory levels of glyphosate. Moreover, CNR is developing aptamer based rapid tests for aflatoxins/fumonisin in maize as well as for tyramine and histamine in poultry meat. These efforts target scientific advancement and involve collaboration with food business operators and official control labs, aiming for implementation through on-site training and technology transfer activities. The intellectual property rights associated with these results are designated as individual. Additionally, CNR is working on the **isolation and genomic characterisation of emerging pathogens from poultry, lentils, and maize chains**. They are developing new real-time PCR-based methods for detecting these emerging pathogens, with the intention of transferring the methods to IMEC for use in a portable lab-on-a-chip device. Moreover, CNR is studying the persistence of emerging pathogenic bacteria. These KERs targets **researchers**, public health authorities, and the food industry, with findings disseminated through scientific articles and conferences, and involve collaboration with joint partners.
- **INRAE** has provided several Key Exploitable Results (KERs) within the HOLIFOOD project, demonstrating their multifaceted approach to enhancing food safety methodologies and practices. Firstly, they have **developed validated generic adaptive holistic risk assessment methods and tools**, specifically targeting microbial risk assessments and holistic evaluations. Their aim is to share these advancements with the scientific community through the publication of scientific papers, highlighting joint collaboration and copyright protection. Furthermore, INRAE is actively engaged in **developing holistic risk assessment models tailored for the lentil supply-chain**. These models contribute to the broader objective of improving risk assessment practices and involve collaboration with scientists from academia, regulatory bodies such as EFSA, and the food industry. Their strategy for dissemination includes publications and communications in conferences, with an emphasis on copyright protection and joint collaboration. Additionally, INRAE is involved in **quantifying the persistence of Campylobacter isolates under stressful conditions**. This research targets researchers, public health authorities, and the food industry, with findings disseminated through scientific articles and conferences. Notably, this effort is marked as an **individual endeavor**, signifying INRAE's primary responsibility for its development and exploitation.
- **DIA's** response in the Google Form indicates "Other" for their Key Exploitable Result (KER), suggesting that they may not have a specific exploitable result to report at this time. The response states "N/A" for various fields, including the exploitation scope, means of exploitation, and intellectual property considerations, indicating that there may be no

applicable information in these areas. The response concludes with "Other" marked for the exploitation category, which may suggest that DIA's contributions or objectives within the HOLiFOOD project lie outside the conventional categories listed in the form. This response implies that DIA's involvement or contributions may be unique or unconventional compared to other partners in the project.

The workshop held on 19/02 provided a platform for in-depth discussions surrounding these results, fostering collaboration and synergy among the project participants.

- Akos from UVMB noted that UVMB shares similar KERs with WUR and AGK, which are novel prediction models for food safety, as well as with INRAE and DTU for validated holistic risk assessment. He proposed grouping KERs with related activities for better organisation.
- Giulia from APRE suggested designating a KER as "other" instead of aiming for a comprehensive interlinked data and knowledge infrastructure for food safety. APRE, in collaboration with CNR, is planning to develop a guide for the co-creation process in Living Labs and has established a connection with the virtual Lab of FoodSafe4u, creating synergy with a sister project. The workshop held on 19/02 provided a platform for in-depth discussions surrounding these results, fostering collaboration and synergy among the project participants.
- Akos from UVMB noted that UVMB shares similar KERs with WUR and AGK, which are novel prediction models for food safety, as well as with INRAE and DTU for validated holistic risk assessment. He proposed grouping KERs with related activities for better organisation.
- Giulia from APRE suggested designating a KER as "other" instead of aiming for a comprehensive interlinked data and knowledge infrastructure for food safety. In fact, this "other" means that: *"The KER proposed as result of WP4 co-creation activities, is a "model for participatory approach based on the methodology of Living Labs (LLs), that can be applied for co-design of a comprehensive, interlinked data and knowledge infrastructure for food safety".* The reason why reformulating the KER is therefore, to include the methodology consisting of:
 - the co-creation approach translated into the 3 LLs,
 - the cross-fertilisation activities that further feed into the ongoing process, resulting in the overall view of a complex problem.

This model as described emphasising its broader social impact beyond its specific application to food safety. This change reflects the recognition that the KER resulting from the co-creation efforts of WP4 will serve as a model for participatory approaches, inspired by the Living Labs methodology. APRE, in collaboration with CNR (involved in WP4 and coordinator of the FS4EU project), intends to produce a guide for the co-creation process within Living Labs that also incorporates the experience of FSO labs. This initiative also plans to establish connections with the FoodSafety4u virtual lab, thereby enhancing synergies with related projects. The guide will not only disseminate but also facilitate the transfer of the developed methodology and approach.
- Jeanne-Marie from INRAE questioned why INRAE and DTU have separate results in WP3 when they share the same KER. She emphasised the importance of developing holistic assessments and highlighted the need for support from partners in tool development. She recommended discussing the presentation of similar KERs with the coordinator.

- Wenjuan from WUR mentioned that, for exploitation purposes, they intend to publish their findings.
- James from Crème Global pointed out that the proposal includes the Technology Readiness Level (TRL), and they will provide a roadmap for commercial licensing options beyond the project's lifetime. The primary outputs will include presentations, publications, and dissemination activities.
- Akos from UVMB indicated an agreement with WUR regarding Intellectual Property Rights (IPRs).
- James from Crème Global suggested managing both the background and foreground of IPRs, particularly when something is patentable. He also emphasised aligning IPR management with project dissemination efforts and ensuring the protection of sensitive information as needed.

Beyond the KER workshop, **WSFR** have also been leading work into the creation of an EFSA data pool initiative reaching across HOLiFOOD, EFRA, and ECOREADY (other EU projects). The collection and development of an accessible database of food safety risks would lay the groundwork for heightened risk analysis by itself, but this particular KER also seeks to establish maintainable pipelines for data within the EU to ensure that the database remains as current as is possible.

3.2 Market Research

The following market research was broken down along public and private prospective markets for commercialisation.

3.2.1 Public market Research

▪ Drivers

Need for Enhanced Food Safety Protocols: The increasing complexity of the global food supply chain and the rising incidence of foodborne illnesses underscore the need for more sophisticated food safety measures. This is most reliably achieved by gathering information and deriving insights from which decisions can be made.

Technological Advancements: Improved data and knowledge sharing infrastructure in conjunction with suitable tools for emerging risk identification offer unprecedented capabilities in data processing, trend analysis, and predictive modeling, enabling proactive risk management.

Regulatory Compliance and Public Health Protection: Public sector entities are mandated to protect public health, necessitating the adoption of advanced technologies to meet these responsibilities effectively.

▪ Restraints

Budgetary Constraints: Public sector entities often face financial limitations, which can impede the adoption of advanced technologies. Additionally, the high degree of oversight required for government vendors can create barriers to entry for smaller firms.

Technological Adoption and Integration Challenges: The transition to a “Big Data”-based system requires overcoming technical, organisational, and cultural hurdles. There are challenges in ensuring that people with the right degree of data literacy are at the right levels for acting in

response to data-derived insights. It is important to note that the HOLiFOOD project has set out aims to achieve Technology Readiness Level of 6-7, meaning that further work would be required to validate the work in an operational capacity.

▪ **Potential Public Sector Users of HOLiFOOD Outputs**

National Food Safety Authorities: Bodies responsible for overseeing food safety standards, inspections, and compliance within countries. They may be more likely to follow guidance as directly provided by the likes of EFSA within the EU however.

International Food Safety Authorities: Entities like the European Food Safety Authority (EFSA) and the Food and Agriculture Organization (FAO) that provide oversight, guidance, and support at regional and international levels. They are one of the directly intended beneficiaries of the HOLiFOOD project.

Public Health Departments: Departments focused on protecting public health, including the prevention of foodborne illnesses and the promotion of food safety education. Shaping food safety policy requires input into the relevant medical and educational channels.

▪

Strategic Recommendations for Engaging Public Sector Entities

Demonstrate Value and ROI: Clearly articulate the benefits of HOLiFOOD outputs in terms of improved food safety outcomes, cost savings, and enhanced public health protection. At present this project targets risk assessors but may need further breakdown to resonate with decision makers at different levels of involvement.

Facilitate Technology Transfer and Integration: Offer support for integrating HOLiFOOD outputs with existing systems and processes in public sector entities. This may include sourcing additional funding for building APIs or other public facing tools.

Collaborate on Pilot Projects: Engage in pilot projects with public sector agencies to demonstrate the practical benefits and feasibility of adopting HOLiFOOD technologies. This may help to overcome challenges as discussed in more detail by “AI adoption in the public sector: a case study” (Nurski 2023), when suitably tailored to the food sector, particularly in the identifying the technological, organisational and environmental contexts that determine the ability for any given entity to adopt new approaches derived from the HOLiFOOD work. These different contexts refer to agencies ability to trial new technologies, leadership willingness to engage with these techniques, as well as competitive pressures that may compel agencies to seek talent from a scarce labour pool. Agencies may not require everything that HOLiFOOD has developed, but they may still benefit from select components.

3.2.2 Private Market Research

Our framework relies on pivotal tools such as market research and company segmentation to navigate the dynamic landscape of our target markets. With a focus on understanding consumer preferences, behaviors, and market trends, the tailored segmentation strategy allows us to precisely align our marketing strategies, product offerings, and messaging with the diverse needs of our customers. Through meticulous data gathering, analysis, and interpretation efforts, we can pinpoint potential opportunities, gauge market demand, and assess our competitive landscape.

Here's a structured approach to conducting market research:

Define Objectives: Clearly outline the goals of your market research, such as understanding preferences, identifying opportunities, and assessing the competitive landscape.

1. **Utilise Tools:** Make use of a segmentation tool and profiling tool to gather comprehensive data on companies and individuals within your target market.
2. **Segmentation Criteria:** Identify specific criteria for segmentation, such as revenue from food products, geographical presence, and the size of food safety teams. Use these criteria to categorise companies into distinct segments.
3. **Data Collection:** Populate the segmentation tool with data on companies, including headquarters location, revenue figures, operational continents, and food safety team size. Additionally, use the profiling tool to gather information on individuals affiliated with these companies, including their roles, contact details, and geographical locations.
4. **Data Analysis:** Analyse the collected data to identify trends, patterns, and insights related to consumer preferences, behaviors, and market dynamics. Use statistical analysis and qualitative interpretation to derive meaningful insights from the data.
5. **Segmentation Strategy:** Based on the segmentation approach outlined, divide the market into distinct consumer groups with similar characteristics or needs. Tailor marketing strategies, product offerings, and messaging to align with the unique needs and preferences of each segment.
6. **Opportunity Identification:** Pinpoint potential opportunities within each market segment by analysing consumer needs, competitor offerings, and market trends. Assess market demand and identify areas where your business can gain a competitive advantage.
7. **Strategic Decision-Making:** Use the insights gathered from market research to make informed strategic decisions regarding product development, marketing initiatives, pricing strategies, and distribution channels.
8. **Continuous Improvement:** Regularly review and update your market research approach to adapt to changing market dynamics and evolving consumer preferences. Continuously refine your segmentation strategy and data gathering methods to ensure relevance and accuracy.
9. **Implementation and Monitoring:** Implement the findings of your market research into your business strategies and monitor the impact of these changes over time. Track key performance indicators (KPIs) to measure the effectiveness of your strategies and adjust as needed.

4. Final words

The HOLiFOOD initiative, by integrating advanced data analytics and machine learning, not only elevates food safety measures but also aligns the consortium towards a unified set of Key Exploitable Results (KERs). The collective agreement among partners on KERs underscores the project's commitment to creating actionable insights and tangible solutions within the food industry. These KERs, ranging from predictive models and hazard detection methodologies to a vast knowledge infrastructure, embody the collaborative spirit of the project. By leveraging each partner's expertise, HOLiFOOD aims to operationalize its findings, ensuring that the innovations not only contribute to the academic and scientific community but also have practical applicability in improving food safety protocols across various stakeholders in the food supply chain. This consensus on KERs reflects a shared vision for the project's outcomes, emphasizing the potential for these advancements to serve as benchmarks for future initiatives in food safety and risk management.

Market analysis within the project highlights potential opportunities and challenges in adopting these technologies across both public and private sectors. The findings emphasize the need for sophisticated safety measures due to the complexities of global food supply chains and highlight potential barriers such as budgetary constraints and integration challenges.

To ensure the impactful application of its findings, HOLiFOOD proposes strategic engagement with key stakeholders. Recommendations include clear communication of benefits, support for technological integration, and collaborative pilot projects to demonstrate value and feasibility.

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