The Food Safety Market: An SME-powered industrial data platform to boost the competitiveness of European food certification

D4.1 - Annual Report from Iterative Application Development

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TheFSM
The Food Safety Market

The Food Safety Market: An SME-powered industrial data platform to boost the competitiveness of European food certification

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EXECUTIVE SUMMARY

This deliverable reports the process and outcomes of agile and iterative development of the software applications, namely Food Inspector Application, FOODAKAI 2.0 application and the Agrivi 2.0 application. It presents how the software applications that food supply chain stakeholders use, can be connected to TheFSM to support data exchange for the business scenarios identified in WP1 and will be piloted in WP6. More specifically, the objectives during the first year of the project were to a) design an agile deployment approach, in order to ensure that new user applications are developed and tested with selected focus groups representing the users on a regular basis, b) follow an iterative process deploying new software applications within the piloting activities of the project, to enable the targeted business scenarios and c) interconnect the new software applications with TheFSM data platform. During the second year of the project, we will focus on a) how the software application can be interconnected with other third-party applications that hold relevant data with the data platform and b) testing and verifying the smooth, robust and complete integration of the various components and services.

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1. INTRODUCTION

This task focuses on setting up an **agile process** that will enable the **iterative implementation**, deployment and **testing** of the various product features with actual users. We designed and put in place a method of work that is executing software development sprints which are then tested with representative focus groups with actual users, in order to get early and continuous feedback on the new product features. An appropriate **mechanism** and **virtual communication tools** were set up to enable weekly team check ins of all the people involved in developing and deploying product features and components.

This document is structured as follows. In the second section we define and analyze the agile development process that is adopted for the development of applications. Third section focuses on the collaboration, communication tools and the routines that are adopted by the technical partners and the development teams of the project. In the fourth section we present a methodology that is used to prioritize the developments using criteria such as impact, confidence and ease. The process for testing the new developments is presented in section 5. In the last section we present the outcomes of the agile development process for the three applications that will be developed in the context of the project.

This deliverable uses the outcomes reported in deliverable D1.1 for the user and business requirements as well as the overall architecture of TheFSM Platform presented in deliverable D3.1. In addition to that, the first release of the platform D3.2 are used to develop the interaction of the applications with the TheFSM platform.

2. AGILE APPLICATIONS DEVELOPMENT ITERATIVE PROCESS

The adopted agile development process includes the following steps

1. **Requirements identification:** Based on the business scenarios defined in WP1 a set of user stories were documented and shared with the development team from the partner that leads the development of the application
2. **Design**: Based on the user stories the development team is creating a set of wireframes that gives a good idea of the operations that will be developed. The wireframes are presented to a focus group of users to validate that the designed operations will bring value to the end users. Based on the feedback we are creating the final version of wireframes
3. **Development:** The final wireframes are used to start the development of the alpha version.
4. **Testing:** the alpha version is tested from the technical and usage point of view by internal teams of technology partners.
5. **Deployment:** Based on the testing results the development team is deploying the alpha version of the application.
6. **Review**: the alpha version is open for testing and review by the focus groups and the feedback is collected using interviews and online questionnaires.

The outcomes of the review are the input for the design and deployment of the beta version. The iterative process is repeated for the beta version and for the first official release of the application (1.0).

Figure 1: The development iterative process followed in TheFSM project for the implementation of applications

The requirements identification step is the sprint 0 and it creates a set of personas and user stories which are added in the sprint backlog. All the stories are organized in Epics (software modules) and the duration of each sprint is from 2-4 weeks. The outcome of each sprint is one or a couple of features that are developed in their alpha version. The end users may be involved in a sprint, if necessary, to provide clarifications about the required functionality of a feature.

Figure 2: The process that is used to transform users' stories to features.

3.   ROUTINES AND VIRTUAL COMMUNICATION TOOLS

3.1. MEETINGS

3.1.1. The Program Increment (PI) planning meeting

Following the best practices of agile development process, every three months we are organizing a Program Increment (PI) Planning meeting, which is a cadence-based event that serves as the heartbeat of the Agile Process, aligning all the teams on the main objectives of the project. This should be a face to face meeting but due to pandemic it is organized online using virtual meeting tools like Zoom and Microsoft teams. To design the program increment for each software application, the development team is using the outcomes of the TheFSM project plenary meeting.

Using the key outcomes that we want to achieve within the next increment, the development team is designing all the iterations (sprints) of the increment. Dependencies between the development teams are identified and discussed to make sure that the work will be completed on time. The potential risks are identified and mitigation actions are planned to ensure that high quality developments will be delivered.
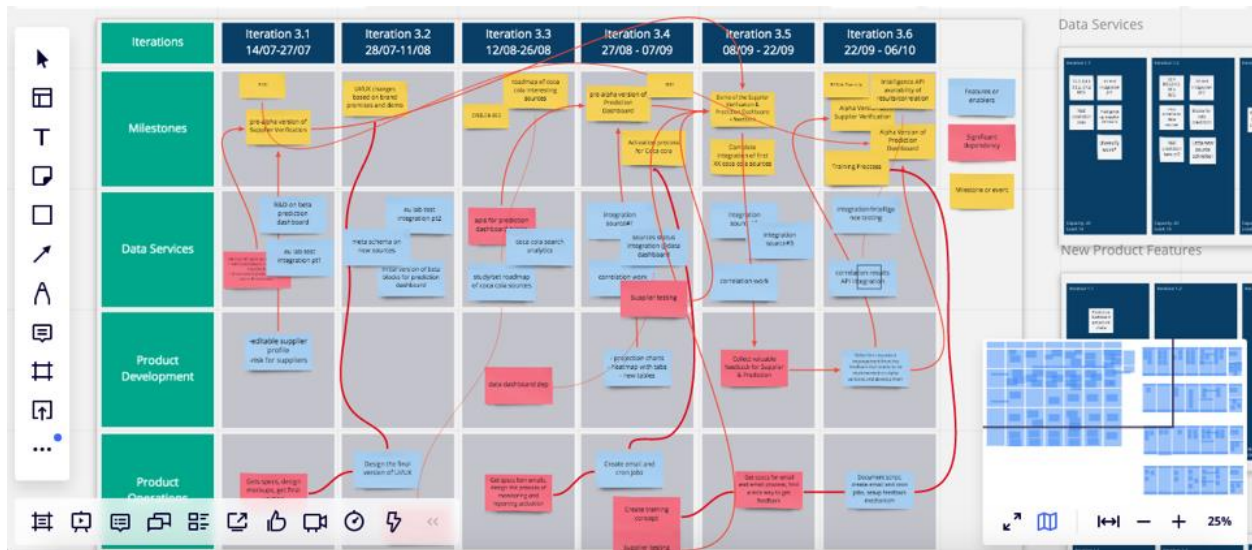
Figure 3: Program Increment planning board

3.1.2. Biweekly sprint planning meetings

Every two weeks, the development teams of the applications together with the partners responsible for the platform development and the data modeling, meet to discuss the progress of the last sprint and to plan the focus of the next sprint. The biweekly meetings include a retrospective session to discuss what the main learnings from the last sprint were. In addition to

that, we are reporting the progress towards the project increment using the key results that are defined after each plenary meeting. The progress of the work in each sprint is monitored using the sprint burndown chart.
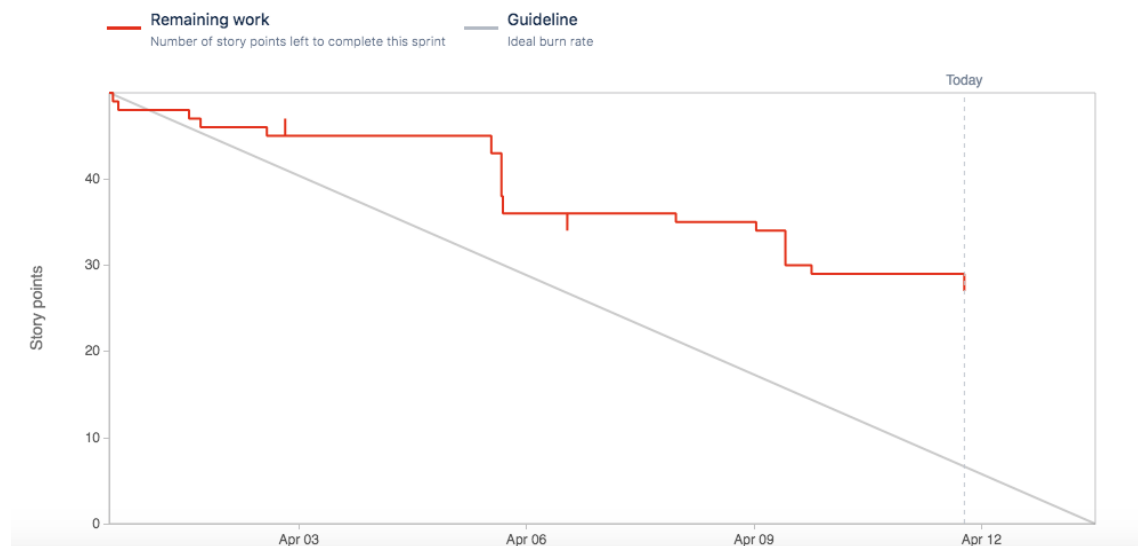
Figure 4: Sprint burndown diagram

3.1.3. Daily Check Ins (Scrums)

The development teams of each TheFSM application are met every working day at the same time to discuss the most important objective of the day and if there are any issues that are blocking the progress of the developments for the sprint.

3.2. Communication and collaboration tools

To organize our work and to share code and documents we use the following tools

- Trello
- Jira
- Gitlab
- Bitbucket
- Google drive

To communicate we use the following tools

- Microstoft teams

- Zoom

4. DEVELOPMENT PRIORITIZATION

In order to select which features are the most important ones to start implementing we use the ICE score prioritization method[1]. The method is based on the following three factors

- **Impact** demonstrates how much your idea will positively affect the key metric you're trying to improve.
- **Confidence** shows how sure you are about Impact. It is also about ease of implementation in some way.
- **Ease** is about the easiness of implementation. It is an estimation of how much effort and resources are required to implement this idea.

The development teams are using the following simple rules to run effective the ICE scoring method

- Keep it simple
- Make sure you have cleared the objectives and the focus for the specific period
- Involve leaders from all the departments and partners to select the priorities for the key results
- Use a Lean Canvas to further analyze a product feature
- The ideas which are selected as the ones with high priority to be implemented have a project manager who is responsible for monitoring the progress and validating the outcomes of development.
- For features which have scored in ICE very similarly, we perform an analysis using a Lean canvas

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[1] Ref: https://www.productplan.com/glossary/ice-scoring-model/

5. TESTING OF NEW FEATURES

The alpha version of the application is being tested both by internal teams of each partner and by end users of the focus groups. The feedback and all the issues identified during the testing are reported using Jira and Hubspot. Any issue received is stored in the internal ticketing system that the application owners have. The feedback from the end users is processed and classified into one of the predefined ticket categories (e.g., system issue, data accuracy issue improvement request, new functionality request).

6. OUTCOMES OF AGILE DEVELOPMENT PROCESS

This section reports the developments for the three applications that will be implemented in the context of TheFSM, namely

- **Food Inspector** which will deploy and validate the software application that inspectors will use in the context of certification scenarios,
- **FOODAKAI 2.0** which further extends and validates the FOODAKAI software application that food companies will use in the context of risk monitoring, traceability and prediction and
- **Agrivi 2.0** which will further extend and validate the AGRIVI software application that food processors and their contracted suppliers will use in the context of supplier data sharing scenarios

6.1. Food Inspector Application

This section focuses on the development plan and the outcomes of the agile development process for the Food Inspector application.

6.1.1. Application development plan

The plan for the development of the Food Inspector application is presented in table 1. Due to the fact that the food inspector application that will enable the digitalization of the inspection process is a brand new application, during the first year of the project the focus was on understanding the requirements and on the design of the application.

Table 1: Development plan for the Food Inspector Application

Task	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Business scenario analysis	▓	▓	▓	▓	▓	▓	▓					
Wireframes of Food Inspection application										▓	▓	
Feedback from focus groups											▓	▓
Create final mockups												▓
Alpha version development												

6.1.2. Developments status

During the first year of the project we focused on the design of the features for the Food Inspector application. Below, we present and analyse the wireframes and mockups that were designed and completed within the first year of the project for the Food Inspector application. The design of the wireframes and the mockups were done based on the usage scenarios identified in WP1.

Identify companies that need certification services

Using the Food Inspector application, the auditor/inspector will be able to perform an analysis of the market in terms of incidents and inspections being reported. This will help inspector to

- find companies and relevant recalls and inspections
- to find companies with specific criteria e.g., find companies from Greece that produce meat products.

In the following figure, the main screen of the module that can be used to perform the market research is shown.
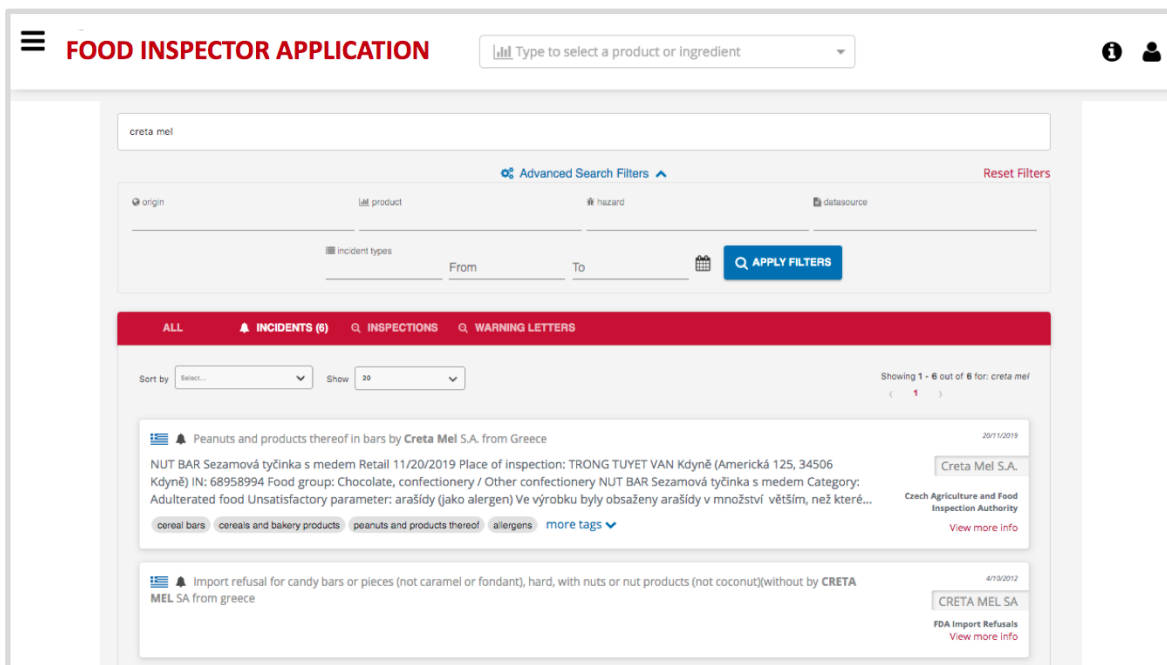

Figure 5: Screen of the find companies functionality

Auditor Dashboard

The Auditor Dashboard highlights the most important information which the auditor needs to know about the companies which he audits and/or certifies. By clicking on the bar of the expired certificates, the auditor is able to see the list of companies with the expired certificate. When the auditor clicks on the name of a company he will be linked to the next screen.
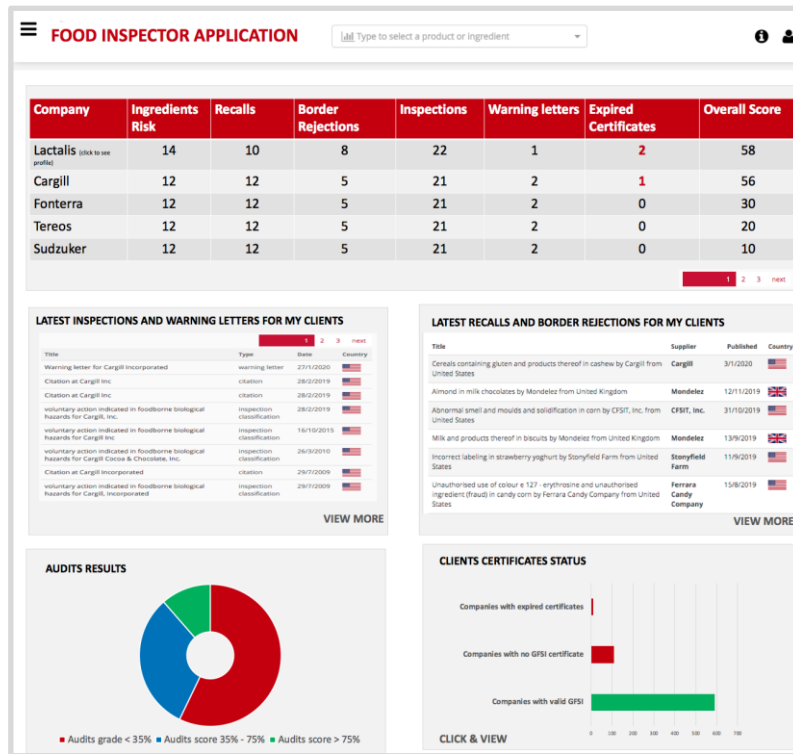
Figure 6: Inspector/Auditor dashboard

Company profile dashboard

When the auditor clicks on a company name he will be linked to this company dashboard. The main goal of this dashboard is to aggregate all the information that the auditor needs to have to get prepared before the audit. He will be able to see information that is already aggregated for the specific company, but he will be also able to invite the company to submit more information that needs to be shared only with the inspector prior to the audit/inspection.

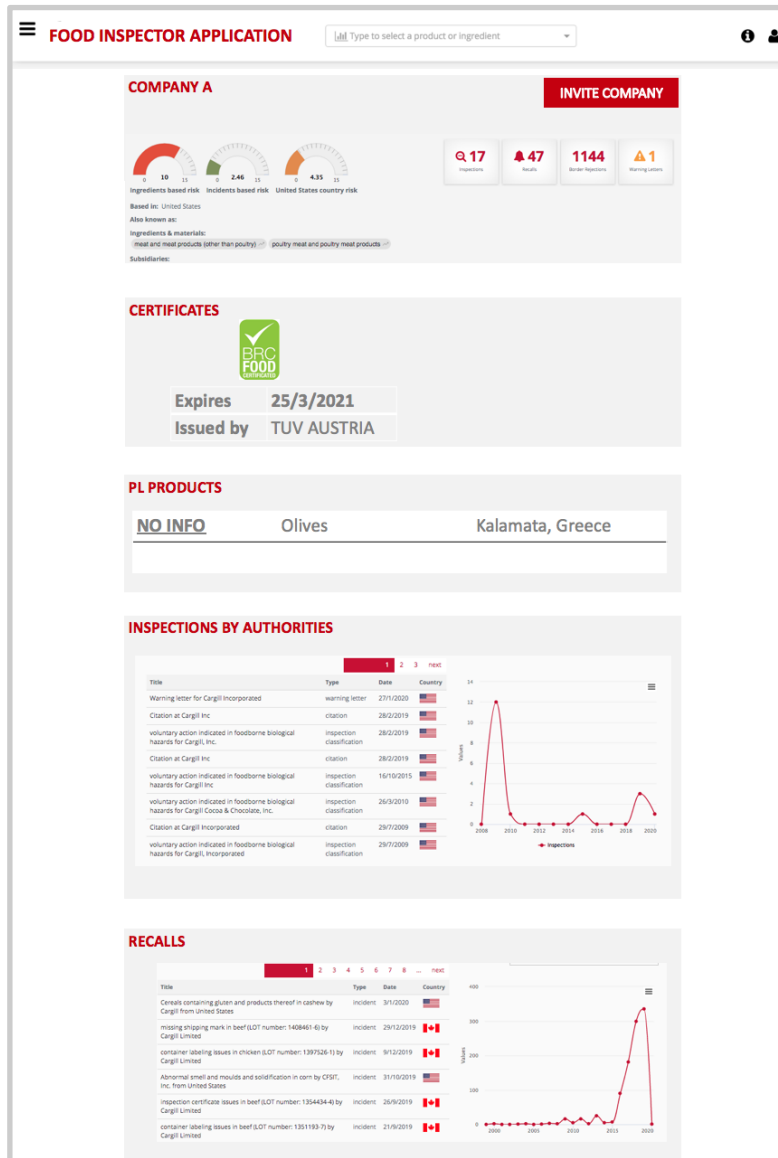**Figure 7: Screen of the company dashboard**

Get prepared for the audit

The food inspector application will provide features that help inspector to perform a risk analysis and prediction for all the raw materials and ingredients that the food company is using and processing. This helps to identify the potential control and critical control points in company's supply chain.
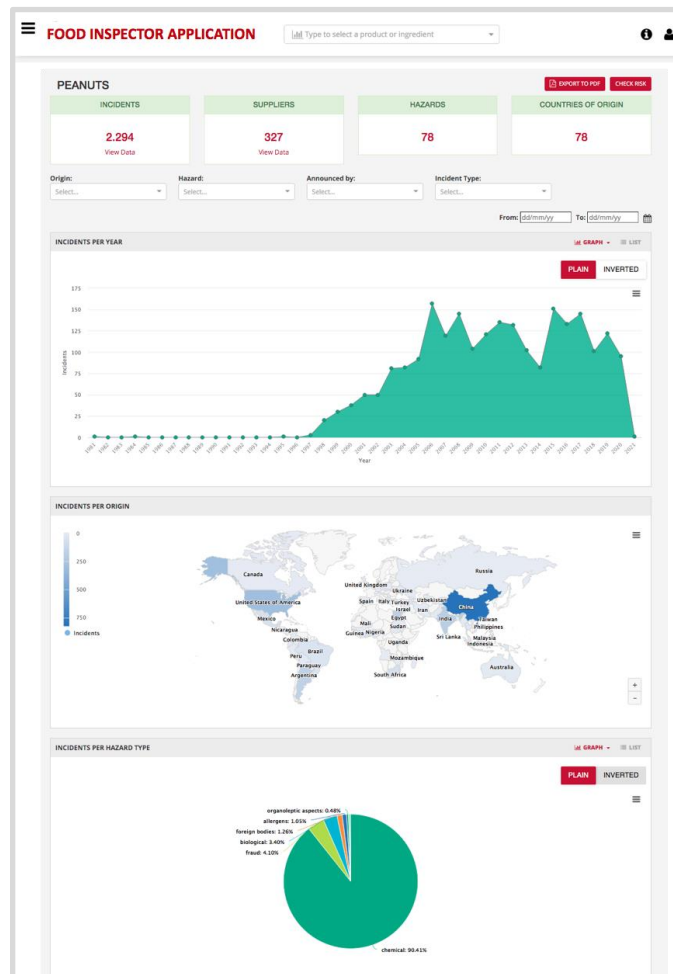
Figure 8: Hazards analysis dashboard

The inspector will be also able to see the predictive analytics for the ingredients of the company and to identify increasing and emerging issues that may affect the safety and quality of company's products.
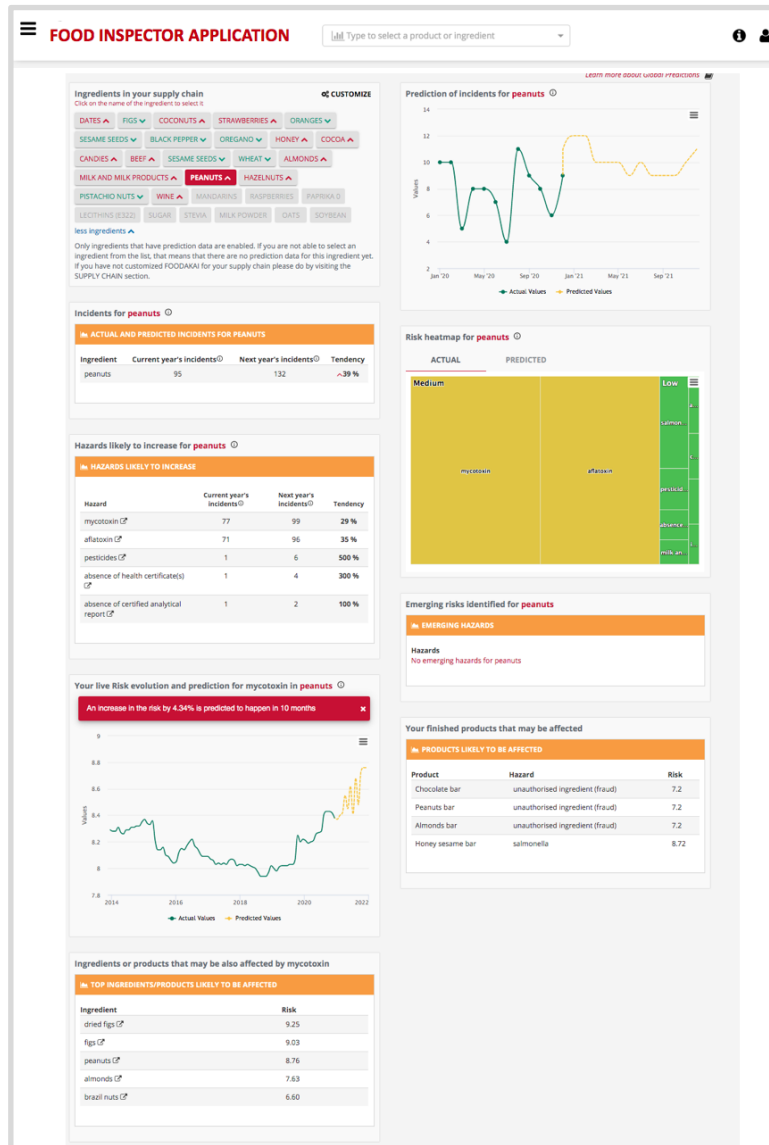
Figure 9: Predictive analytics for the ingredients of the company to be inspected

Invite company to share all the required information for the inspection

When the inspector will click on the invitation button he will see a pop up window like the one shown in the following screen. The pop up will help him select what type of data the company should share prior to the inspection (audit) and he can send the invitation. An email will be sent to the company with the details of the invitation and a link to enter the system.

Figure 10: Invite a company feature

Data Exchange prior audit/inspection

The food safety and quality assurance experts of the company will receive an invitation to create a profile in the Food Inspector Application.

They should provide information about
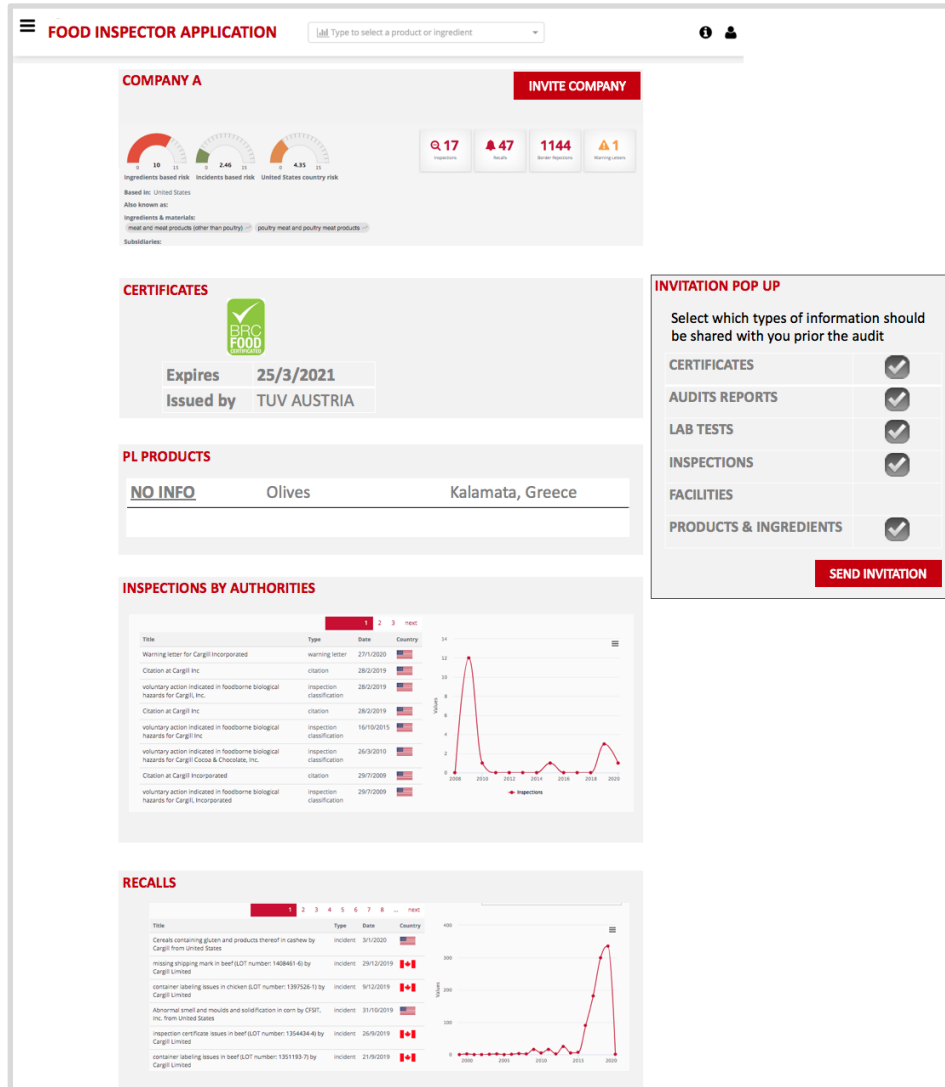
- Facilities that they have
- Certificates that they have

- Information about products and ingredients that they are using in the product
- Lab test results and Certificate of Analysis

When the user will click on the Add button a popup window will appear and he will need to add the required data for each category of information.

The shared information will be only available to the Entities (Retailers, Food manufacturers) which are authorized to access the data. Company's expert will be able to select with whom the information should be shared. The shared information will be securely stored in the TheFSM platform.
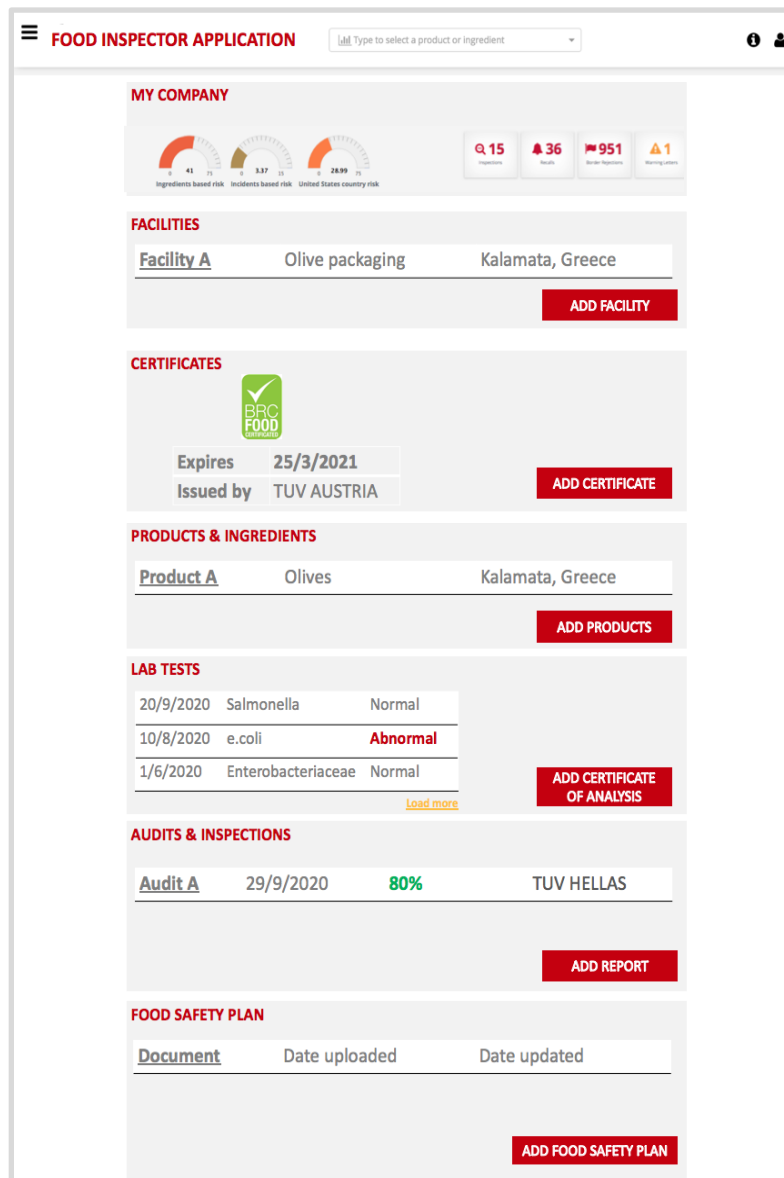

Figure 11: My company profile page

6.2. FOODAKAI 2.0

This section focuses on the development plan and the outcomes of the agile development process for the FOODAKAI 2.0 application, which will implement the Retailer and Manufacturer business use case scenarios that are presented in D1.1.

6.2.1. Application development plan (Gantt Chart)

The plan for the developments of the FOODAKAI 2.0 application is presented in table 1. During the first year of the project, we focused on developing the extensions in FOODAKAI system, that will enable the remote supplier verification and automated assessment.

Table 2: Development plan for the FOODAKAI 2.0 application

Task	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Business scenario analysis	▓	▓										
Wireframes of FOODAKAI 2.0			▓									
Feedback from focus groups				▓								
Create final mockups					▓	▓						
Prototype alpha version development							▓	▓	▓	▓	▓	
Testing of the alpha version												▓

6.2.2. Developments status

In this section we present and analyse the developments that were completed within the first year of the project for the FOODAKAI 2.0 application.

The FOODAKAI is the food safety intelligence platform that provides risk assessment and predictive analytics services. Within the context of TheFSM project the FOODAKAI application will be extended with functionalities that will allow Retailers and Food Manufactures to perform remote supplier verification.
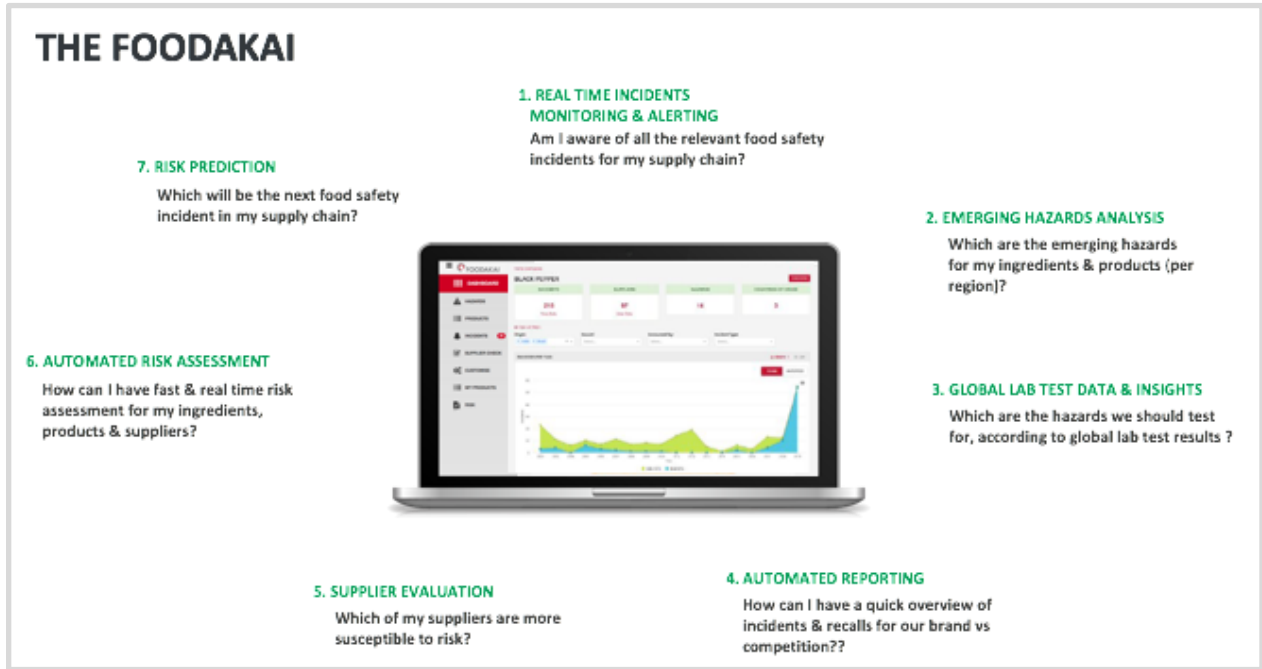
Figure 12: The FOODAKAI platform services

The data that is used for risk assessment and prediction is collected and processed through a big data platform that focuses on data quality and accuracy. Millions of data records published by National Authorities from all around the world are collected and processed following a methodology that includes several steps as presented in the following diagram.
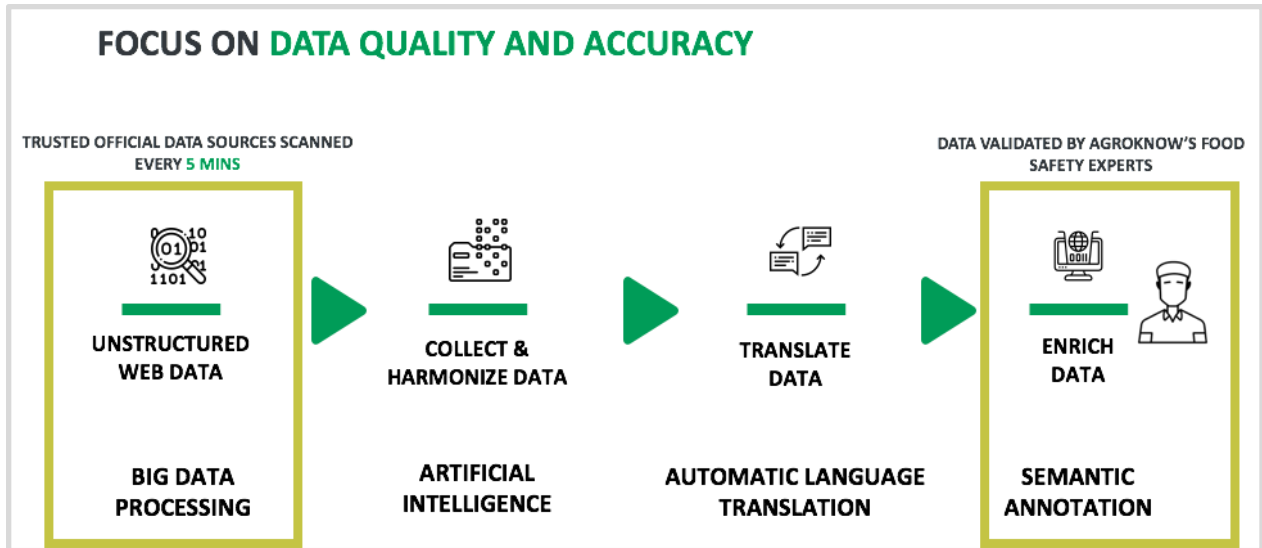

Figure 13: The big data processing workflow

The new features for FOODAKAI 2.0 that were developed during the first year of the project are presented in the following sections.

Import Suppliers

One of the first features that were developed within the context of the project was the possibility to import all the suppliers that a retailer or food manufacturer has.
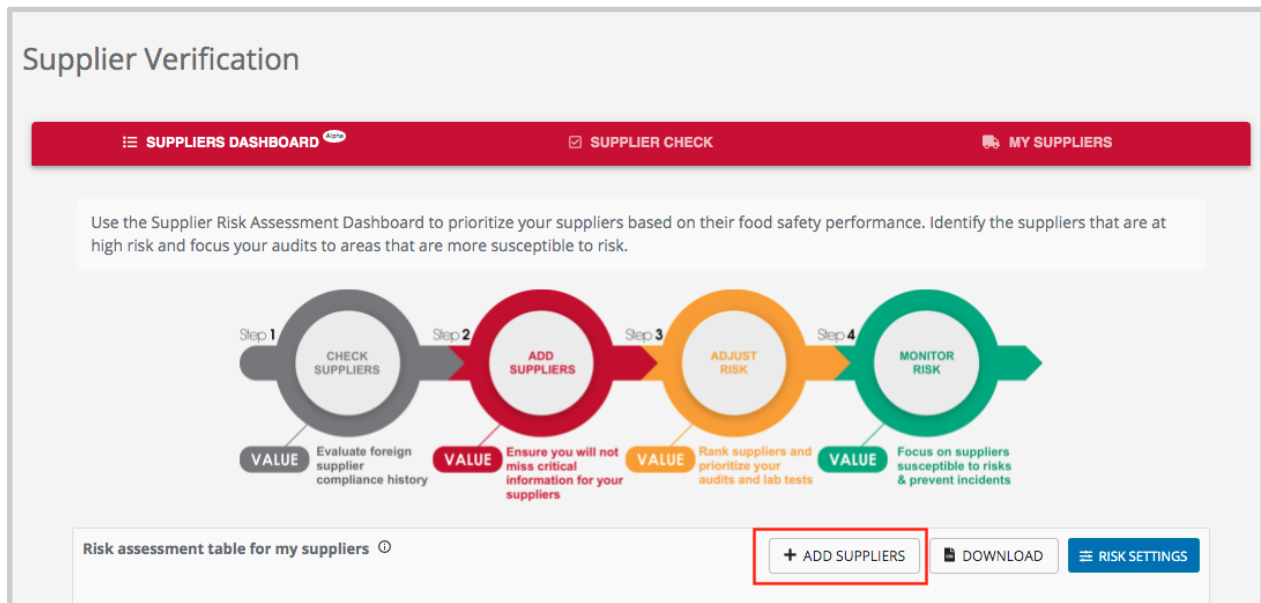
Figure 14: Add suppliers feature that allows the import of hundreds of suppliers

To facilitate the process of importing hundreds of suppliers and their ingredients, the development team of Agroknow has designed and implemented a data importing wizard. The import process includes a step for mapping the properties (columns) of the original file to the GS1 compliant properties of the data model of the TheFSM platform. Values of each property can be also mapped to the ingredient vocabularies used by TheFSM platform.
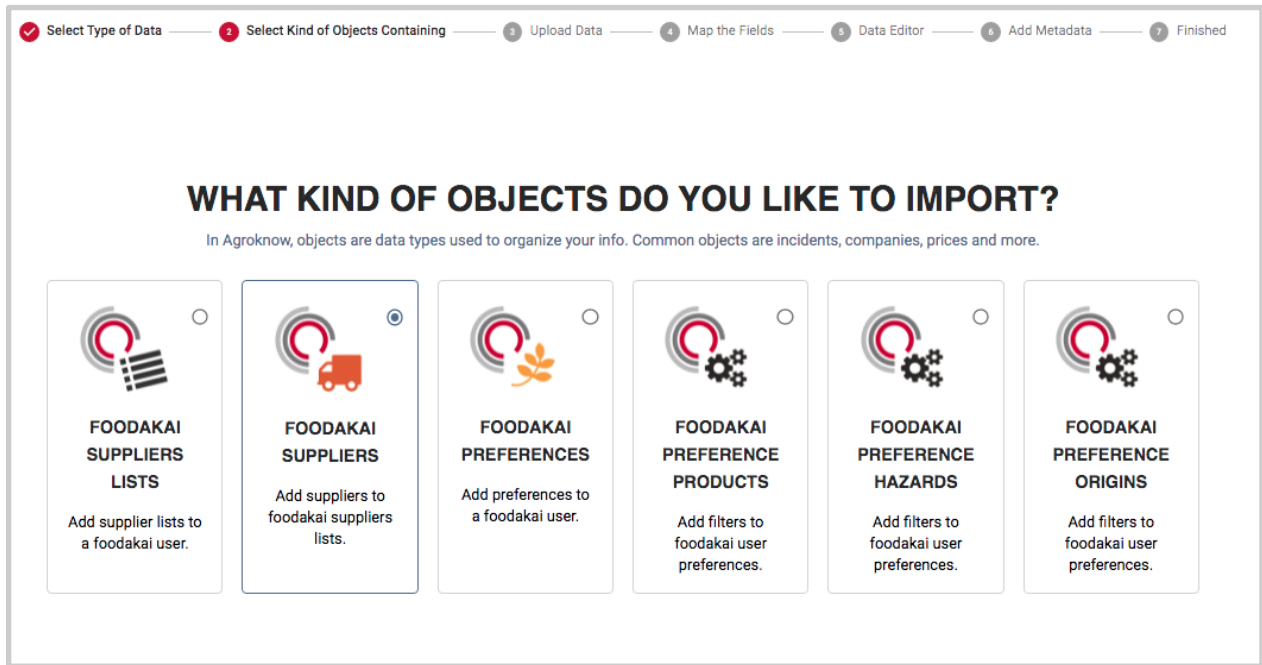
Figure 15: Import mechanism for suppliers and their ingredients

Supplier evaluation profile

Based on the requirements of Retailers and Manufacturers, Agroknow team developed a food safety evaluation page that aggregates all the critical information for the food safety profile of a company. The user has access to all the historical recalls and border rejections in which the company was involved as well as the outcomes of the inspections that were conducted in this company by the Authorities.
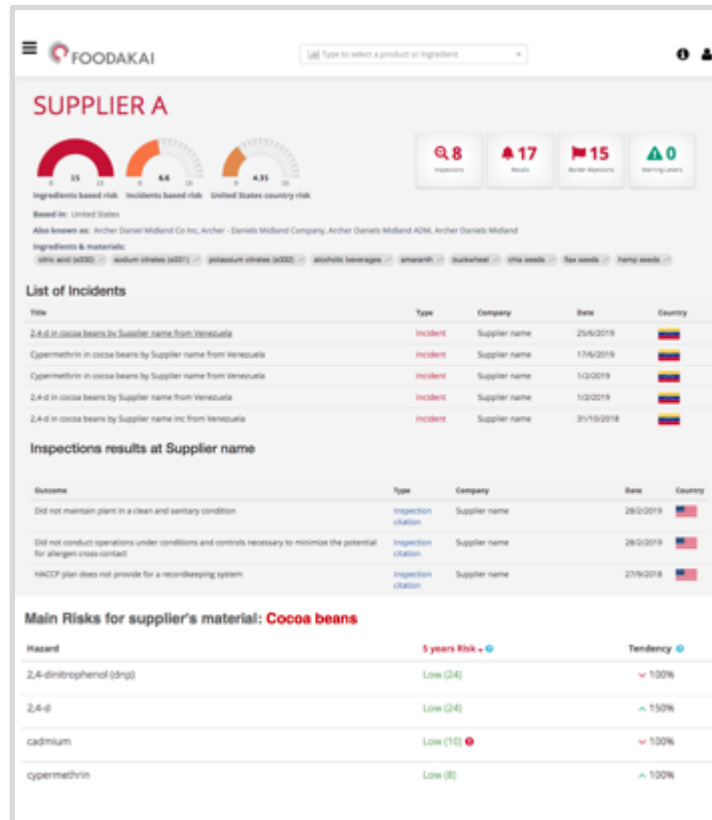
Figure 16: An evaluation profile page for a supplier

Supplier automated risk assessment

Agroknow team developed the alpha version of the supplier automated risk assessment feature. Using this feature, the estimation of the suppliers' risk can be automated, resulting in speed up of the supplier verification process. This helps the user save time from doing all the manual work to combine information from several systems. User can focus his actions on the suppliers susceptible to risk and prevent incidents.

Using the Automated Supplier Risk Assessment module, the user can fully automate the process of analysing the risk for all Retailer's suppliers and performing a risk ranking that will help the user focus on the ones that are susceptible to risks.

The automated supplier risk assessment consists of four (4) steps.

Step 1: User can check the food safety history of your suppliers before starting working with them, using the name of the supplier to find the relevant incidents, inspections, and warning letters.

Step 2: User can add the preferred suppliers to the FOODAKAI and continuously monitors them. Agroknow can help Retailer's users to add hundreds of suppliers to the platform.

Step 3: For all the selected suppliers, FOODAKAI user can create a supplier's risk matrix with a risk score that is estimated using several parameters such as the risk of ingredients that the supplier is using, the risk of his incidents, borer rejections, warning letters, and inspections.

Step 4: The supplier's risk matrix is not fixed. The user can adjust the risk assessment score to **the user's approach** by selecting how each parameter will contribute to the overall score.

FOODAKAI supplier risk estimation includes the following parameters

- **Ingredients risk** that is estimated using the Risk Assessment module. This parameter corresponds to the risk of the ingredients that are used by the specific company. The score is the risk that was estimated for the ingredient with the highest risk. Please check how risk is estimated in FOODAKAI (link to risk documentation).

- **Incidents risk:** this is the risk that is estimated based on the frequency and severity of the incidents (recalls and border rejections) that were reported for this company.

- **Recalls:** The number of food recalls that were reported for the specific company and its subsidiaries by National Authorities from all around the world.

- **Border rejections:** The number of border rejections (import refusals) that were reported for this company and its subsidiaries by National Authorities from all around the world.

- **Inspections:** the number of inspections that the supplier had in which an action was indicated.

- **Warning letters:** the warning letters that were announced by the National Authorities for this company.

Risk table for my suppliers ⓘ   CHANGE SETTINGS

Search...

Supplier	Incidents Risk	Ingredients Risk	Recalls	Border Rejections	Inspections	Warning Letters	Expired Certificates	Overall Risk Score
Supplier A	2.59	10.01	47	1186	17	3	1	1263.6
Supplier B	2.76	2.64	51	106	19	1	-	181.4
Supplier C	2.14	5.48	26	53	15	2	1	101.63
Supplier D	10.71	3	15	41	18	1	-	84.71
Supplier E	5	2.3	2	23	30	3	-	60
Supplier F	6.6	2.2	17	15	8	1	-	46.6
Supplier G	2	5.48	4	16	18	1	1	45.48
Supplier H	2	2.5	3	5	2	-	-	44
Supplier K	2	3	1	1	1	-	-	15

Figure 17: Supplier risk assessment matrix

The automated risk assessment module includes a feature which allows users to adjust the contribution of each factor to the overall risk score for a supplier.
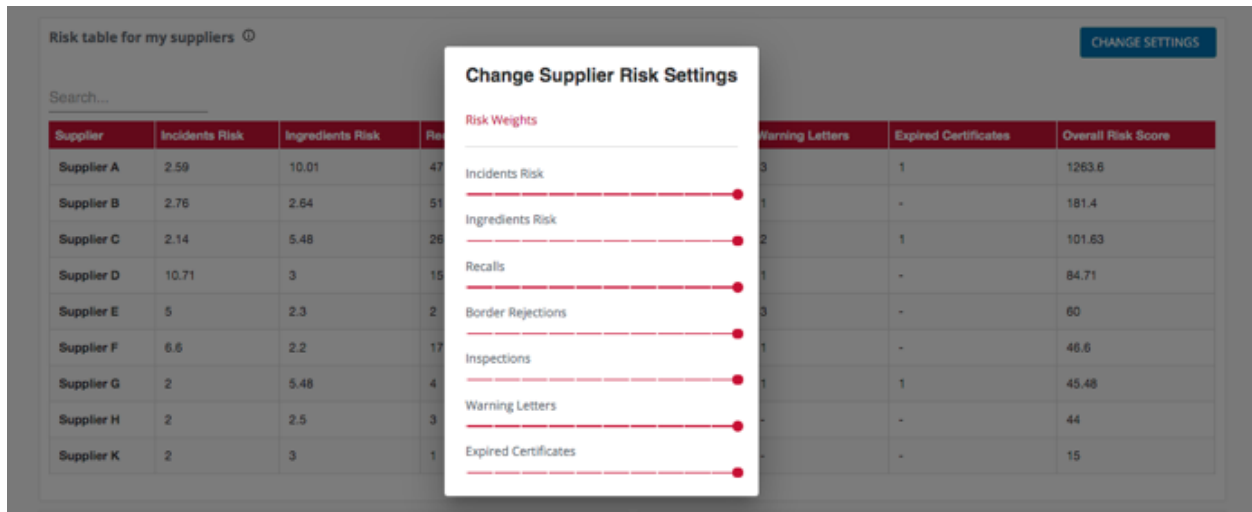
Figure 18: Suppliers' risk weighting feature

Add data a Supplier risk factor

Within the context of TheFSM, we developed a feature that allows the integration of a new parameter for the suppliers risk assessment. This can be done by adding a new column and uploading the data for the suppliers e.g. upload the number of expired certificates.
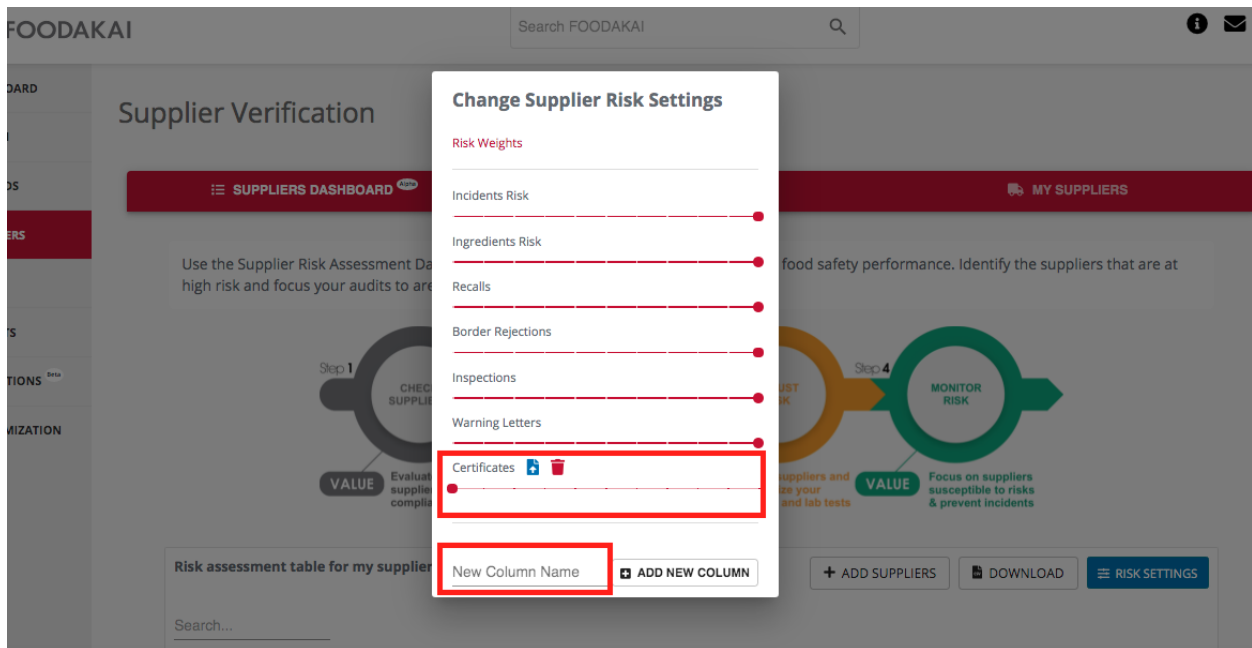

Figure 19: Add a new factor for the supplier risk estimation risk weighting feature

In addition, the user can download the risk assessment matrix for your suppliers and use it in his internal food safety systems.

6.3. AGRIVI 2.0

The main goal is to further extend and validate the AGRIVI software application that food processors and their contracted suppliers will use in the context of supplier data sharing scenarios.

6.3.1. Application development plan (Gantt Chart)

The development plan for the Agrivi 2.0 that we followed within the context of the TheFSM project is presented in the following table.

Table 3: Development plan for the Agrivi 2.0 application

Task	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Business requirements analysis	░	░	░	░	░	░	░	░				
Wireframes of Agrivi 2.0									░			
Create final mockups										░		
Prototype development										░	░	░

6.3.2. Developments status

During the first year, we focused on analyzing and designing the required initial extension of the AGRIVI software that will further extend the flexibility of the software to support the desired data sharing scenarios for different stakeholders in the value chain. The process was followed by the development activities which enabled the software to support the additional actors, other than food processing companies with their contracted farmers, such as consultants and auditors to collaborate with farmers through a farm management software AGRIVI in a digital way.

Development included extending the AGRIVI software with the options to:

- Create new role
- Manage new role permission setup

- Activate or deactivate the newly created role for the adequate food processing and/or farmer AGRIVI account option
- Create newly created user role for the food processing company and/or farmer using AGRIVI with only the desired permission setup and the view option for the desired permission setup

Roles and Permissions Administrative Panel

Roles and permissions administrative panel serves the AGRIVI support staff to create a new role for the software. Through the administrative panel, administrator is enabled to:

- Create a new role
- Name the new role
- Select to which AGRIVI accounts this role should be activated (i.e. specific food processing company and farms)
- Define which user permissions should the new role contain
- Enable/disable the new user role
- Edit/delete the new user role

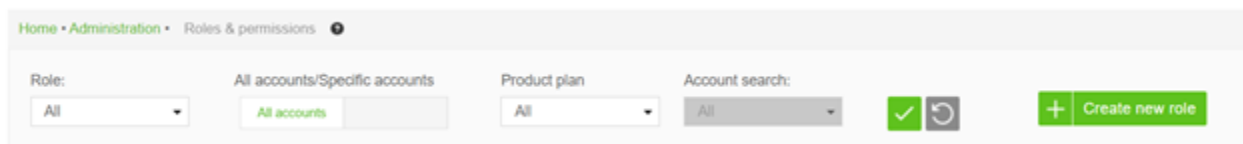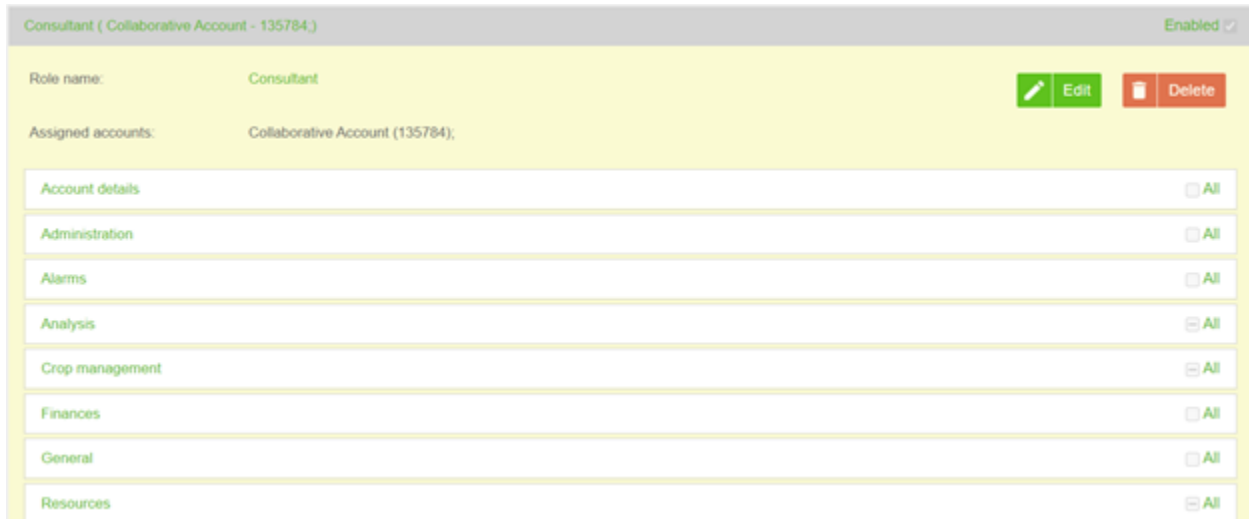This administrative panel can only be accessed and managed by AGRIVI staff supporting the project.

Figure 20: Administrative panel

Add User with New Role

This feature enables the end users to create a new user to which the newly created role through the administrative panel will be assigned.

This user will contain only the permissions which were enabled to the new user role to ensure that the new user with access can only see the parts of the software they need to.

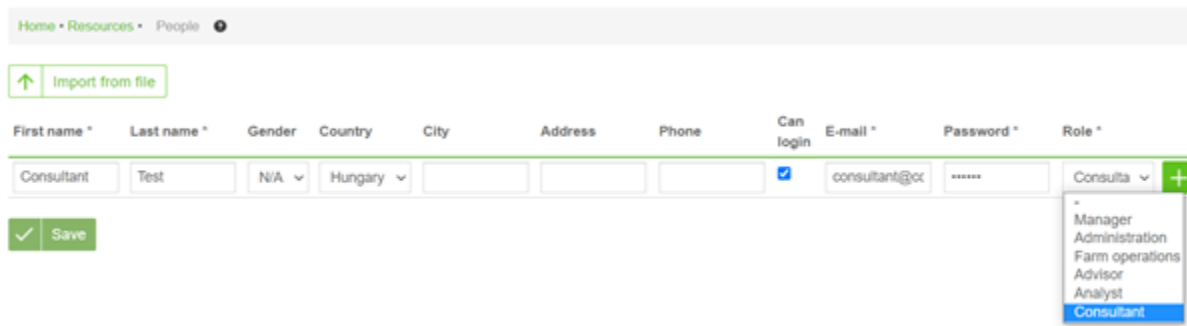This feature is managed by the end user.

Figure 21: Add user feature

Figure 22: Manage user feature

7. CONCLUSIONS

This deliverable presented an agile iterative development process that was developed in the context of TheFSM project and it was adopted to develop the three applications, namely Food Inspector, FOODAKAI 2.0 and Agrivi 2.0. The agile process helped the development teams to be focused on developments that address the user and business requirements defined in WP1. The main goal was to prioritize the developments that are the most impactful for achieving the goal of the project.

In addition to that, this document reported the status and the outcomes of the agile development process for each application. In the case of Food Inspector application we focused more on the design of the functionalities and not on the development of a working prototype. In the case of FOODAKAI 2.0, we developed an alpha version for supplier verification and assessment that is available for testing by end users. For Agrivi 2.0, we focused on analyzing and designing the required initial extension of the AGRIVI software that will further extend the flexibility of the software to support the desired data sharing scenarios for different stakeholders in the value chain.