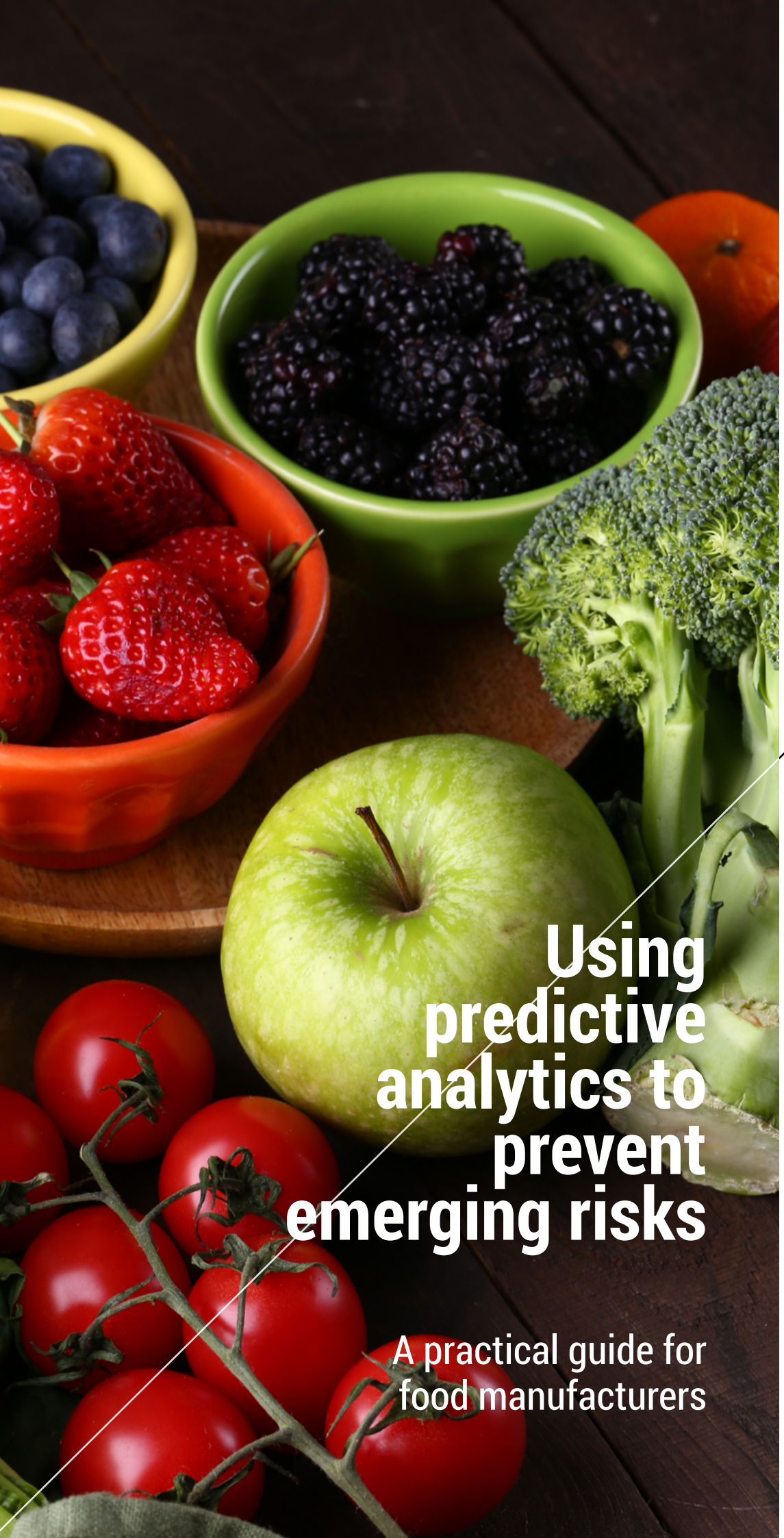

Using predictive analytics to prevent emerging risks

A practical guide for food manufacturers

Using predictive analytics to prevent emerg

Agroknow

Status & Need Recognition

What if you could use an intelligent software tool that could notify you early on about emerging risks that need your attention and action?

In fact, what if there was a software tool that could predict the probability of risks just like weather prediction apps forecast the likelihood of sunshine or rain.

With foresight: not receiving an incident alert after a recall has taken place, nor when a product has been stopped at the borders, nor once a consumer has complained. Definitely not after having spent hours investigating whether an alert that you have received is relevant and valid.

We are talking about a software system that can serve as your team's digital crystal ball: one to ask every morning about what is going to happen, before it actually does. A predictive solution that every member of a safety, quality or supplier performance team will be able to rely upon, on a daily basis.

This is the promise of Artificial Intelligence (AI) in food risk prevention. It covers a range of technologies with trending names such as "machine learning", "deep learning", and "predictive analytics". At its core, it refers to technologies that already exist and we see them out there in action in many other aspects of our lives.

Pioneers like Amazon trust their AI algorithms enough to automatically remove products from their shelves, as soon as they are flagged as unsafe for consumers. Still, such software does not work like magic for everyone; the predictive features of these tools usually inform decisions that a food safety expert is going to make.

The challenge is that deploying an AI-powered software with predictive capabilities in your company requires a significant investment. Which brings up an important question:

How can a food manufacturer assess whether the investment in predictive analytics is worth it?

In this guide, we are addressing exactly this question. We are taking an in-depth look at the various options at your disposal to improve your risk prevention practices. We will see how these options differ, depending on the type of decision that you aim to support. We will introduce the pros & cons of each path. As well as the steps towards selecting an appropriate solution.

More specifically, by reading this guide you will learn:

- How predictions can improve and enhance horizon scanning and risk monitoring
- How risk assessment of ingredients and suppliers may be automated and digitized
- How testing and auditing priorities can be dynamically informed and updated by estimating the probability of an upcoming risk
- Which practical steps can be followed to evaluate and select the right predictive analytics solution for your company

How do food companies perform risk monitoring, assessment, and prevention currently?

FOOD RISK MONITORING PRACTICES & TOOLS:

39% search various **online sources** about emerging issues and hazards.

FOOD RISK ASSESSMENT PRACTICES & TOOLS:

52% use a **periodically updated spreadsheet** which **calculates risk scores** of ingredients/suppliers using various data inputs.

FOOD RISK PREVENTION PRACTICES & TOOLS:

50% **revisit & revise their risk prevention measures** to ensure that these are up-to-date.

Agroknow

Really early warnings: being informed about incidents that will probably affect your supply chain

There are different ways to stay informed on what is happening out there that could be critical to your supply chain. You may be regularly checking official, trusted websites like the European RASFF portal and the US FDA recalls and safety alerts. Or you may be subscribed to one of the services that send an e-mail alert when a food recall of interest is announced.

Welcome to the world of food risk monitoring tools – also widely known as horizon scanning and foresight

For many years these terms were used to describe online services that scanned a large number of information sources in order to alert professionals as soon as an announcement of interest was published.

In an era of AI and Big Data technologies for food risk prevention, available options for performing risk monitoring across the food supply chain have become even more extensive and powerful.

Option 1: *Relying upon your suppliers to be informed about a critical incident*

The most traditional way to be informed about an incident that concerns your suppliers: expecting that someone will pick up the phone (or drop a line), as soon as something important happens. No need to be proactively on the lookout for what is happening that could be critical for your supply chain.

This option assumes that you fully trust your suppliers and that, if something happens, you will be notified on time.

Option 2: *Regularly monitor 2 or 3 official sources of information in the markets of interest*

This means devoting less than a couple of hours every week to visit important, official websites (such as EU's RASFF and US FDA) to check if something new has been announced. A routine that will keep you up to date with credible, verified information. Particularly useful if your geographical and jurisdictional scope of interest is covered by these specific official authorities.

This method assumes that official authorities have everything that matters to your company on their web sites.

Option 3: *Systematically devote time to search numerous online sources for emerging issues and hazards*

This is where you get a bit more proactive and extensive in your information search. Apart from 2 or 3 major global authorities, you have also bookmarked a number of other information sources that you systematically research. Very often, these include:

- Inspection reports announced by local authorities nearby your critical suppliers
- Web sites of official authorities at each and every country in which your products are being distributed
- Results of border inspections or residue monitoring programs in these countries
- Trusted food safety news sites

Systematic research can keep you really up to speed with what is happening. Though it assumes that you have time and people to allocate to such a systematic desktop research.

Option 4: *Use a third-party service that provides notifications about announced incidents as well as predictions about expected ones*

Whether you prefer one of the traditional horizon scanning tools or go for a modern AI-powered dashboard, the food safety tech ecosystem has plenty of third party services available - and for every budget.

This lets others do the strenuous work of scanning, processing, combining, and extracting meaning out of hundreds of information sources. An external service saves lots of time and resources, especially if the selected tool also predicts emerging risks and upcoming incident trends so that it gives you a glimpse of the future.

Using a third-party service assumes that you have explored several available options and have chosen a solution that fully covers your needs.

Option 5: *Develop an internal software that monitors a variety of online sources, provides with alerts & notifications, and implements AI algorithms that predict upcoming issues*

This is the preferred solution for large food manufacturers that have the appropriate resources, senior management buy-in, and a digital transformation agenda.

Software development focuses only on the modules and features that are important for your company (although learning from what others do in the industry usually helps). It reduces the risk of relying upon third party suppliers for an operation that is critical.

Assumes that, apart from the required resources, the company demonstrates patience and persistence; organizational data engineering capabilities and solutions, grow and mature with time.

Examples of ways in which AI & predictive analytics improve risk monitoring

1. Horizon scanning & alert investigation

- Web site crawling software can automate data gathering and processing, monitoring about updates in near-real time
- Text mining algorithms can understand which products, ingredients and suppliers are involved in a reported incident
- Deduplication algorithms can ensure that each report is unique, aggregating multiple alerts into one, more complete data record

2. Identifying rapidly emerging issues

- Time-series forecasting can estimate how many incidents per product or ingredient category should be expected in the weeks or months to come
- Prediction models can estimate whether specific risks have a high or low probability to occur

Taking into consideration emerging issues when performing supplier and ingredient risk assessment

The inherent complexity of risk assessment and ranking is that it needs to take into consideration multiple dimensions that contribute to the overall risk score – and therefore, combine numerous data inputs. As a matter of fact, people working in ingredient and supplier assessment roles, very often need to combine heterogeneous information that comes from several sources and people, both internally and externally. These data inputs could include:

- number of incidents reported globally for a key ingredient or supplier
- what internal lab testing results show about key ingredient categories
- risks emerging in the market
- supplier performance in recent audits
- supplier compliance to required certification schemes
- internal and external expert opinions

Often, the assessment is logged into an Excel spreadsheet that collects and combines tons of different data inputs. Many companies opt for a software tool that may automate parts of this calculation.

Still, the challenge remains: the calculation of a risk score for each and every ingredient and supplier can become an extremely time-consuming and difficult task.

So how do AI and Big Data technologies change the traditional ways in which systematic risk assessment and ranking is taking place?

> ***Option 1:*** *Rely upon your team's experience and ability to assess and prioritize risks related to your ingredients and suppliers*

No spreadsheet. No risk models. Trust the experience and intuition of your team that knows best about the risks that should be expected and prevented.

Assumes that you fully trust your team and that they have a solid understanding and knowledge of both known and unknown risks that might emerge in your supply chain.

> ***Option 2:*** *Bring external experts on board to contribute to the conversation about risks the company should be focusing on*

This routine is followed by many companies out there. For instance, food brands organize a risk assessment and prioritization meeting every six or twelve months, in which external experts and their team members discuss which risks the company should be prepared for.

This option assumes that you feel confident that nothing urgent will occur between these meetings. Also, that the experts that you bring to the table can offer reliable advice and insights.

Option 3: *Use a periodically updated spreadsheet to combine data inputs and calculate a risk score*

One step closer to digital automation, this can be used complementary to one of the previous options. A spreadsheet puts together various data inputs in order to calculate a risk score. Then, it uses this risk scoring system to rank and prioritize ingredients and suppliers that are more susceptible to risk.

This automation represents a risk assessment model that is reliable but also practical: data entry should be easy for all people contributing; and risk score calculation should be automated and straightforward.

Option 4: *Use a third-party service that automatically combines various data inputs to calculate and predict the risk score of ingredients and suppliers*

Enlisting a third-party service simplifies the process and makes it more dynamic. There are not so many risk assessment solutions out there, but the ones available are quite robust. Most of these tools take into consideration the number of incidents reported by major official sources. Then, they apply an internal risk scoring formula to assess and rank ingredients or suppliers. In some cases, a predictive algorithm is also used to incorporate expected risks in the calculation.

The assumption here is that you feel comfortable with the risk assessment model that the third-party solution uses, as customization is difficult. You'll be relying heavily upon the number of data sources that each solution covers, therefore you may not find the granularity or specificity needed. You may come across incongruence when integrating data from other internal systems into your subscription service.

Option 5: *Develop an internal software that automatically combines various data inputs to calculate and predict the risk score of ingredients and suppliers*

Though, this sounds like the ideal solution, it does require significant resources, senior management buy-in, and an overarching digital agenda.

An internal system makes integration with other relevant software (such as supplier performance) much easier. It also allows hard-wiring your preferred risk assessment models in the calculation process. Expanding it with AI capabilities can add cool features like processing internal audit reports to early detect emerging issues.

An internal software is incumbent on having the necessary IT resources to develop, maintain and evolve it.

Examples of ways in which AI & predictive analytics improve risk assessment

1. Supplier risk calculation

- Web site crawling software can identify, gather, and incorporate incidents reported globally about your suppliers into the risk model, in near real time
- Deduplication algorithms can ensure that risk calculations do not unfairly penalize a supplier if the same incident is reported multiple times in different sources
- Natural language processing algorithms may process supplier audit reports to detect and highlight potential risks that have been documented in an automatic way

2. Ingredient risk scoring

- Web site crawling software can identify, gather and incorporate accurately in the risk model the number of incidents that are being reported globally about key ingredients and ingredient categories
- Prediction models can estimate how many incidents per product or ingredient category are also expected in the upcoming weeks or months, incorporating this number into the risk model
- AI models may also calculate the estimated probability of hazards typically associated with key ingredients, enhancing the risk assessment model with an additional weighting factor

Identifying emerging, unexpected, mid- or long-term risks that should be foreseen in risk mitigation and prevention plans

Risk prevention is a complex task with a very important goal. It is where you need to combine the best practices that food safety standards put in place, with the requirements of applicable regulations, and the requests of your key clients.

Your team has to develop a plan that properly documents all your risk mitigation priorities and actions. This plan needs to be updated on a periodic basis, depending on parameters like your company's strategy, effective regulation, and incidents in the market.

It is also a plan that subsequently informs (and utilizes) a number of preventive measures, such as:

- Designing a variety of specific HACCP plans
- Sending ingredients and products for lab testing
- Requesting third party audits of suppliers
- Prioritizing inspection of internal facilities and plants

At the end of the day, it aims to eliminate the probability of an incident happening before products leave your facilities.

Ideally, risk prevention should ensure that a potentially harmful ingredient or product does not even enter your manufacturing.

This is exactly where AI and predictive technologies can demonstrate their true merit, as the promise to help a company move from a reactive mode to a proactive mode of risk prevention.

> ***Option 1:*** *Put in place a risk prevention plan that is updated every time that a major incident occurs or there are news in the market about a serious emerging risk*

A risk prevention plan is likely the preferred option when resources are thin. A good HACCP plan to control critical parts of your internal processes. Some standardized check points for risky suppliers and ingredients, such as sending suspicious samples for lab testing.

And when news about a new threat is announced, sit down with the team to update and enhance the prevention plan. For instance, when a major recall is announced and it seems to be affecting your supply chain. Or when an important client calls and requests an extra measure of precaution.

This method assumes that you can quickly react to something new. And that you can find and allocate the extra resources that will be needed, really fast.

> ***Option 2:*** *Regularly revisit & revise your risk prevention measures to ensure they are up-to-date*

A periodic procedure that is pencilled down in your calendar foresees how often your team meets to review and update the prevention plan and its priorities. These revisions take into consideration any major news or feedback from the market.

Iterations are much more efficient and helpful in preventing emerging issues. Here we assume that you are well connected to the market and can identify emerging issues that may emerge at any part of the world.

Option 3: *Systematically devote time to interact with external experts & industry peers*

This is a routine that deliberately involves external experts from academia or the market. It may be a distinguished food safety scholar that you hire to share insights and recommendations. Or an industry focus group in which you regularly participate to hear from your peers about emerging issues and risks.

These opportunities are extremely important and highly recommended, as they tap into the expertise of people outside your system. Networking assumes that you have the resources to allocate to this interaction: it requires financial investment but, most importantly, a significant amount of time.

Option 4: *Use a third-party risk prediction service that helps identify emerging risks & re-prioritize your prevention plan*

You can take advantage of services that try to predict the probability of incidents or risks in the supply chain. Here we are referring to vendor-provided software tools that may use a variety of data signals and a proven prediction model to calculate the likelihood of an emerging threat.

You can choose the solution that better fits your needs, similar to the way that you choose a weather prediction app that is relevant to the decisions that you want to support - e.g. deciding about whether you should take an umbrella tomorrow is very different from selecting the right sail route for your boat to avoid bad weather conditions.

An external service has the benefit of being able to experiment with a variety of vendors and services. You can also combine different solutions for different purposes. It assumes that you have a clear understanding of the internal decisions in which such a service can be of value, to avoid unrealistic expectations or choosing a service that is not fit for your particular job.

Option 5: *Develop an internal risk prediction software that will employ a variety of AI models to help you identify emerging risks & re-prioritize your prevention plan*

Practically means setting up an internal data science team that will design and develop your in-house predictive models. Very large food manufacturers seem to go for this option, as they are embarking on an organization-wide digital transformation agenda.

In the long term, it seems to be the ideal solution for a large organization, as it develops internally a digital powerhouse with predictive capabilities. Still, it will require a significant investment in the infrastructure for data gathering and processing. It will also take a great deal of experimentation with a variety of predictive models, until the better performing and most efficient ones are found.

Examples of ways in which AI & predictive analytics improve risk prevention

- In short term prevention, risk forecasting models may help revisit ongoing risk mitigation priorities and re-allocate risk prevention measures on the fly.
- In the longer run, holistic and systemic risk prediction models may help identify and forecast trends about external hazards that are expected to appear or increase in 3 to 5 years.

How to Incorporate Predictive Analytics in a Food Manufacturing Company

THE AGROKNOW PROCESS

STEP 1

Understand where you stand

Perform a self-assessment of where you stand in terms of digital risk intelligence maturity by answering 3 simple questions: https://agroknow.typeform.com/maturity

STEP 2

Discover what this technology may offer

Reach out to request a demo of predictive analytics in action: see how FOODAKAI uses advanced prediction models in order to support critical decisions.

STEP 3

Run a pilot and measure ROI potential

Run a feasibility pilot of 1-3 months with a select number of food safety, quality and supplier compliance people from your team. Test the full-scale capabilities of our platform and measure the value that such an investment can have for your company.

STEP 4

Present a convincing plan to senior management

Use the ROI report and its insights to find the right arguments to convince senior management to allocate the budget you need. Co-design with our team a 12-month deployment plan noting specific timelines, critical milestones and progress KPIs.

STEP 5

Follow a proven onboarding process

Kick off a collaboration with well-defined specified steps and a proven onboarding and training methodology that will ensure that all key team members take maximum value from the new system.

STEP 6

Assess engagement and take corrective action

Regularly review agreed-upon milestones and KPIs, as well as the usage of the new system. Measure how frequently and efficiently decisions are supported, how much time people have saved, and how much brand damage has been prevented. Feed this back to the process and improve the way the team works.

Agroknow

www.agroknow.com

Agroknow

@Agroknow

The Food Safety Intelligence Blog