EUROPEAN CONFERENCE ON ICT
5TH 4 TRANSPORT LOGISTICS

ECITL: Smart Freight to enable sustainable logistics solutions
7 - 9 NOVEMBER 2012
GOTHENBURG, SWEDEN

CASSANDRA

IMPROVING SECURITY THROUGH VISIBILITY

Computational Auditing and Horizontal Supervision

SEVENTH FRAMEWORK PROGRAMME

TNO

CASSANDRA / Overview

TNO

- Introduction
- Background
- What is computational auditing & horizontal supervision?
- Information Quality Assessment Framework
  - Purpose of methodology
  - Categorization of IQ metrics
  - Administrative Organization
    - Segregation of duties
    - Flowchart AO
    - Control Principles
  - Events & Data
  - 5 step IQAF
- Example
- Concluding remarks

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/ Introduction

- Fouad Gaddur
- TNO Defense, Safety & Security
- Project CASSANDRA WP200
- TNO, EUR and Dutch Tax & Customs

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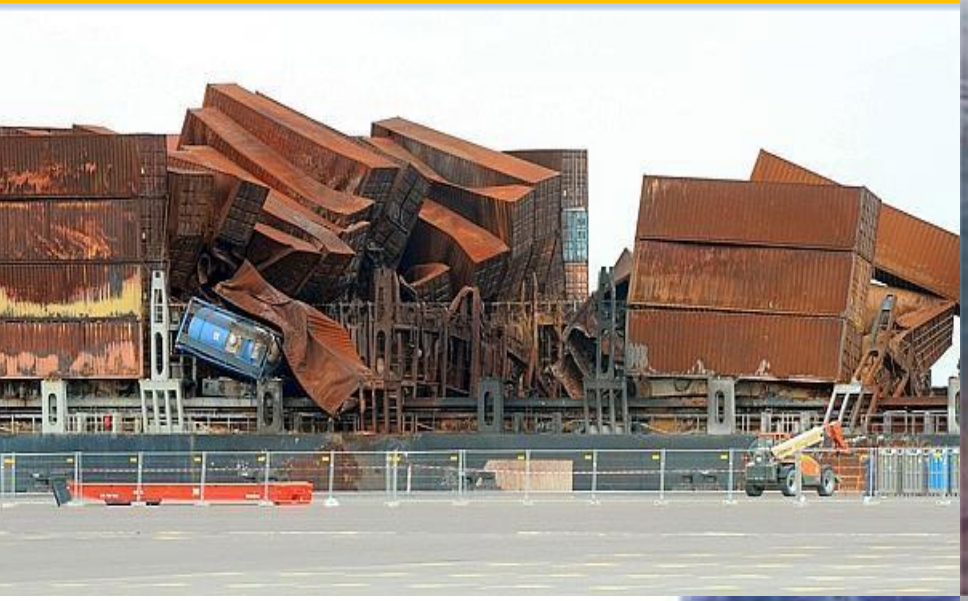
/ Background



/ Background

3CE Customs Import Entry Analysis

100,754 import customs declarations analysed

85,28% 89,925 records contained some narative description

14,72% 14,829 records contained no narative description

12,30% 12,388 records contained enough product detail to enable validation of the HS code

3CE Customs Import Entry Analysis

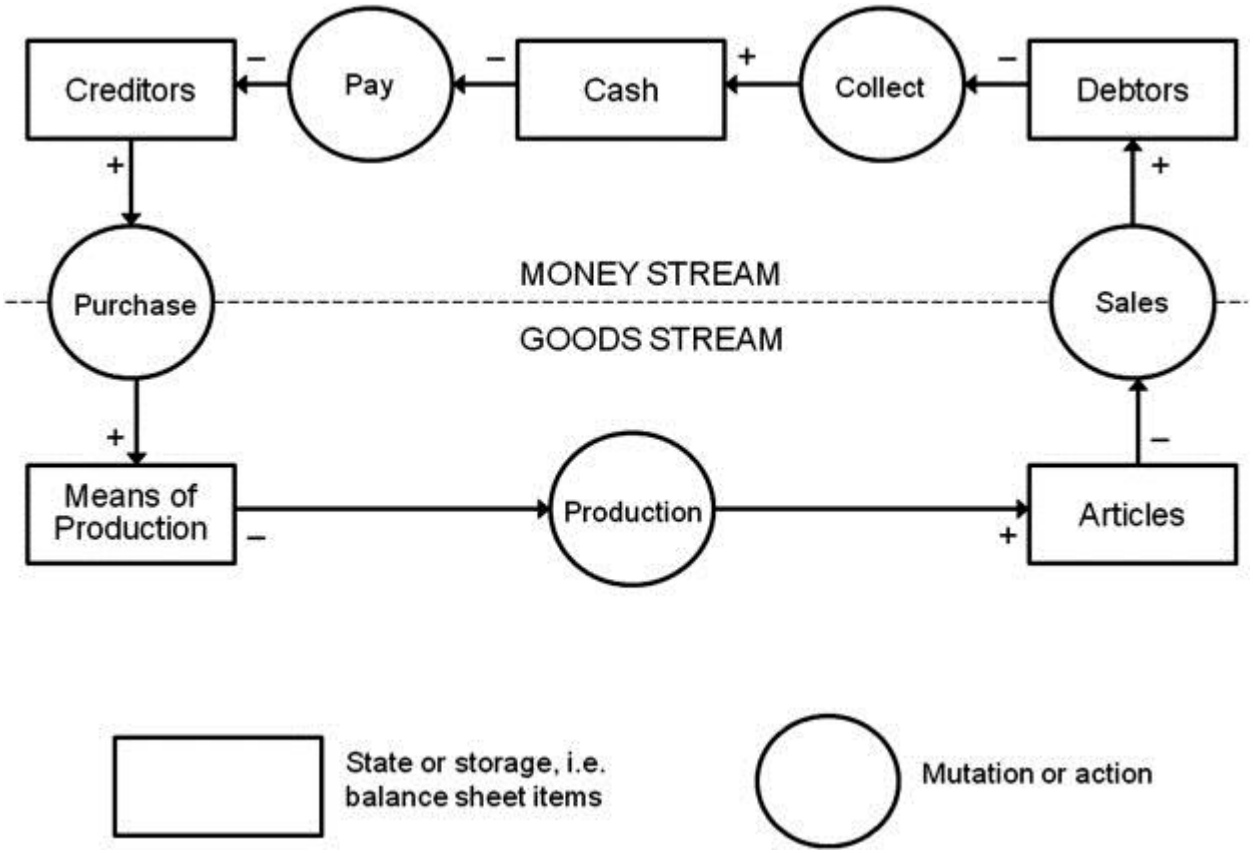
87.70%

Over 88,000 records contained insufficient data to assess a correct text description or HS code to 6-digits

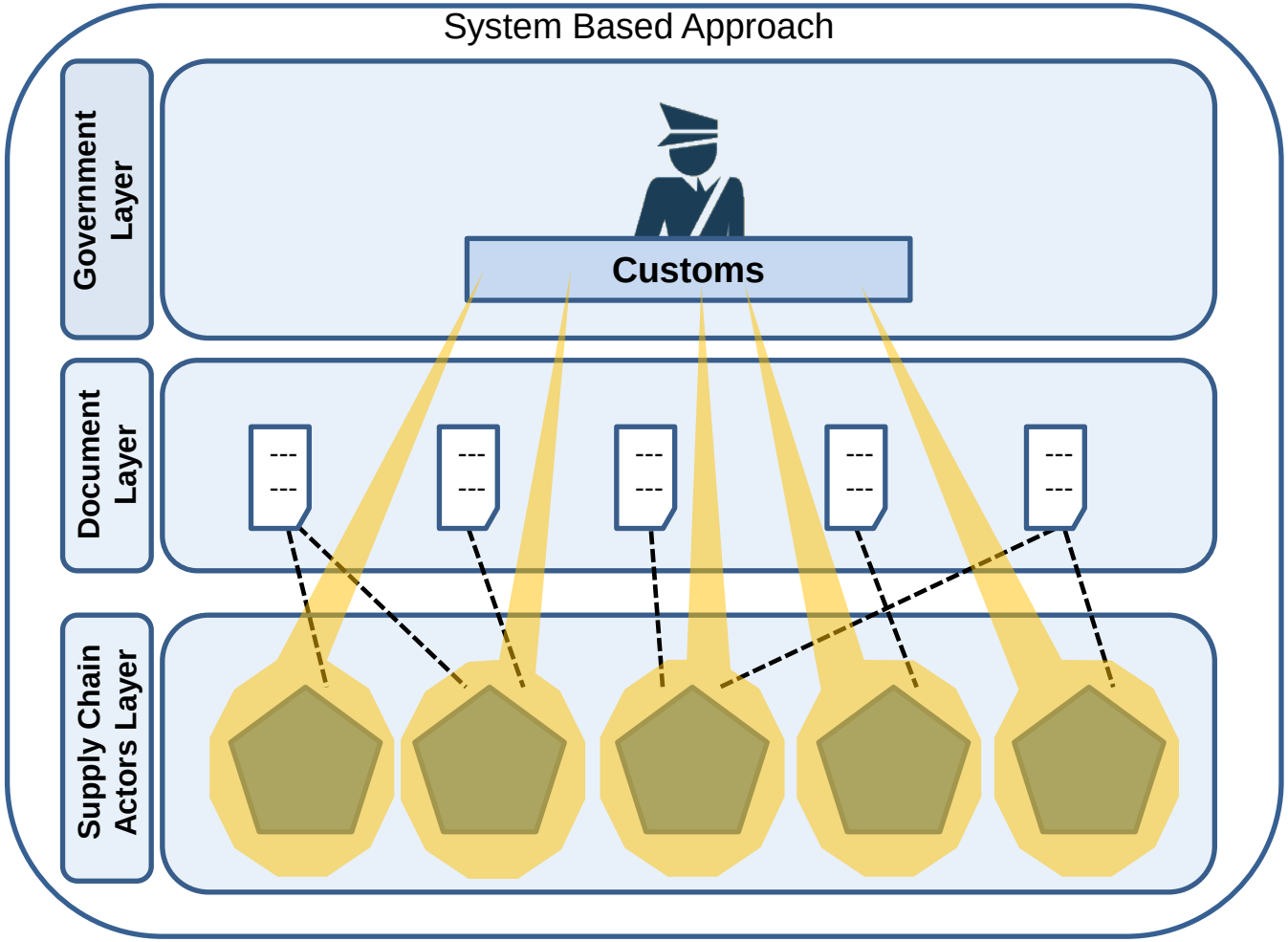
HM Revenue & Customs

/ Computational Auditing

- Model based auditing approach
- Enterprise-level rules stock and flow equations
- Link up with important bookkeeping variables, such as sales, inventory etc.
- Value cycle model (Starreveld)


Creditors
Pay
Cash
Collect
Debtors
Purchase
MONEY STREAM
GOODS STREAM
Sales
Means of Production
Production
Articles
State or storage, i.e. balance sheet items
Mutation or action

/ Horizontal supervision



- 1) How good is a business system's information quality?
  - Quantify the measurement of information quality (quality metrics)
- 2) How good is enough?
  - Managing the problem of poor information quality. How can we have information which is sufficient timely, reliable and complete for risk management.

Principles of computational auditing

Categorization IQ Metrics

Category w.r.t. Usability	Index	Info Quality Dimensions	Definition	Relation to Information Quality Assessment in CASSANDRA
Intrinsic	1	Objectivity (factual)	Reflecting actual business activities, free of bias	Whether data generator and/ or custodian are reliable in providing objective data
	2	Accuracy	Sufficiently precise	Whether data generator and/or custodian are reliable in providing accurate data
	3	Reputation (believability, credibility)	Regarded as reliable in terms of source and content	This will be the reliability score, i.e. the aggregated output of the Assessment Methodology
	4	Consistent value	Correctness, free-of-error	Whether the data are verifiable by cross checking
Accessibility	5	Accessibility	Information available, or easily retrievable	N/A, information is assumed to be available to and from data pipeline
	6	Access security	Generation and processing of information restricted to maintain security	Whether data generator and custodian are reliable w.r.t. access control
Contextual	7	Completeness	Information reflecting all business activity, and no missing record	Whether data generator and/or custodian are reliable in providing complete data
	8	Comparability (consistent semantics)	Semantically correct, use same alias (or numeric value) to refer the same meaning, e.g. consistency in using currency or metric unit	Whether data generator and custodian can manage the semantics consistency
	9	Relevancy (value-added)	Information helpful for task (decision support)	N/A, information is assumed to be relevant (otherwise not shared)
	10	Timeliness (version control)	Up-to-date	Whether data generator and custodian are reliable in providing timely data
	11	Aggregation level (or volume of data)	Volume of data appropriate for task (decision support)	Usefulness in risk assessment depend on purpose of analysis
Represent-ational	12	Understandability (interpretability)	Easy to comprehend, or the underlying semantics of data (meta-data) is sufficient and matches the knowledge background of decision maker	Whether there is sufficient meta-data accompanying the shared data available for decision-maker (risk manager) to comprehend and analyze the shared data
	13	Correct representation	Meaningfulness, lack of confusion	Whether the data custodian is able to manage the representation
	14	Concise representation	Use appropriate alias, format and syntax	Whether the data custodian is able to manage the representation
	15	Consistent representation	Use same alias, format and syntax	Whether the data custodian is able to manage the representation

Administrative Organization

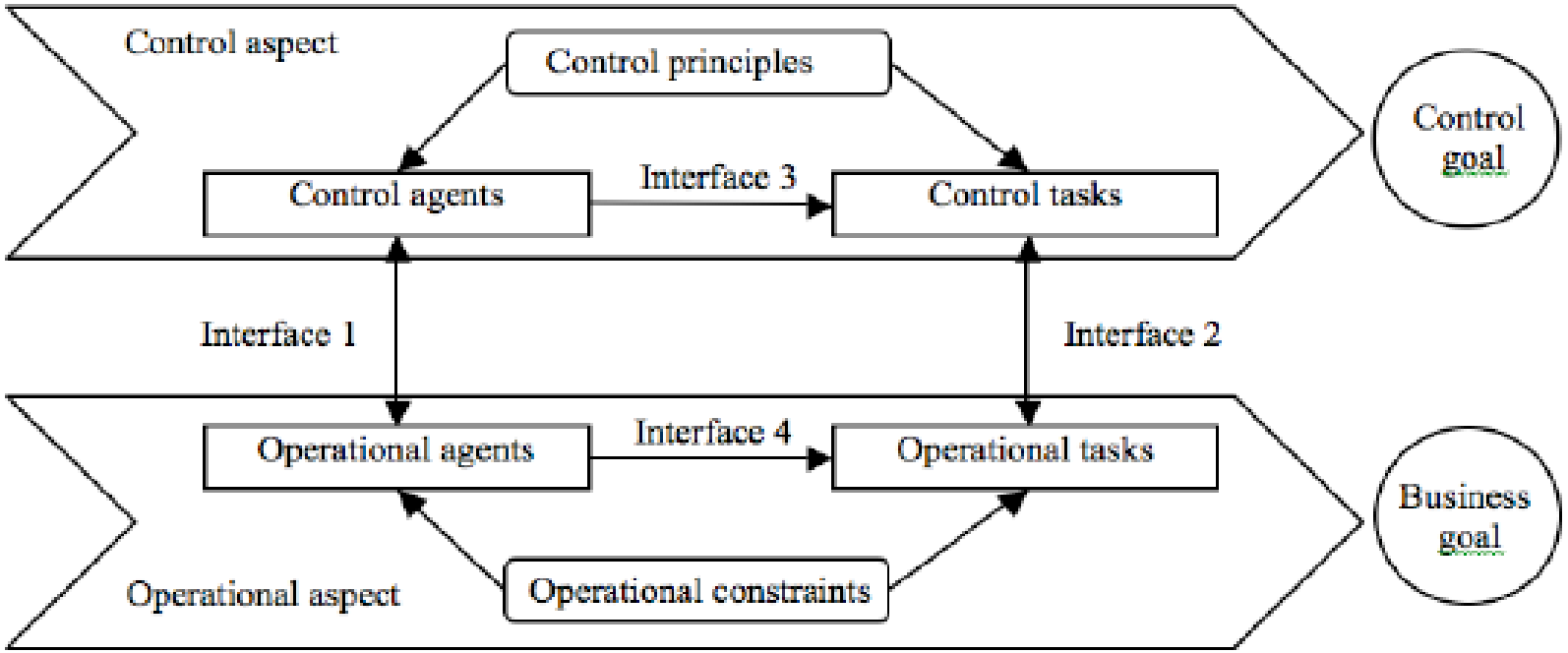
Responsible for organizing the information from a business system

Poor information quality ⟶ Poor quality of administrative organization

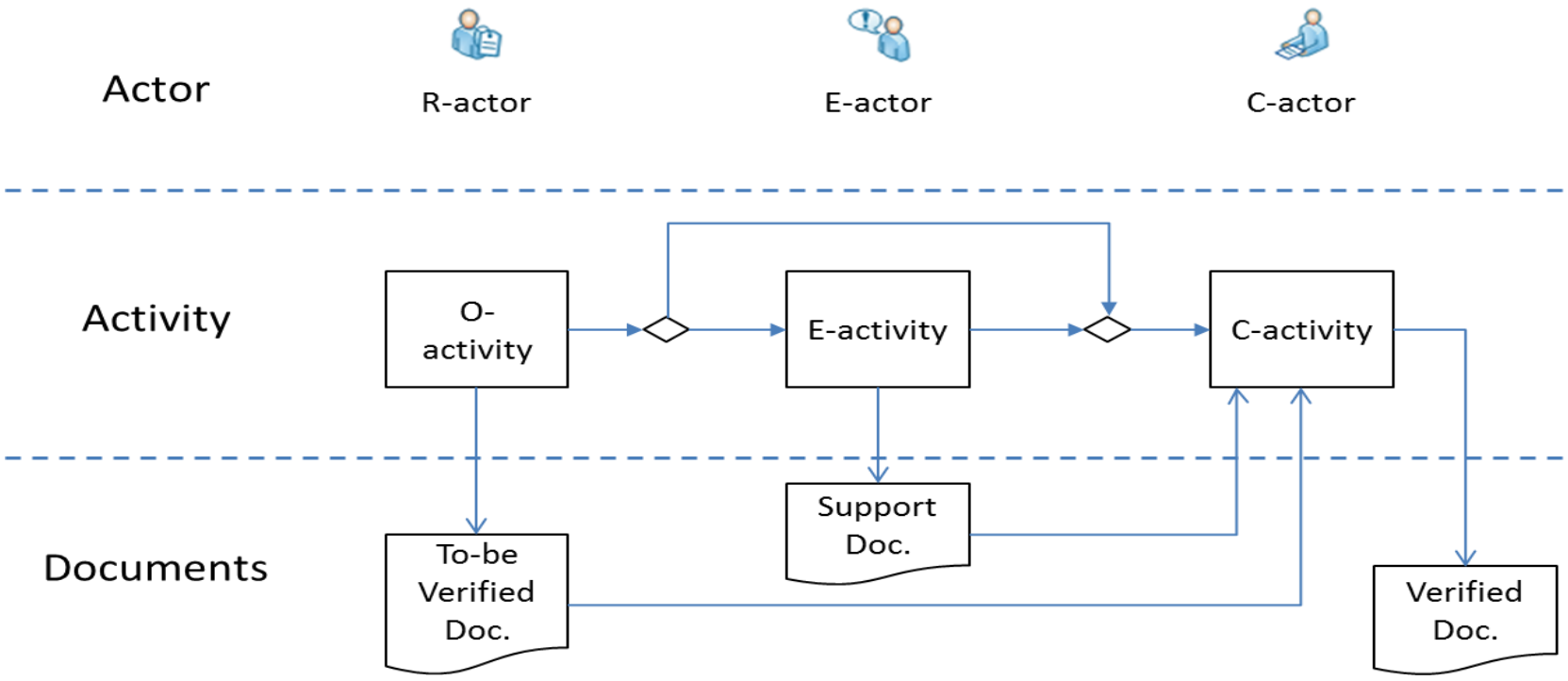
How to improve?

An administrative organization has to have two sphere's (operational – control sphere)

An administrative organization has to have control principles



Relation of Control aspect and Operational aspect of Administrative Organization



Information-flows and Workflows of Control in Administrative Organization

P1. Does the control activity exist and follow the corresponding operational activity?
P2. Can the control actor directly witness the execution of the operational activity? If not, is the evidencing (witnessing) activity delegated to an evidencing actor (trusted third party)?
P3. Is there a supporting document furnishing the evidencing activity?
P4. Is the supporting document the result of the previous evidencing activity directly witnessing the operational activity to be controlled?
P5. Is the supporting document directly transferred to the control actor from the evidencing actor who witnesses the operational activity to be controlled?
P6. Is the supporting document generated by an actor independent of the actor who generates the to-be-verified document?
P7. Are the operational activity and its corresponding control activity segregated into two different positions and done by two different actors?
P8. Are the actors responsible for the operational activity and its corresponding control activity socially detached?

Events in Supply Chain

Event 1: Purchase Order (multiple messages sent at same time)

Event 2: Export Booking Completed

Event 3: Empty Container Pickup (multiple messages sent at same time)

Event 4: Transport Milestones

Event 5: Stuffed (multiple messages sent at same time)

Event 6: Commercially Invoiced(multiple messages sent at same time)

Event 7: Cleared for Export(multiple messages sent a same time)

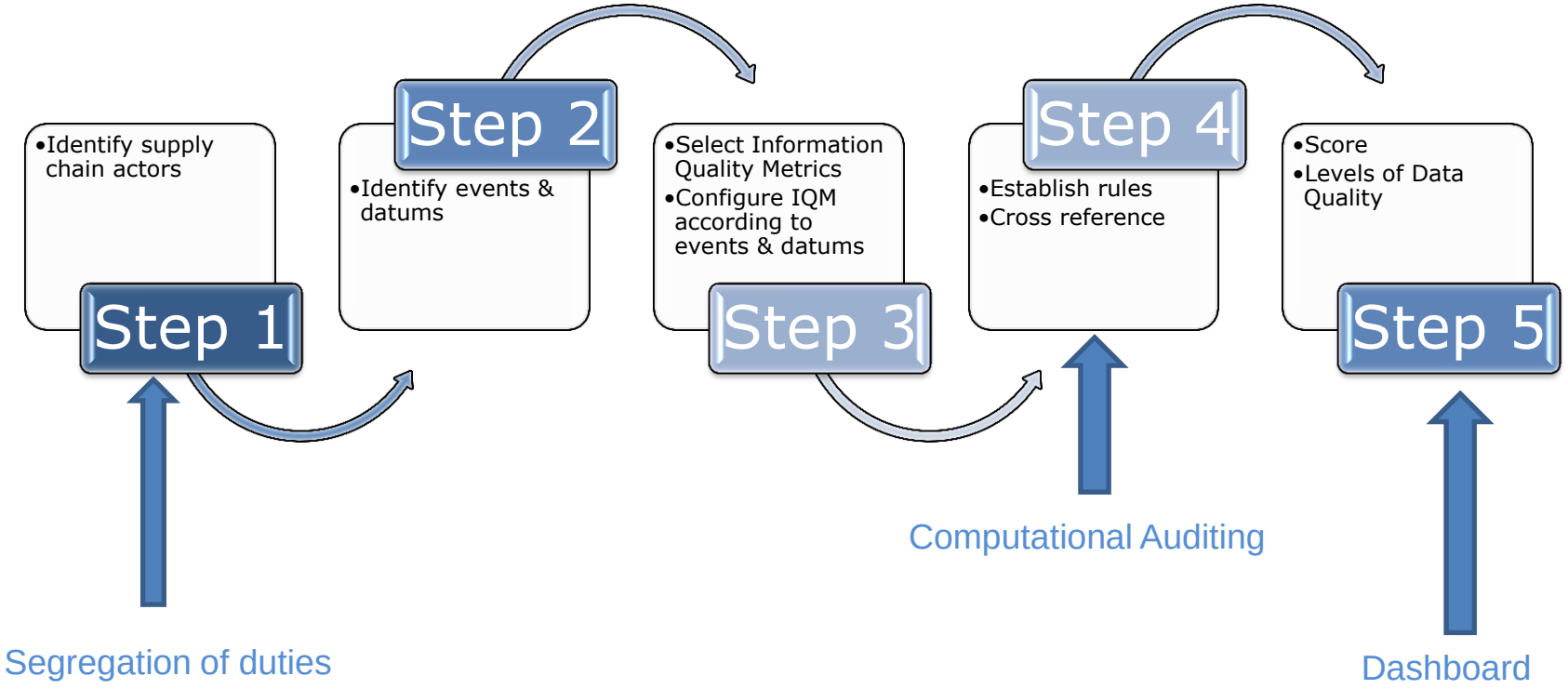
Event 8: Transport Milestones

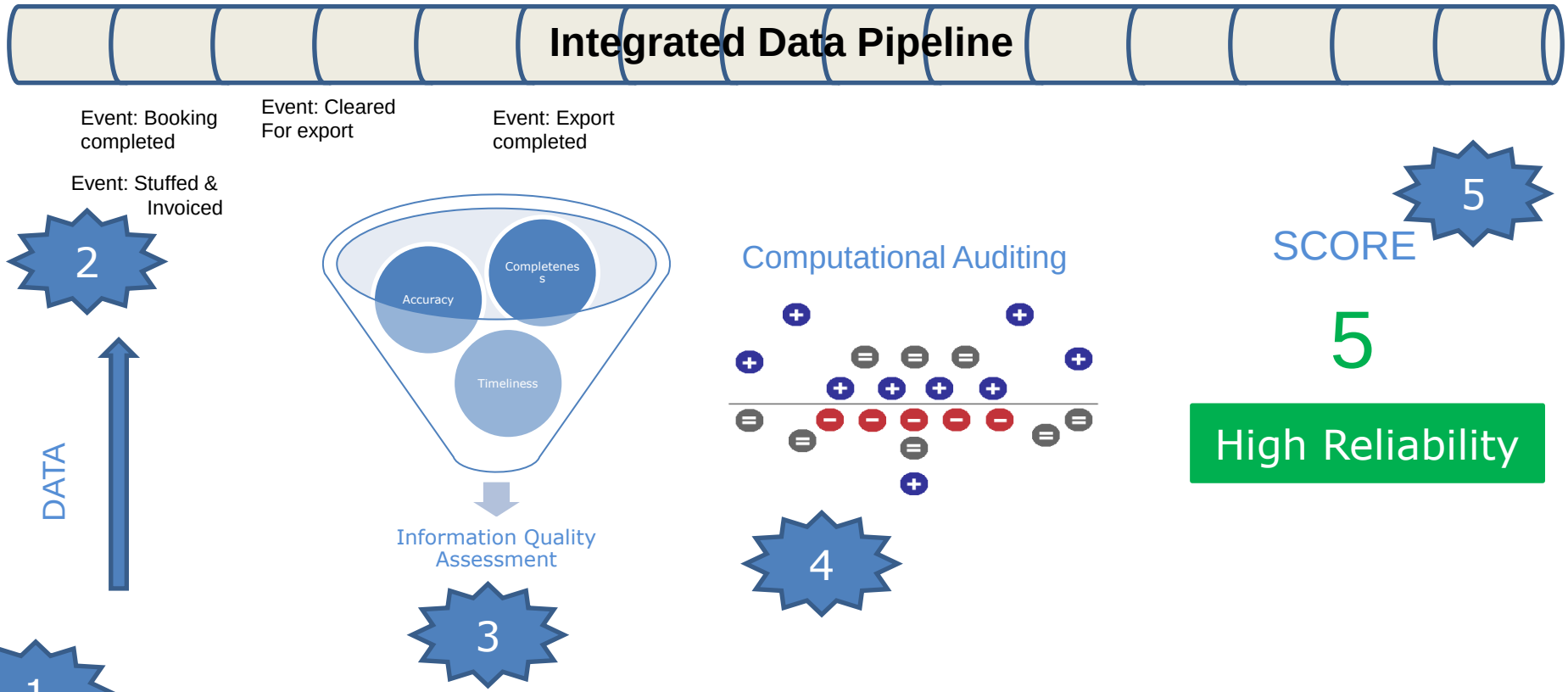
Event 9: Confirmation of exit

Event 10: Export Completed

Data linked to events

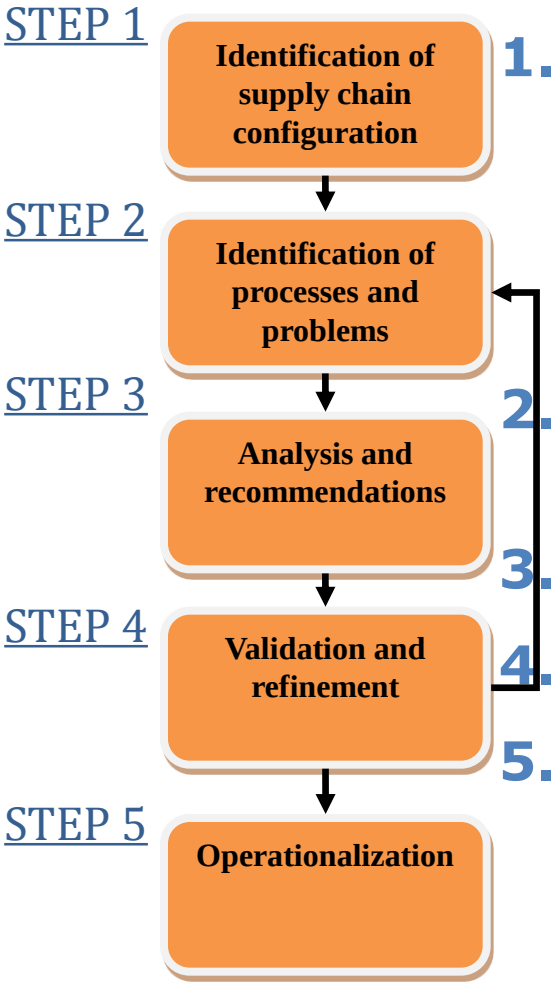
Name and address Shipper	x	x			o					
Name and address Seller		x	x		o					
Name and address Exporter	x	x	x		o					
Country of export	x	x	x		o					
Manufacturer			x							
Country of origin	x	x	x							
Name and address Consignee			x		o					
Name and address Buyer	x	x	x		o					
Name and address Importer										
Country of destination	x	x	x		o					
Declarant identification	x									
Incoterms (Terms of delivery and payment)	?	x	x							
Terms of payment	x		o							


•Identify supply chain actors
Step 1
Step 2
•Identify events & datums
•Select Information Quality Metrics
•Configure IQM according to events & datums
Step 3
Step 4
•Establish rules
•Cross reference
•Score
•Levels of Data Quality
Step 5
Segregation of duties
Computational Auditing
Dashboard


Integrated Data Pipeline
Event: Booking completed
Event: Cleared For export
Event: Export completed
Event: Stuffed & Invoiced
2
DATA
Accuracy
Completeness
Timeliness
Information Quality Assessment
3
Computational Auditing
4
5
SCORE
5
High Reliability
1
Physical
Empty depot
Consignor
City
Port A
P
Port B
P
City
Consignee
Empty depot

- Better risk assessment by governments and businesses
- Detect quality problems of information (incorrect recordings of business activities)
- Businesses will have a framework to show their level of internal control
- Stimulate top-down governmental supervision to horizontal supervision

Implementation steps RBA



1. **Identification of supply chain configuration**
   - Who are the supply chain actors (tradelane partners, including sub-contractors)?
   - How are the supply chain actors related?
   - Data modeling effort
2. **Identification of processes, problems and existing mitigating measures**
3. **Analysis and recommendations**
4. **Validation and refinement**
5. **Operationalization**