Evaluating the impact of Data analytics on the Customs Risk Management process : A balancing act

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PROFILE

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Belgian Customs, Profile & Data analytics

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01 Belgian Customs

- Data Science team for ~10 yrs
- SEDA 2.0 risk engine

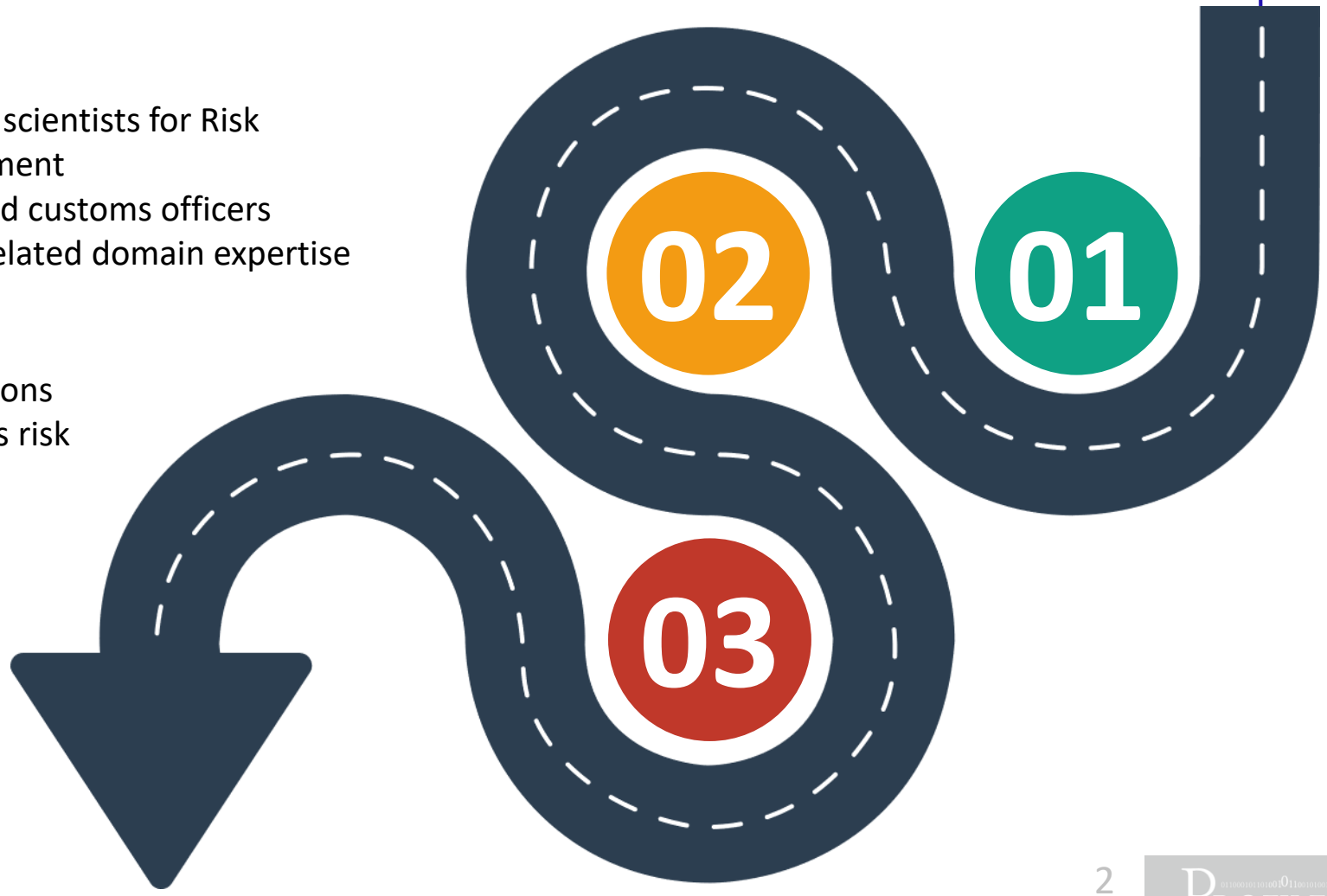
10+ data scientists for Risk Management
→ Trained customs officers
→ Risk related domain expertise

02 H2020 Profile

- Research project with 5 Customs Administrations
- Machine learning & data analytics for customs risk management

03 WP4 – Belgian Living Lab

- Economic operator profiling
- Summary declaration data enhancement



The dual role of Customs

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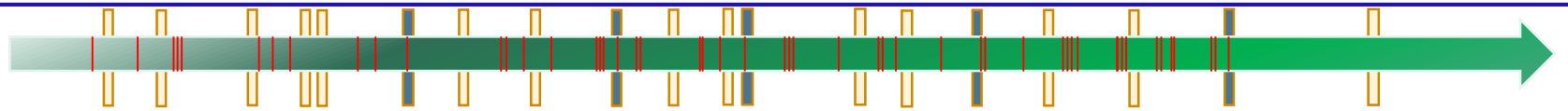

CUSTOMS
RISK MANAGEMENT

Trade flow

- ✓ AEO
- ✓ Authorizations
- ✓ Green lanes

Facilitate legitimate trade

- ❖ Physical and document controls
- ❖ Risk profiles and Data-mining
- ❖ Infringement records

Prevent, identify and stop fraud

The dual role of Customs

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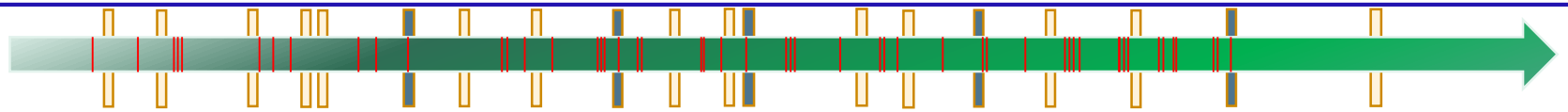
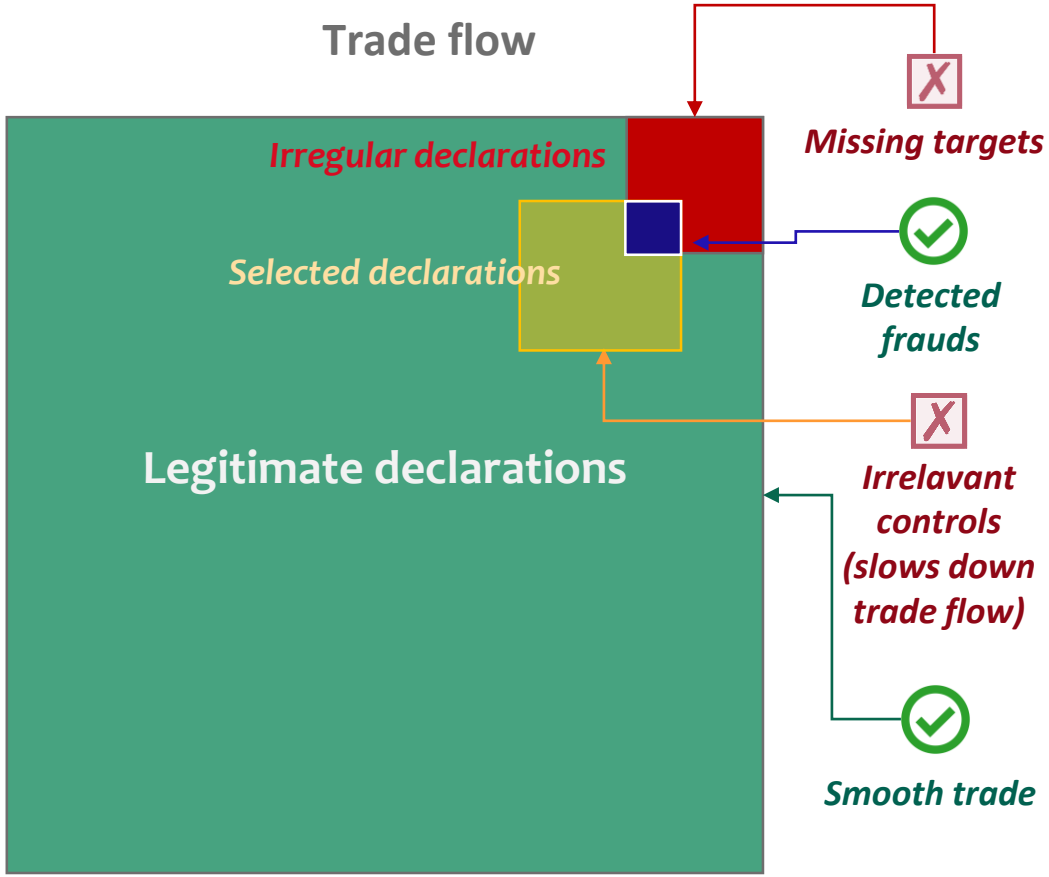


Trade flow

Confusion (error) matrix

Legitimate declaration	Selected for control: No	Selected for control: Yes
No	*Missing targets*	*Relevant controls*
Yes	*Normal trade*	*Irrelevant controls*



Classical KPI's and their limitations

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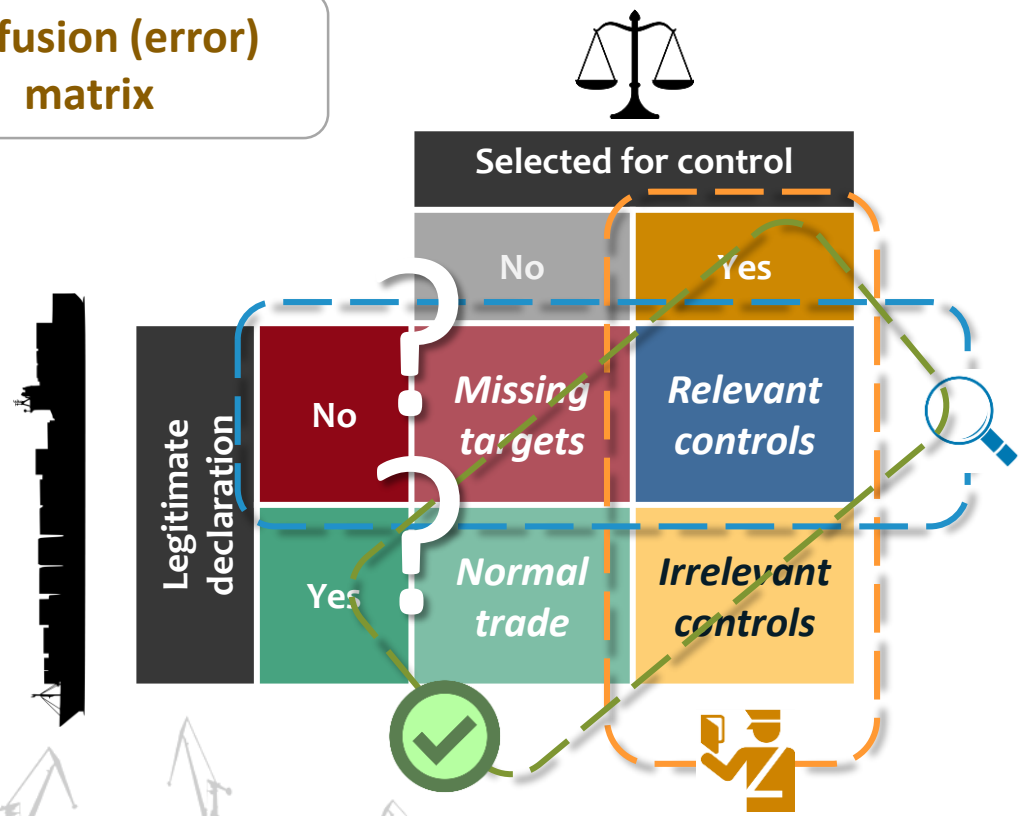
Confusion (error) matrix



- **Precision :** *Percentage of good selections*

  Problem : Does not quantify what is missed.

- **Sensitivity :** *Percentage of frauds found*

  Problem : Estimation about what is missed must be available

- **Accuracy :** *Percentage of good decisions*

  Problem : Customs data is strongly imbalanced
  ❖ ***Accuracy will always be close to 1***

Classical KPI's and their limitations

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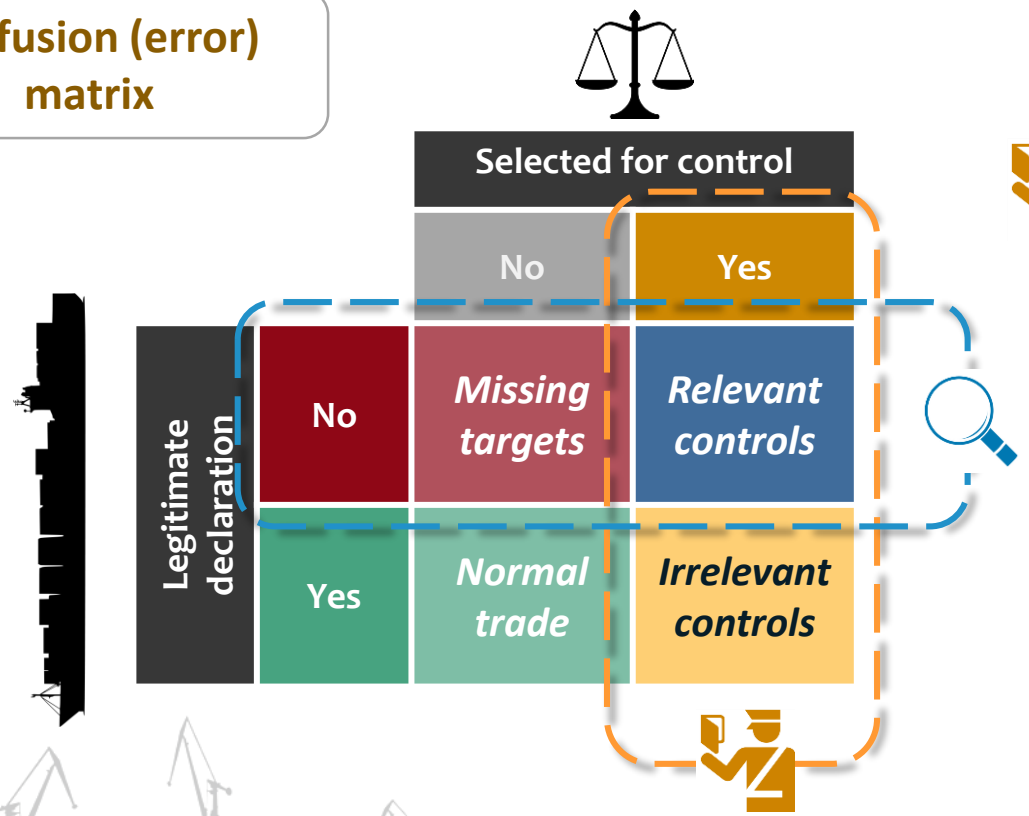
HOW TO BE MORE EFFICIENT ?

Confusion (error) matrix



- **Precision :** *Percentage of good selections*
- **Sensitivity :** *Percentage of frauds found*

INCREASE SELECTION RATE → **INCREASE SENSITIVITY**

<u>Problem 1</u> : Control resources are not unlimited
- ❖ *Time, equipment, costs, available field officers*

<u>Problem 2</u> : More unnecessary controls
- ❖ *Slows down the trade flow*
  - → *unhappy reliable operators*
- ❖ *Waste of time and effort*

Classical KPI's and their limitations

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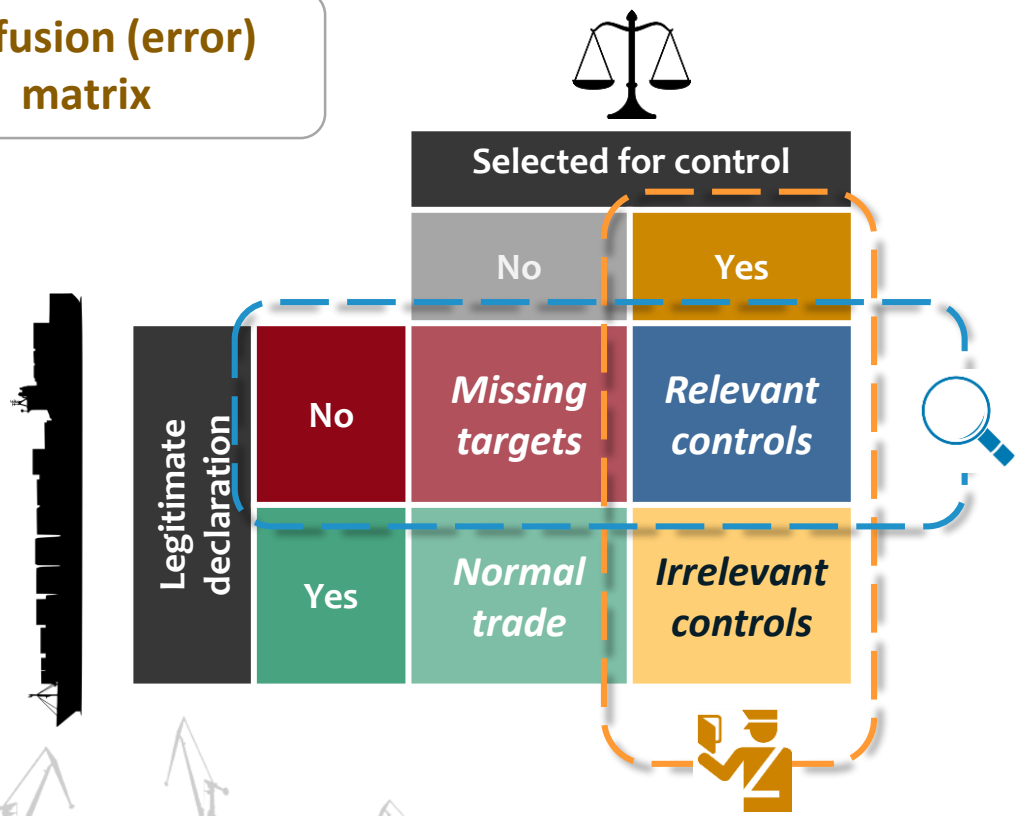

<u>Problem 3</u>: Not every trade and every associated risk has the same weight

- **Small frauds :** common / limited impact / small payback
- **Large frauds :** rare / large shortfall / large payback

Opportunity-cost matrix

Legitimate declaration	Selected for control: No	Selected for control: Yes
No	Missing duties	Recoverd duties + fines
Yes	Paid duties	Costs

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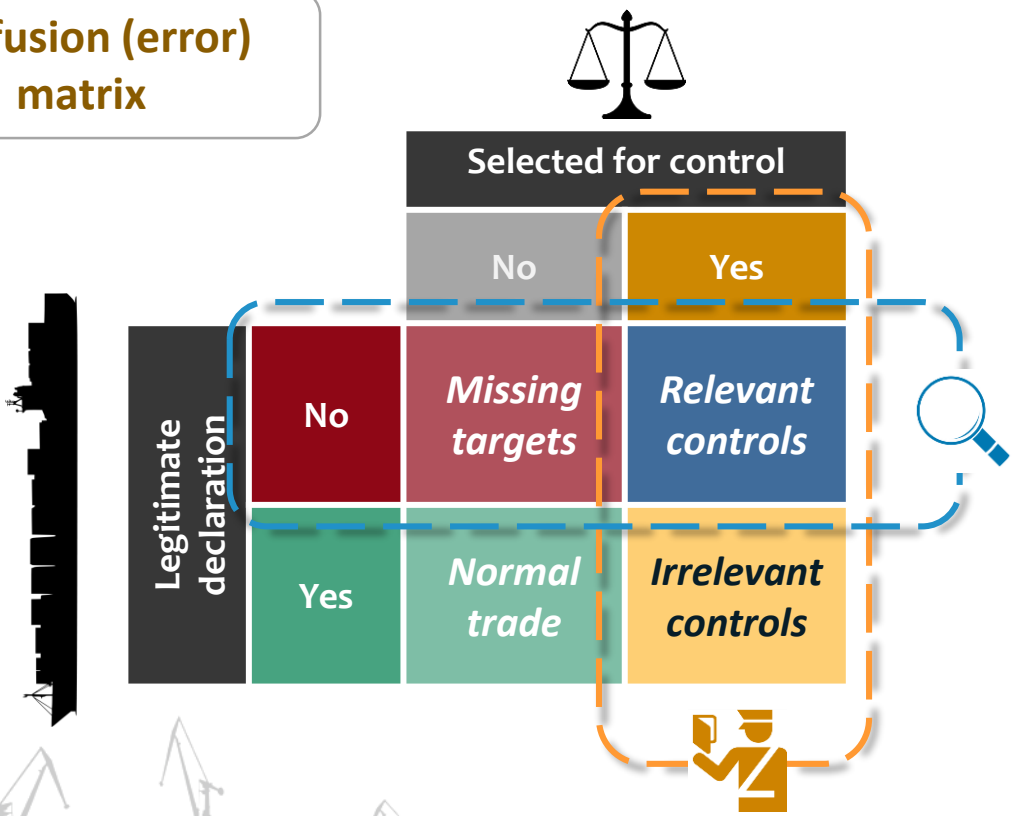
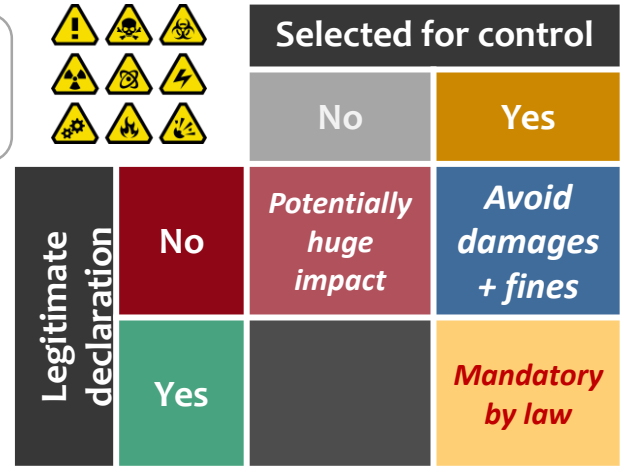


Problem 4: the opportunity/cost weight is sometimes difficult to quantify

Opportunity-cost matrix



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Classical KPI's and their limitations

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HOW TO BE MORE EFFICIENT ?

~~**Precision :** *Percentage of good selections*~~

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Confusion (error) matrix

		Selected for control: No	Selected for control: Yes
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Legitimate declaration: Yes		*Normal trade*	*Irrelevant controls*

Opportunity-costs matrices

		Selected for control: No	Selected for control: Yes
Legitimate declaration: No		*Costs & Damages*	*Reward*
Legitimate declaration: Yes		*Facilitation*	*Investments costs*

Illustrative Case : Import of forbidden dangerous goods

- **Strategy :** Missing frauds must absolutely be avoided.
  - ➡ **Costs & Damages >>> Reward and Investments costs**

Classical KPI's do not reflect the priorities and strategy

KPI's should be designed depending on:

the information available — ***well defined objectives***

Confusion matrix — Opportunity-cost matrix

the reality of trade trends

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Customs expertise

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Customs framework is very specific and complex :

- Large number of procedures
- Many risks and fraud scenarios
- Quickly evolving
- **Often obscure for external collaborators**

→Experience is key

Understanding of :

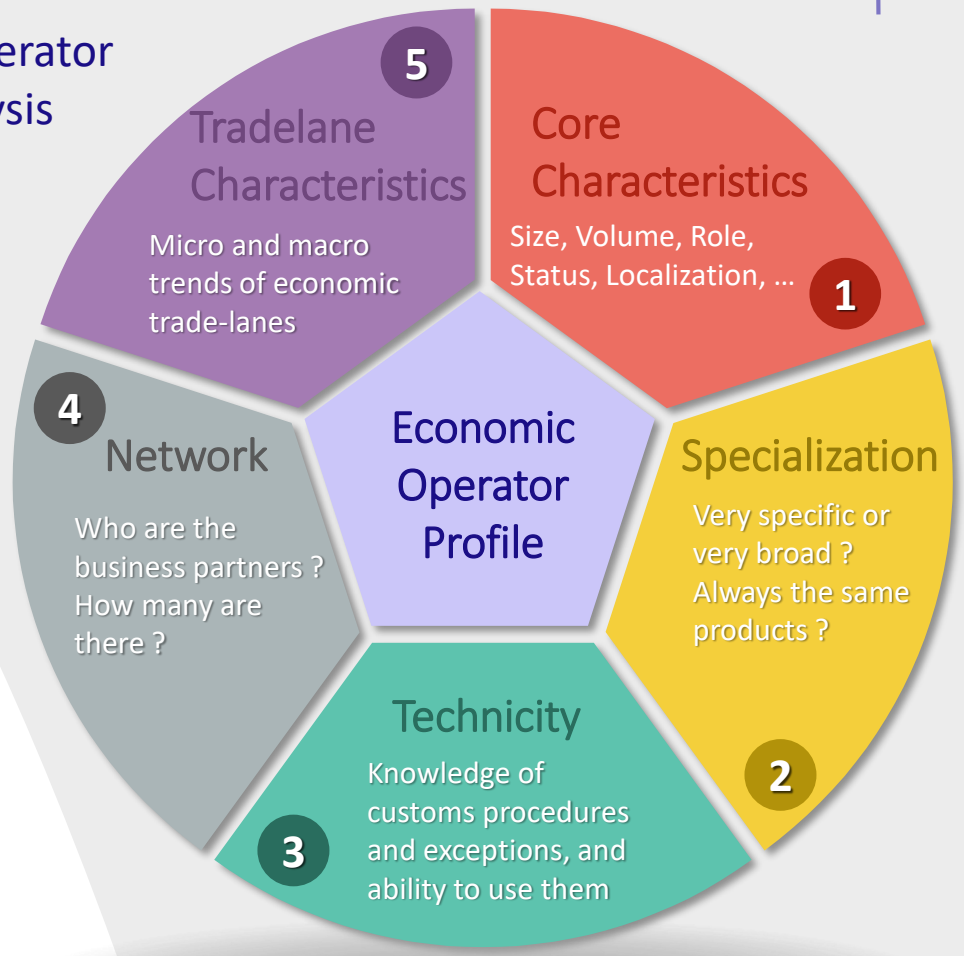
- *the goals*
- *the variables*
- *the limitations*

Fast response must be limited to specific topics

Broader targets need time and learning efforts

Contribution and outcomes must make sense for internal usage

Ex : PROFILE operator behaviour analysis



How to measure customs expertise ?

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Parameters such as :

- Level of proficiency
- Number of analysts
- Coverage of risk domains

EXPERT
Extensive expert knowledge in specific risk domains
Link with 'Big Picture'
Tailored advice with context and examples

EXPERIENCED
Broad and in depth knowledge
Ability to deal with exceptions & special cases
Ability to share experience

AWARENESS
Basic knowledge
General understanding

TRAINED
Working knowledge
Ability to apply knowledge
Work independantly

BEGINNER
No prior knowledge of customs business

Data quality through the lens of Data usability

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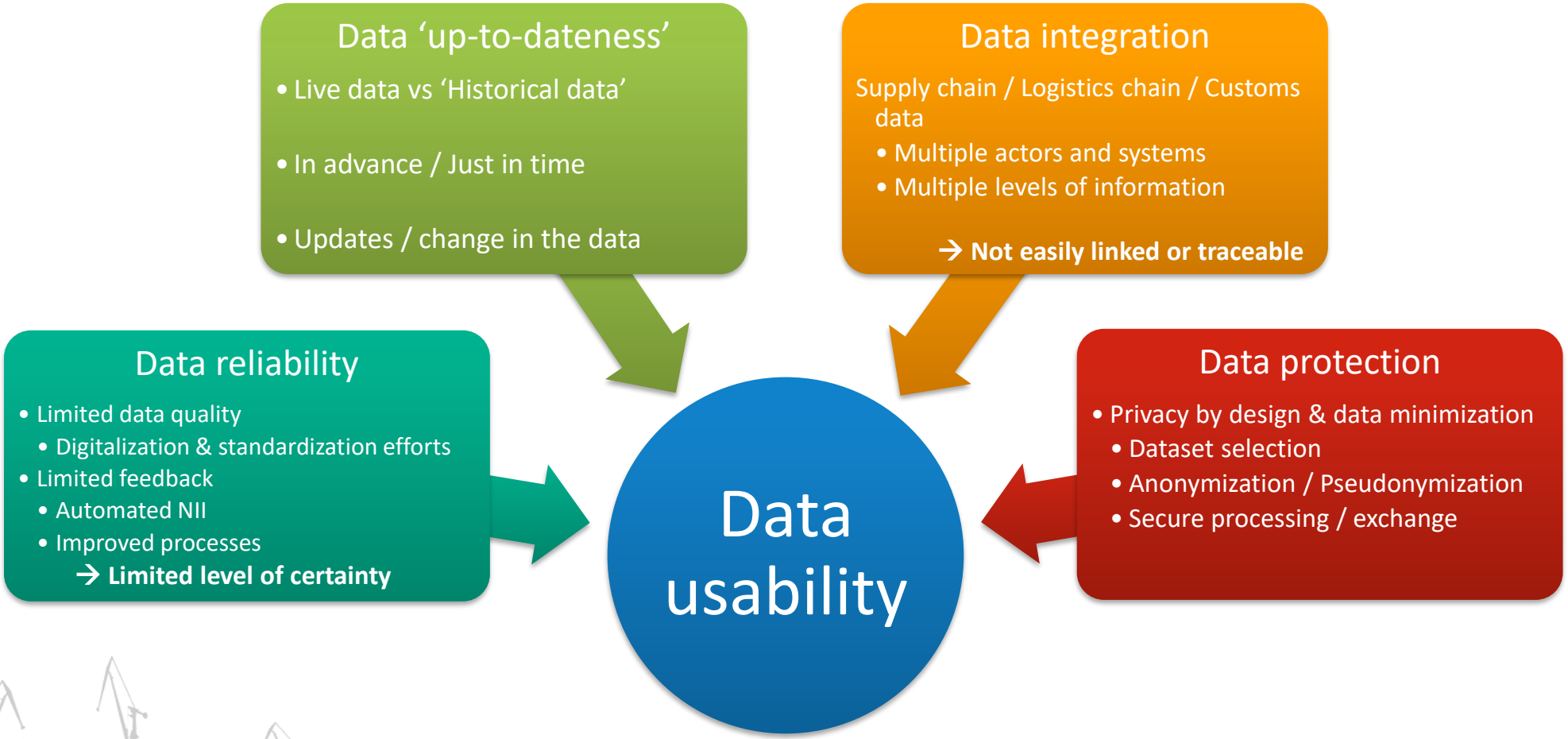

Evaluation dimensions for data usability

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Variety	*How many distinct sources are available ?*
Accuracy	*Is data correct and how well does it represent reality ?*
Completeness	*Does a dataset include all critical data elements ?*
Granularity	*Does data provide detailed enough information ?*
Standardization	*Is data in a standardized format ?*
Timeliness	*Is data available in advance / when it is needed ?*
Comparability	*Can data be used with other information to support decision-making ?*

Data usability in practice

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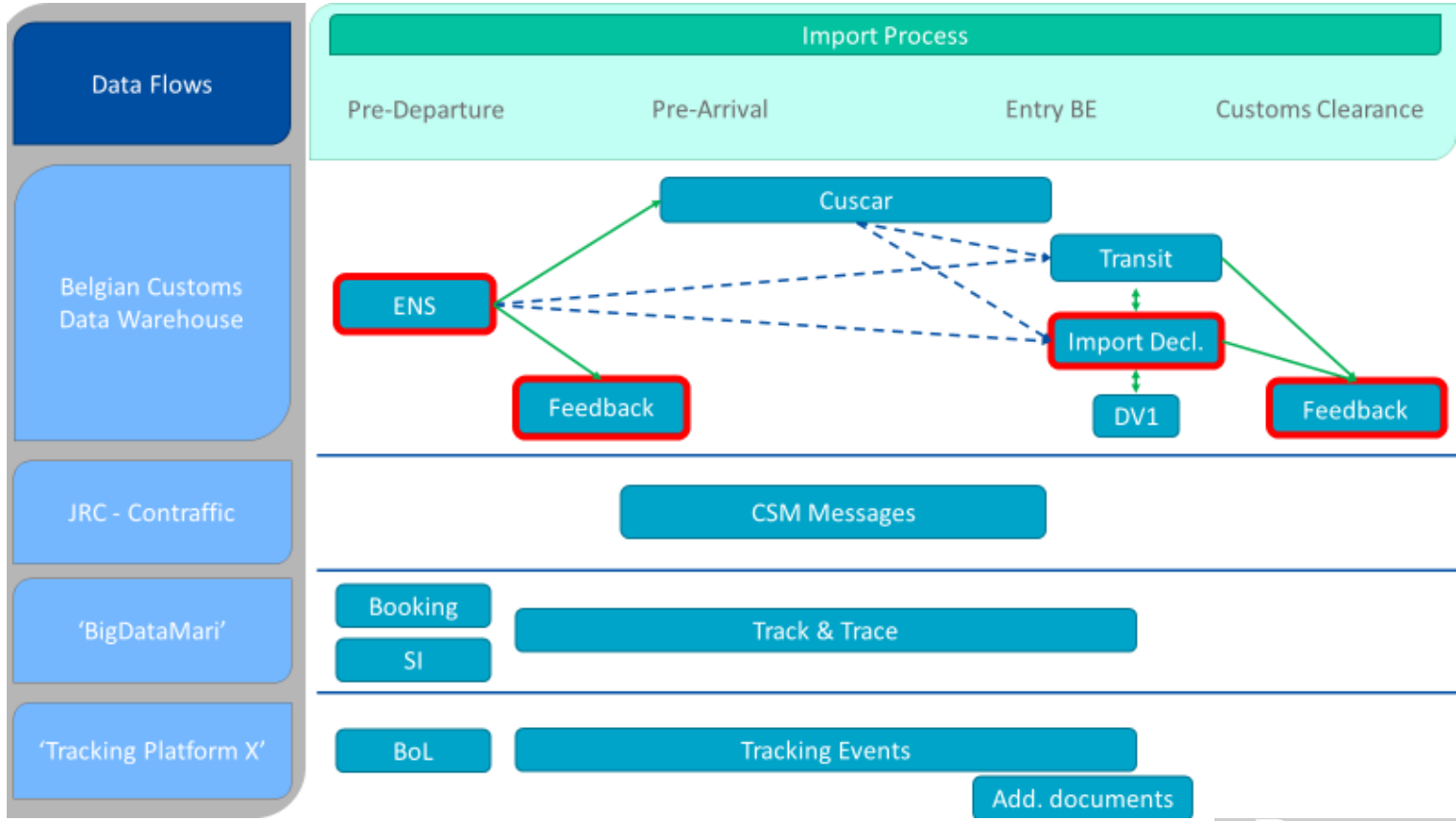
PROFILE Belgian Living Lab : Summary Declaration (ENS) enhancement

Use of multiple internal and external datasets to enhance the quality of ENS data

- Discovering useful additional features
- Cross-checking and validation of the data
- Evaluation of the completeness of the data



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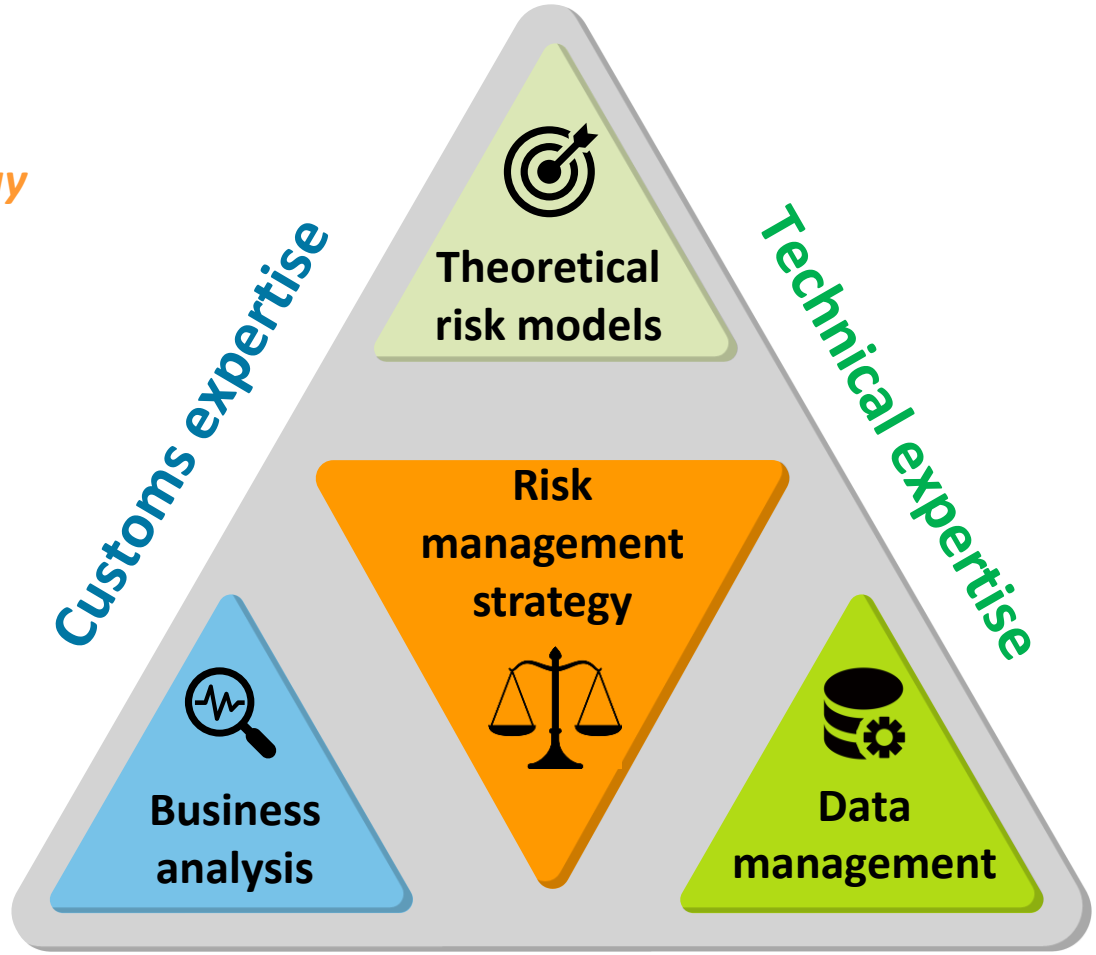
The risk management strategy must be at the core of the evaluation