The FERA Early Warning System:
Using Data analytics to improve Food Fraud Detection

fera

Original thinking... applied

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Our Vision

To support our partners to respond to the challenges ahead through original thinking and world-class science.

FOOD AUTHENTICITY
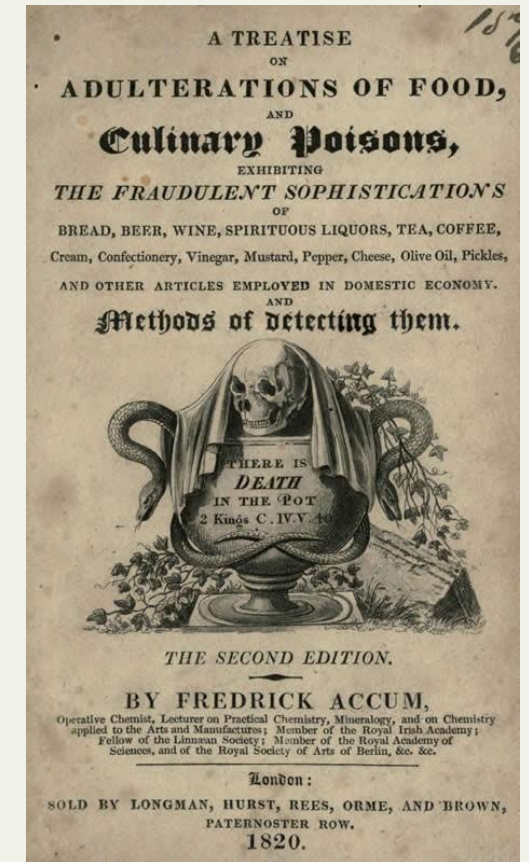
"FOOD AUTHENTICITY IS ABOUT ENSURING THAT FOOD OFFERED FOR SALE OR SOLD IS OF THE **NATURE**, **SUBSTANCE** AND **QUALITY** EXPECTED BY THE PURCHASER (SECTION 14 FOOD SAFETY ACT 1990)." *
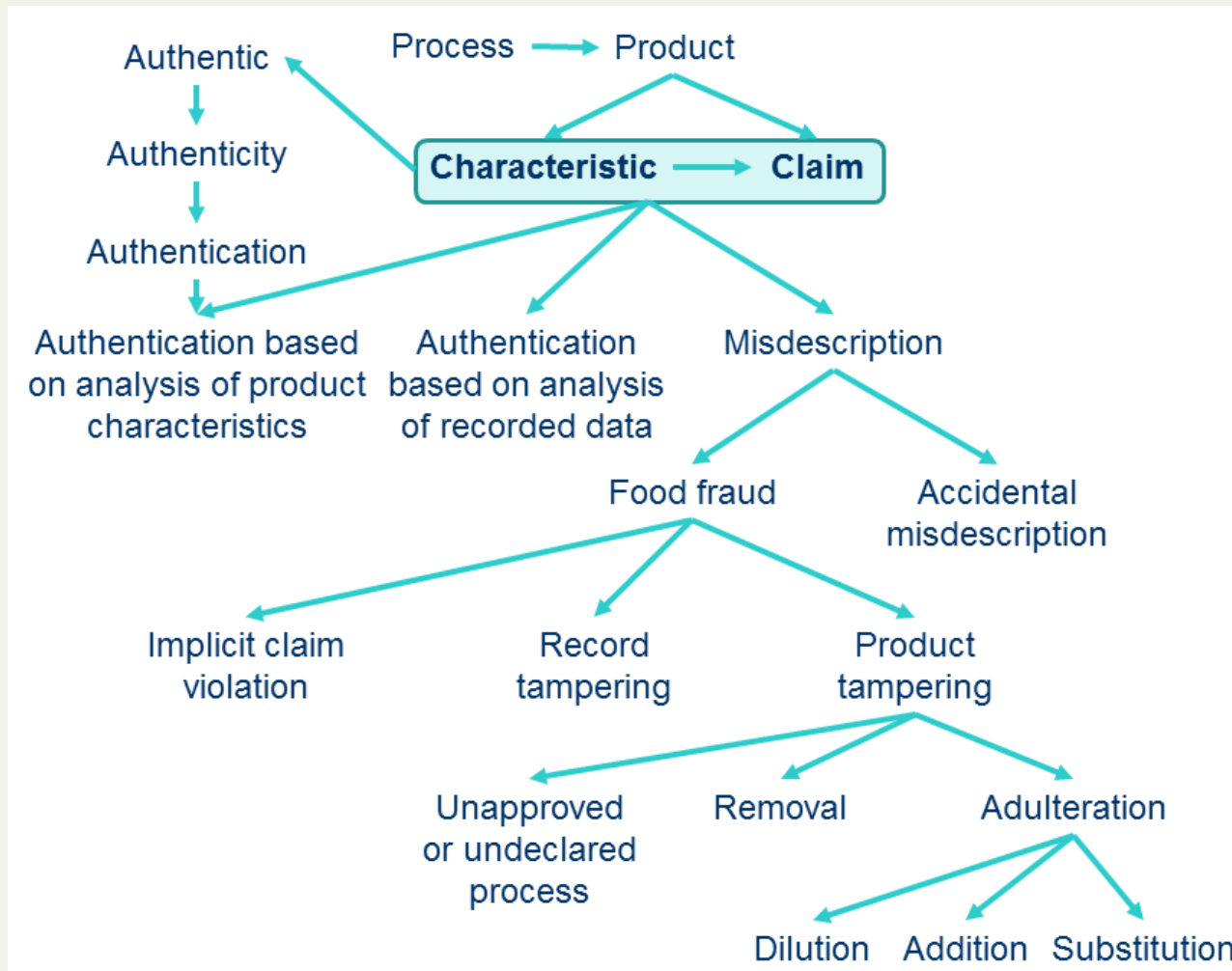
FOOD FRAUD

"DISHONEST ACT OR OMISSION, RELATING TO THE PRODUCTION OR SUPPLY OF FOOD, WHICH IS INTENDED FOR PERSONAL GAIN OR TO CAUSE LOSS TO ANOTHER PARTY" **

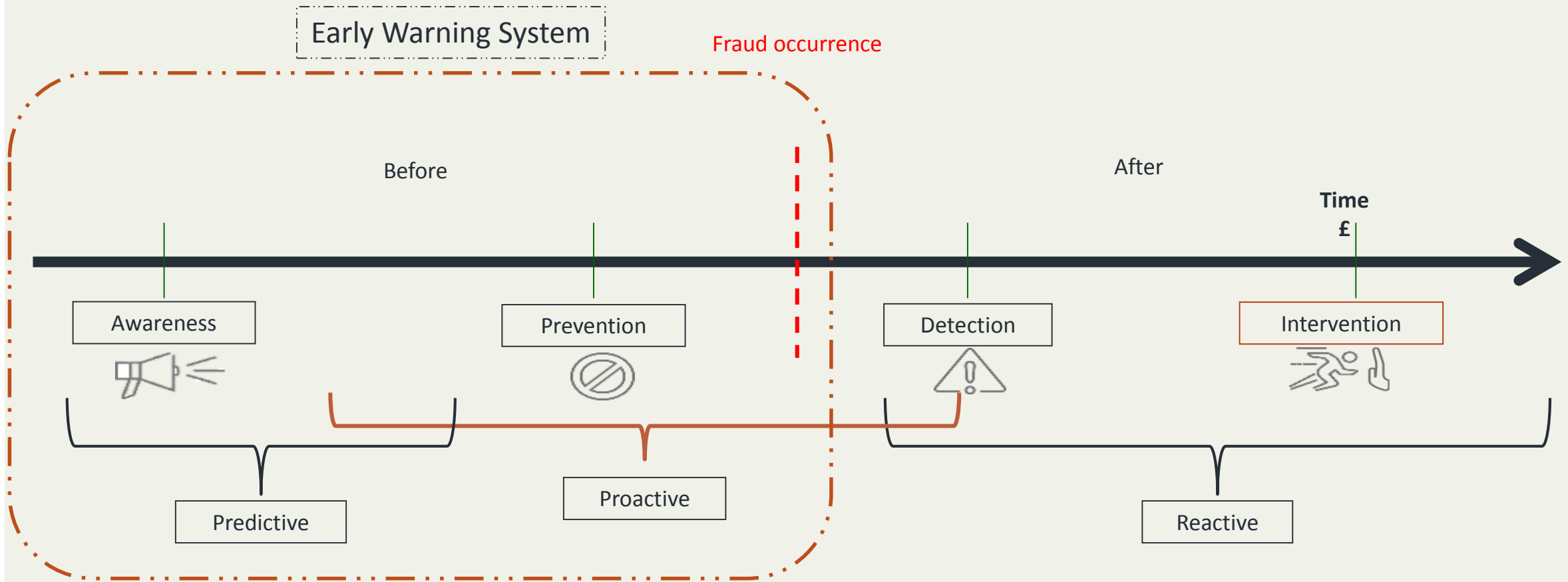*Elliott Review into the Integrity and Assurance of Food Supply Networks – Final Report

**PAS 96:2017 Guide to protecting and defending food and drink from deliberate attack
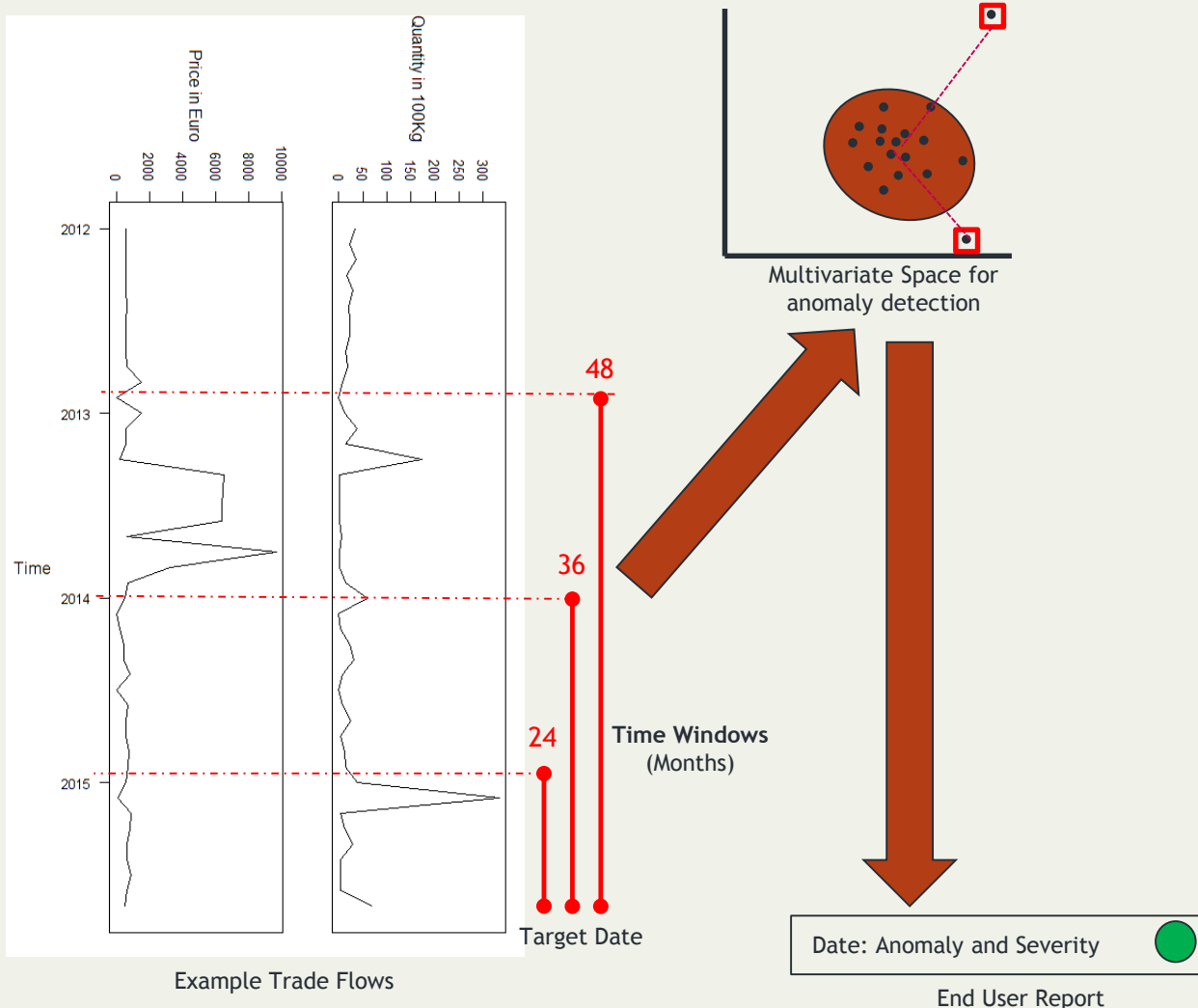
Examples:

Health Claims
Ingredients
Maturity / Vintage
Origin
Production method (organic)
Species
Synthetic / Natural
Variety
etc…….

*Taken from CEN WS86 – Authenticity in the feed and food chain

Fraud Management

Early Warning System

Fraud occurrence

Before

After

Time £

Awareness

Prevention

Detection

Intervention

Predictive

Proactive

Reactive

EWS helps your business to be proactive and save time and money in combatting food fraud

The FERA Early Warning System (EWS) monitors European trade in food commodities and alerts users to disruptions in historic trade patterns

Example Trade Flows

Multivariate Space for anomaly detection

Time Windows (Months)

Target Date

Date: Anomaly and Severity

End User Report

- The Early Warning System (EWS) developed by FERA automatically collects and analyses data on the volume and price of **over 2000** Food and related commodities across the EU member states [and beyond]

- This information is combined with sophisticated **Unsupervised Machine Learning** to identify where historic trade patterns have undergone local disruption across space and time

- Recovered disruptions are reported to the user as an alert, the severity of which is based on sensitivity of findings to assumptions about what constitutes normal trade

- The underlying algorithm is **flexible** and able to accommodate a wide range of variables, allowing alerts to be tailored for increased relevance to particular markets.

- The system provides **visualisations** of trade patterns to help users interpret the alerts generated
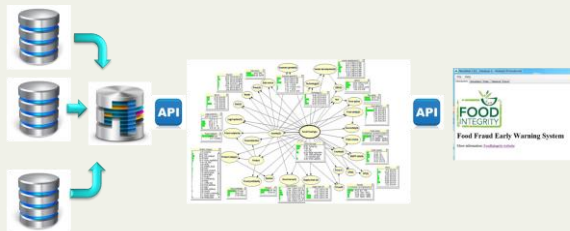
Prof Chris Elliott OBE @QUBFoodProf · 8h
Los Angeles Seafood Monitoring Project team working to reduce sushi fraud & mislabeling of fish. #foodfraud
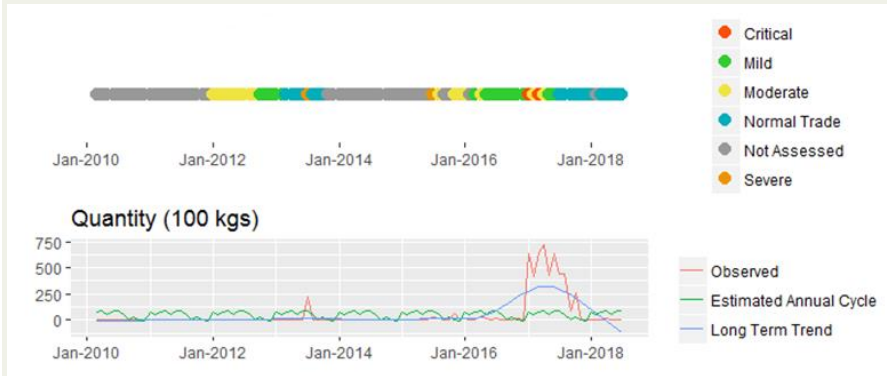
UCLA Seafood Monitoring Project Works to Redu...
Project involving UCLA researchers and partners aims to take "fake sushi" off area diners' plates.

HorizonScan
Food Safety at Your Fingertips

Databases → API → Bayesian Network → API → User Interface
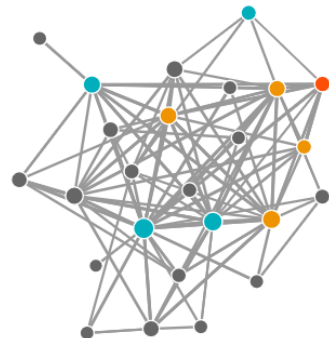
- EWS is NOT a social media monitoring tool
  - It does not mine twitter feeds for intelligence

- EWS is NOT a historical database of official recorded food integrity issues
  - Fera offers HorizonScan™ for that purpose

- EWS is NOT predicting the fraud type
  - A predictive model can be trained using the historical incidents to predict the type of food fraud based on some key information (i.e. exporter country, commodity, time, etc.)

- EWS is a system that provides key intelligence to prevent a Black Swan event

- **Specific commodity tracking**

  - Alerts show where trade routes are disrupted from normal patterns

  - Unexpected / sporadic trading is consistent with fraudulent actors

- **General commodity risk**

  - Amalgamated alerts over commodity groups are compared with historical data

  - Provides input into risk registers for commodities where analytical data is not available
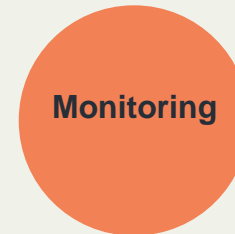
- **General country risk**

  - Amalgamated alerts grouped by countries

  - Trade network visualisation by commodity type and risk combined

Integrated System

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Public Available Data on Trade

Commodities

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Intrinsic Risk: Horizon Scan
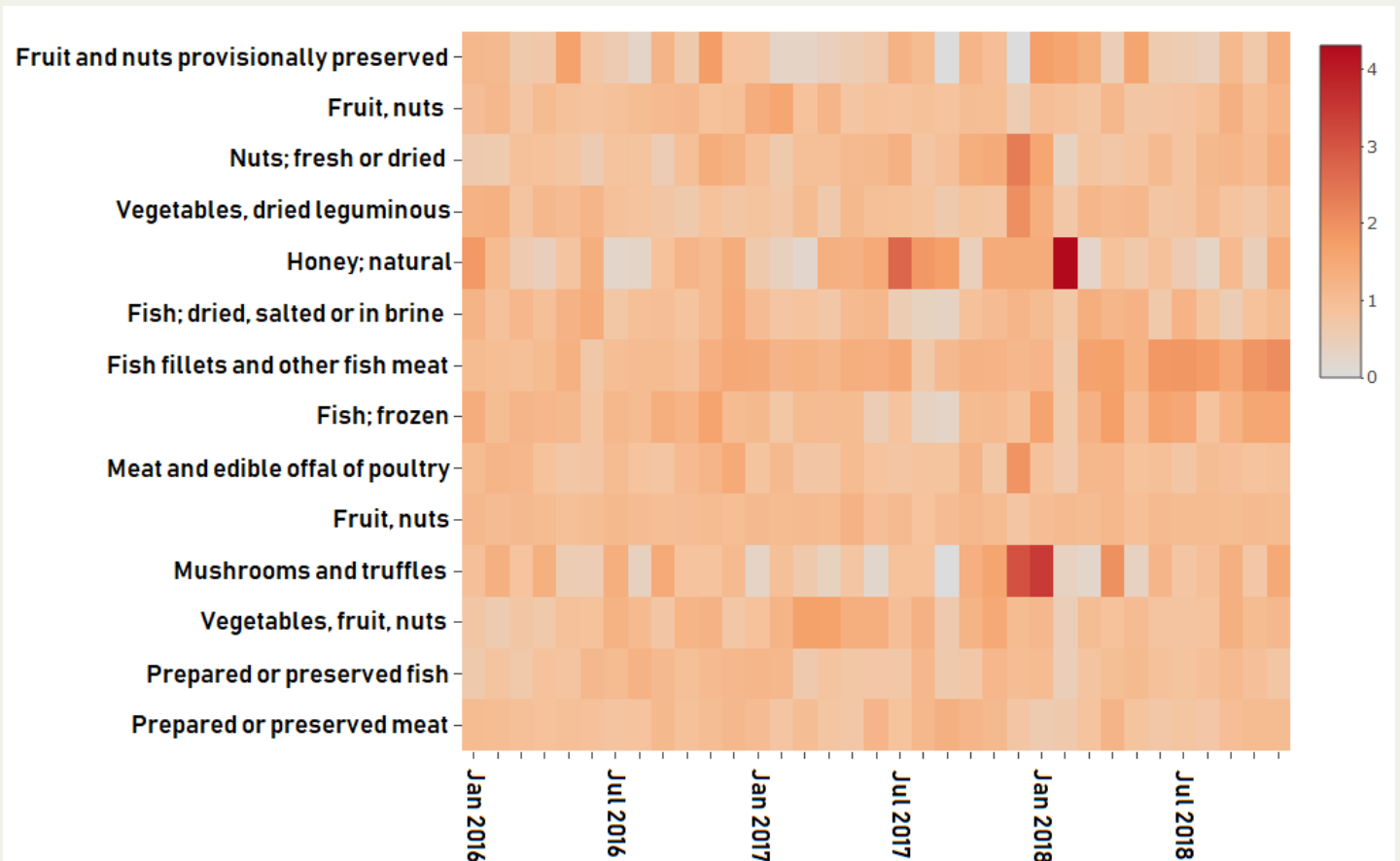
Monitoring
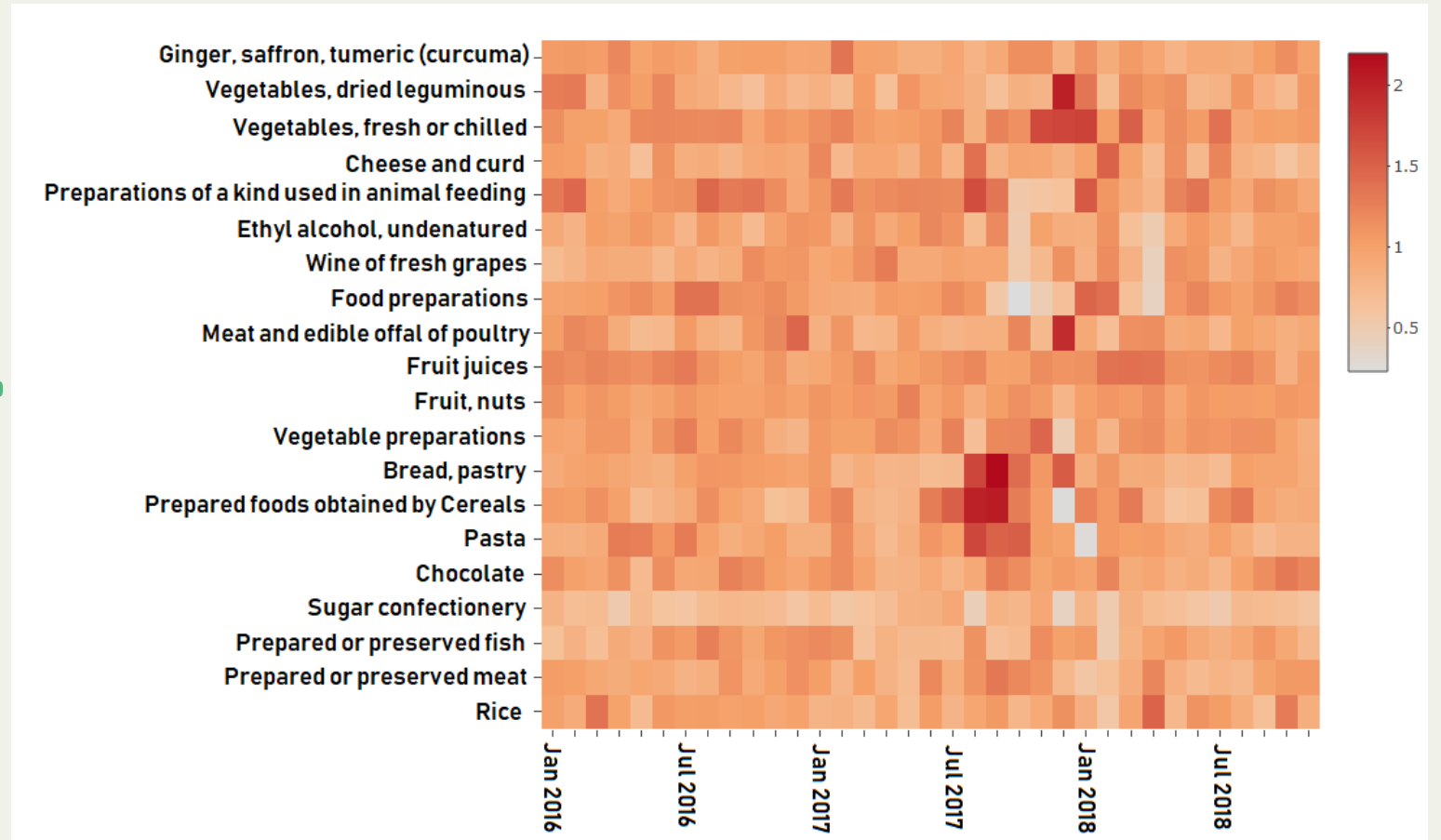
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Risk Dynamic: EWS

Predict

Big Data Approach

1) "Candidate" UK Imported Agri-food Commodities affected by Brexit;
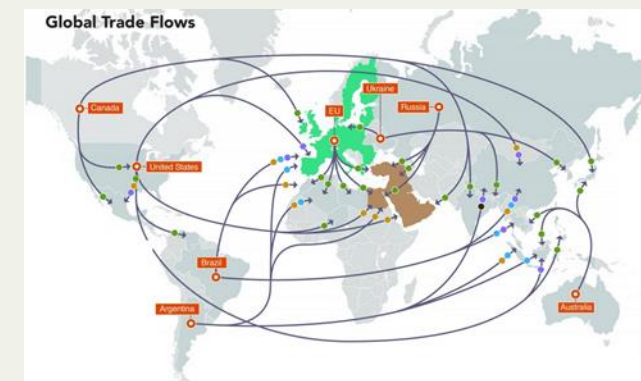2) Intrinsic risk of the "candidate" commodities;
3) Estimated Change in Risk.

Commodities that are getting riskier among those that will the most affected by Brexit and are intrinsically already risky

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Those Commodities that are getting riskier among all Agri-food commodities

- Higher resolution data

  - Incorporate specific company data (production volumes, specific market knowledge)

- Modelling Global Networks

  - Develop systems based approach to model routes and markets

- Model specific fraud cases, use to develop specific alert rules .

- Output design

  - Current system is data analytics based, capability to design dedicated web portals

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