Unlocking the Data Economy via Digital Marketplaces
Researching governance and infrastructure patterns in airline context.

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Decreasing technology cost enables companies to collect Operational Data at exponential growing rates. Companies increasingly understand how to apply data science and machine learning to extract business value from large volumes of data. Companies are reluctant to share data when considering the involved risk. Emerging “hub firm” dominance: “While creating real value for users, these companies are also capturing a disproportionate and expanding share of the value, and that’s shaping our collective economic future”. *

Considering value exchange and involved risk raises the main research question: How can operational data be shared in an economically viable way, whilst providing adequate means to reduce risk?
Improve passenger experience at airports

Improve efficiencies across multi modal logistic chains

Increase fleet availability by improving maintenance scheduling by using component health monitoring & prognostics
“Airline operators own the operational data”

Oliver Wyman
THE POWER OF DATA
DATA SHOWING ENGINE PERFORMANCE DEGRADATION
**USE CASE:**
DIGITAL TWIN DEVELOPMENT TO ESTIMATE MAINTENANCE CREDITS

**Research scope**
How to share big data assets across airline operators whilst observing ownership rights?

**Benefits**
- Aircraft Airworthiness
- Maintenance Scheduling
- Aircraft Dispatch

**Digital Twin**

**Algorithm Development**

**Certification**

**Evidence**

**Aviation Authorities**

**Operator Context & Maintenance Experience**

**Operational Data**

**OEM System Knowledge**

**Maintainance Credit Estimate**

**Aircraft System**

**AERIALIS**
ENABLING OPERATIONAL DATA SHARING: REQUIRES STEPS AT DIFFERENT LEVELS

- Common benefit:
  - Define and agree common benefit no single organization can achieve on its own.

- Group rules:
  - Define consortium rules considering data use, access and benefit sharing.

- Organize trust:
  - Organize power and trust as a means to reduce risk for participating members.

- Implement:
  - Implement power and trust via Secure Digital Marketplace concepts.
Enable data sharing needed for the development of digital twins, capable of estimating an aircraft systems airworthiness credit:

- Each time when the digital twin obtains the most recent data from its physical twin.
- Airworthiness credit estimates can be obtained from zero hour onwards.

Allowing improvements to air safety, passenger experience and additional cost reductions by:

- avoiding unplanned maintenance
- increasing maintenance planning flexibility
- moving from fixed interval planning to maintenance when indicated
- less disruptions by avoiding ‘Aircraft On Ground’ situations
Algorithm development will need contribution from multiple parties:

- Operational data collected from physical systems, based on agreement with operators (may inherently require pilot consent)
- Data & engineering knowledge from manufacturer
- Data & repair experience from certified maintenance organizations
- Data & day to day operational knowledge from operators
- Flight context (weather, geologic factors, environment,..)
- Etc.

allowing the development of powerful solutions operators can choose from.

Consequently: sharing data, experience and knowledge across multiple organizations enabling such algorithm development will carry risk.

Trust is considered as a means to reduce risk: Must therefore be arranged and implemented prior to implementing data sharing between organizations.
ESTABLISHING GROUP MEMBERSHIP RULES:
RE-USE AN EXISTING FRAMEWORK

Start with minimal set and expand as experience is gained. Re-use existing industry umbrella by involving e.g.

Topic’s for discussion:

- Member eligibility (e.g. certification requirements)
- Member roles (data supplier, algorithm supplier, consumer..)
- Member interaction rules (offer, contracts, execution, ..)
- Membership in competing markets
- Standards and conduct (including indemnity and limitation of liability)
- Member Obligations
- Data supplier rules
- Algorithm supplier rules
- Marketplace operations
- Service provider requirements
- Financial settlement
- Auditing & dispute settlement
- ...

An SAE International Affiliate
ORGANIZE TRUST AS A MEANS TO REDUCE RISK*
SECURE DIGITAL MARKETPLACE IS ONE WAY

Risk:
Compliancy (privacy, anti-trust,..)
Liability (evidence in legal case)
Unwanted disclosure of IP (competition)
Loss of ownership (economic value)
Enabling additional oversight (cost)
etc., etc...

Means:
Trust and power are both means capable of reducing risk

How to organize trust and power? -> The Secure Digital Market Place concept


Performing research in collaboration with University of Amsterdam Faculty of Law
SECURE DIGITAL MARKETPLACE CONCEPT: COMBINED BUSINESS, LEGAL AND COMPUTER SCIENCE RESEARCH

- National Law & Regulations
  - Market rules
  - Member admission
- Secure Digital Marketplace Member Organisation
  - Algorithm supplier(s)
  - Data supplier(s)
- Agreement
  - Infrastructure Patterns
  - Deployment Specification
- Registry
- Future Internet Infrastructure: Software Definable - No Bandwidth Limitation
- Dispute Resolution
- Customers
- Accounting & Auditing

Business & Legal Research
Computer Science Research
Blockchain/Finance Research
RESEARCHING IMPLEMENTATIONS: INVOLVING RESEARCH AND INDUSTRY

GLOBAL RESEARCH INFRASTRUCTURES

Data Sharing Infrastructure Model
Research using Future Internet capabilities

GLOBAL DATACENTER INFRASTRUCTURES

How to create a Global Digital Marketplace Ecosystem

Data Transfer Node at KLM fieldlab with 100 gbps link to enable SDMP research thanks to UvA, SURFnet and Ciena

AM3 and AM4 Datacenters
Amsterdam Science Park
SV10 Datacenter Silicon Valley
Envisaged Implementations: Involving Research and Economic Initiatives

- Envisaged Research test-bed
  - Funding Agency: Big Data Hub or Industry initiative funding
  - Topsector Funding
  - International Networking: ESnet
  - GÉANT
  - Regional / National Networking: CENIC
  - SQuaR
  - LEARN
  - SURFNET
  - Local University: Stanford
  - Georgia Tech
  - University of Houston
  - SAE AeroSpace Group
  - HM-1 working group
  - Use Case on accelerometer sensor Big Data

- Envisaged Economic Use
  - Amsterdam Economic Board
  - Amsterdam Science Park
  - University of Amsterdam
  - VU
  - Data Owners
  - AmsDX facilitator
  - Open Digital Market
Enterprises join a membership organization to achieve a common goal no single enterprise can achieve on its own.

Membership rules are defined by rulemaking & standards processes, subsequently execution, enforcement and judgement is organized by membership organization as a means to reduce risk.

Members arrange data sharing and processing via agreements deployed in an infrastructure, provided by a secure digital market place owned by its members.

Members achieve common benefits in a transparent way. Members trust its operation based on use of accounting & auditing mechanisms, relying on market dispute resolution mechanisms.