Unlocking the Data Economy via Digital Marketplaces

Researching governance and infrastructure patterns in airline context.

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SURF Exhibition Booth #857

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BUSINESS CONTEXT

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".* *

Affecting sharing of operational data across companies to further increase the potential of creating business value no single organization can create on its own.

* M. Iansiti, K.R. Lakhani, *Managing our hub economy,* Harvard Business Review, pg. 85-92, Sep/Oct 2017

DATA IS INCREASINGLY CONSIDERED AN ASSET

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?

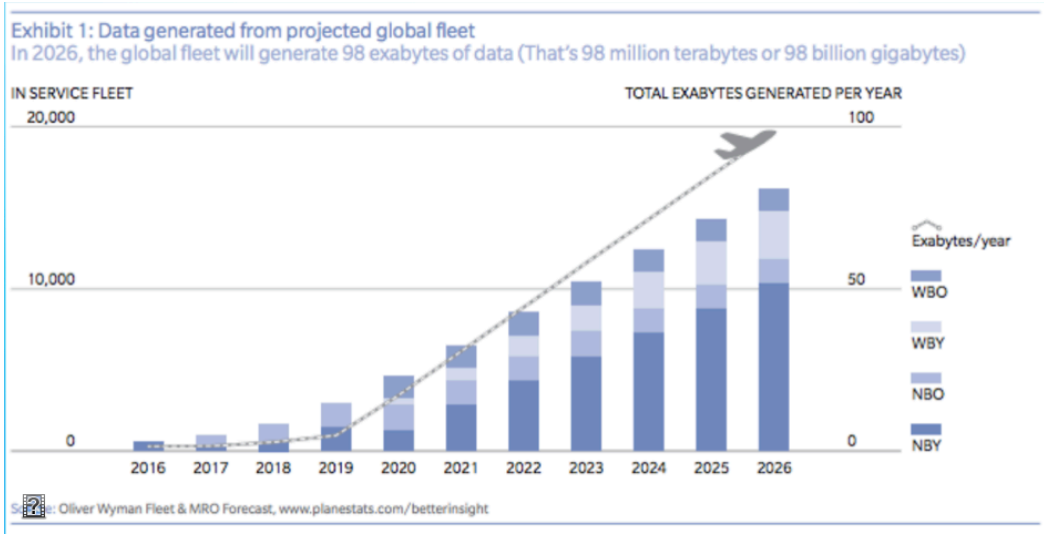
DATA REPRESENTING VALUE IN AIRLINE CONTEXT

Improve passenger experience at airports

Improve efficiencies across multi modal logistic chains

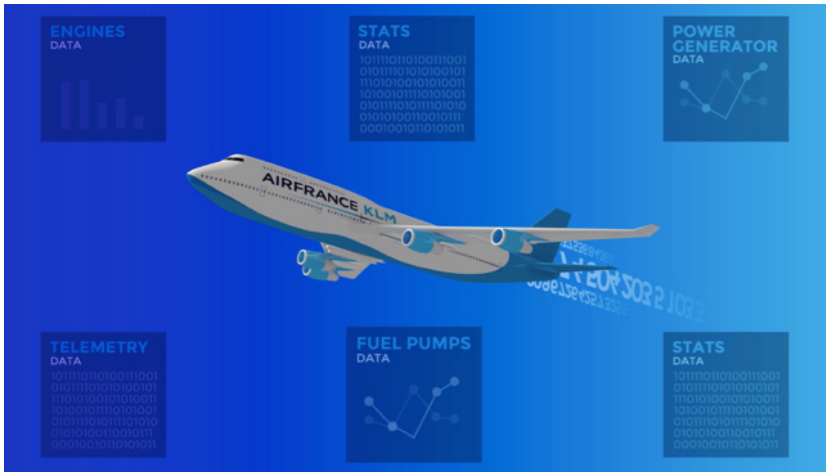
Increase fleet availability by improving maintenance scheduling by using component health monitoring & prognostics

EXPECTED VOLUMES
OF AIRCRAFT DATA



"Airline operators own the operational data"

Oliver Wyman

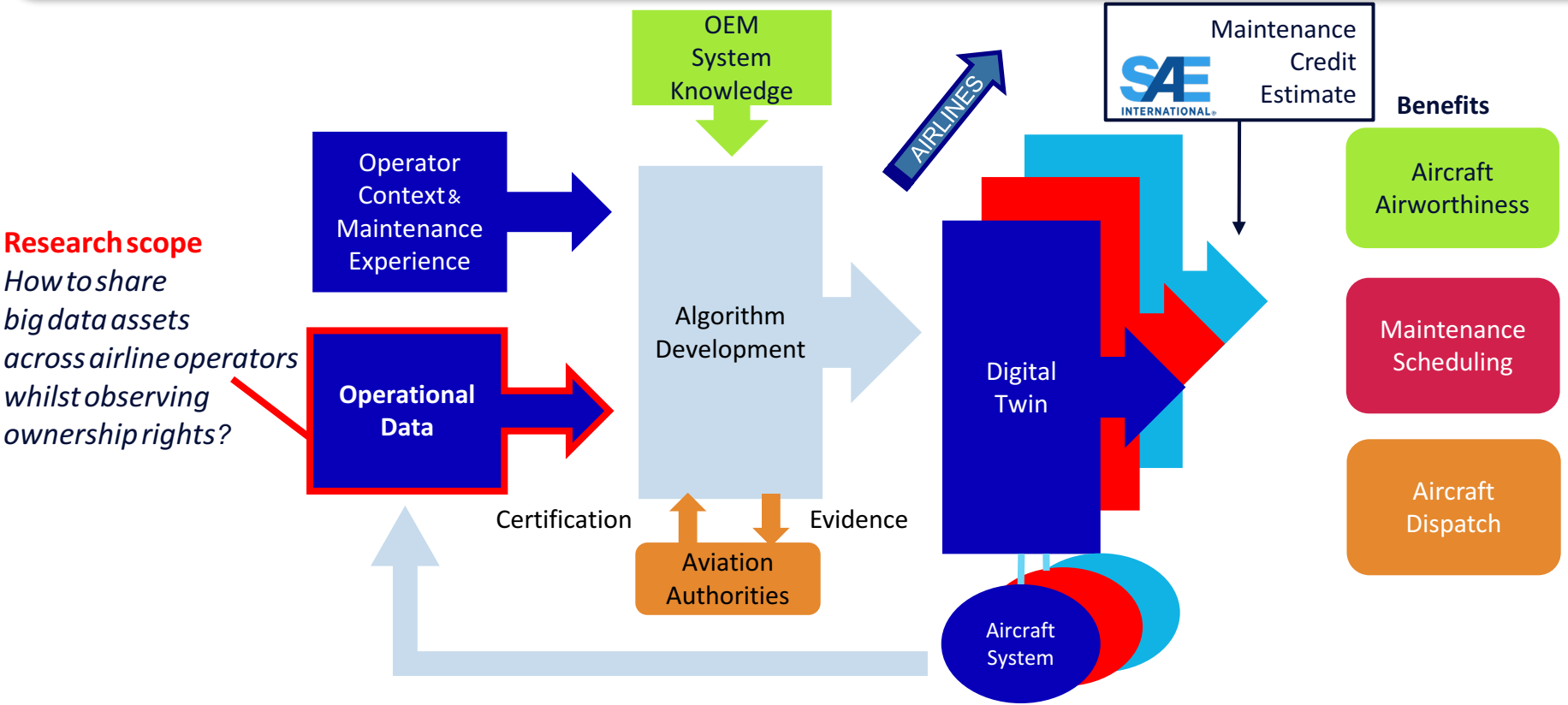


THE POWER OF DATA

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?

ENABLING OPERATIONAL DATA SHARING:

REQUIRES STEPS AT DIFFERENT LEVELS

Comon 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

DEFINE AND AGREE COMMON BENEFIT:

DEVELOP MAINTENANCE CREDIT SYSTEM (SAE PROJECT)

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:
NEED FOR DATA SHARING INVOLVING RISK

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. SAE ITC An SAE International Affiliate

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
- …

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...

Performing research in collaboration with University of Amsterdam Faculty of Law

Means:

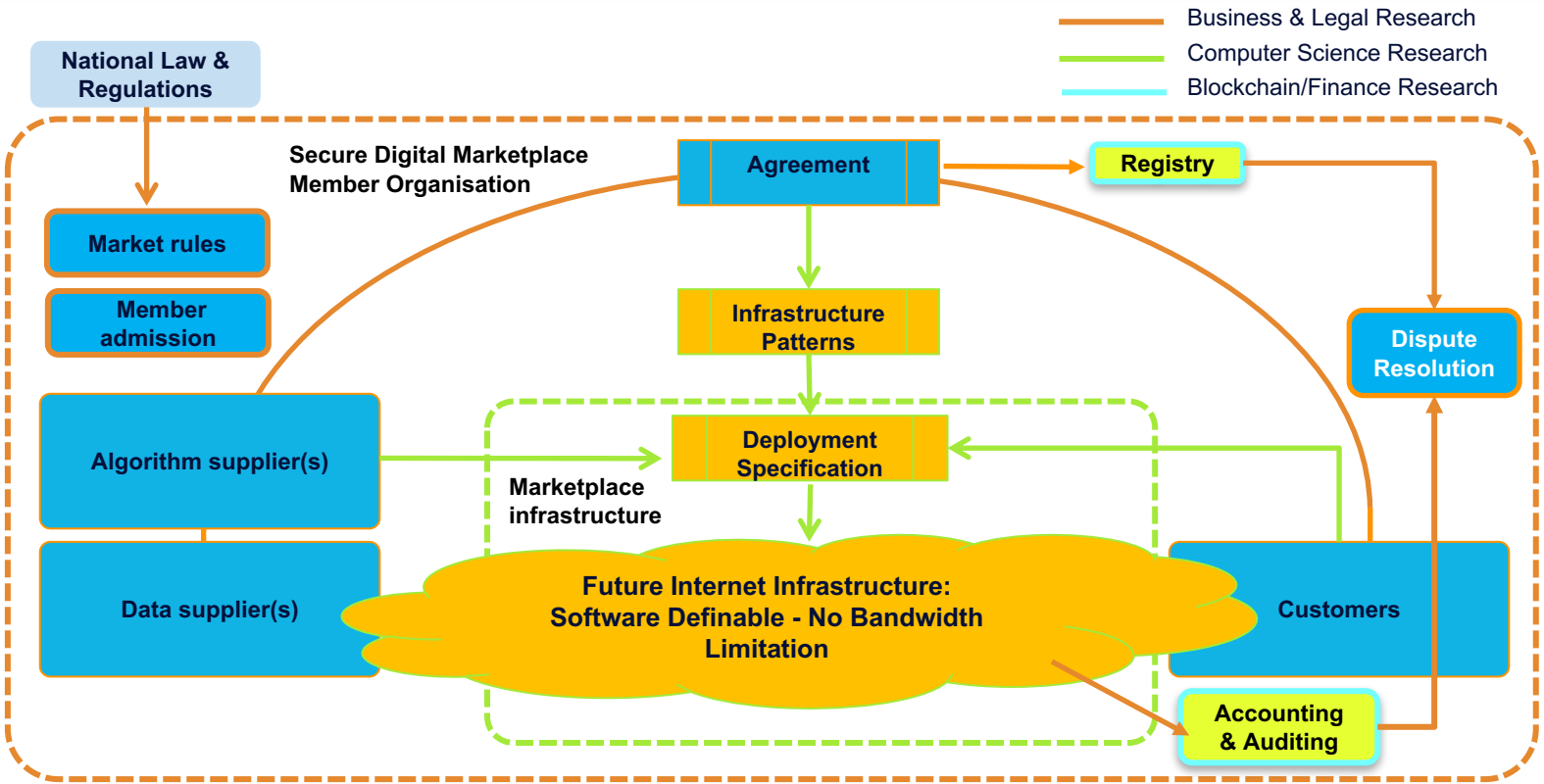
Trust and **power** are both means capable of reducing risk

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

*) Chapter 5 PhD thesis “Multi-domain authorization for e-Infrastructures”, Leon Gommans, UvA 2014.

SECURE DIGITAL MARKETPLACE CONCEPT:

COMBINED BUSINESS, LEGAL AND COMPUTER SCIENCE RESEARCH

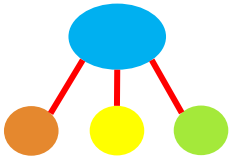


RESEARCHING IMPLEMENTATIONS:
INVOLVING RESEARCH AND INDUSTRY

GLOBAL RESEARCH INFRASTRUCTURES

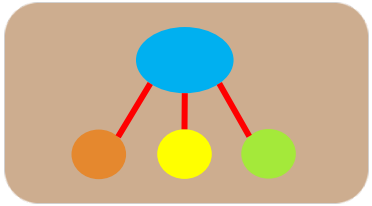
Data Sharing Infrastructure Model Research using Future Internet capabilites

UNIVERSITEIT VAN AMSTERDAM



Research collaboration

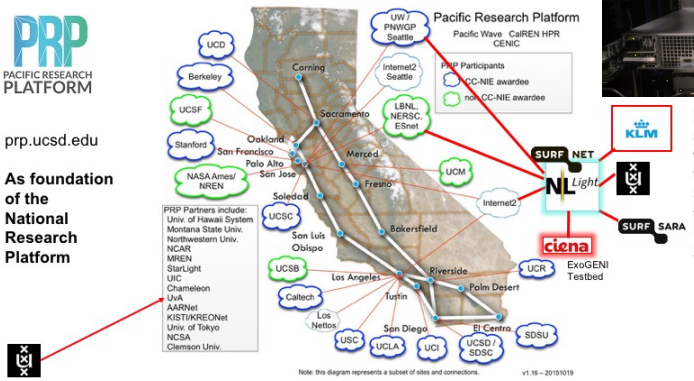
GLOBAL DATACENTER INFRASTRUCTURES



PRP PACIFIC RESEARCH PLATFORM

prp.ucsd.edu

As foundation of the National Research Platform



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

How to create a Global Digital Marketplace Ecosystem

AM3 and AM4 Datacenters Amsterdam Science Park

SV10 Datacenter Silicon Valley

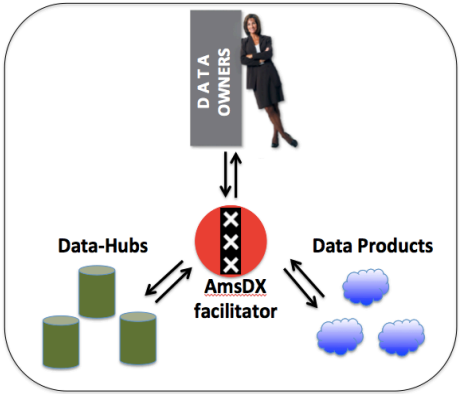
ENVISAGED IMPLEMENTATIONS:
INVOLVING RESEARCH AND ECONOMIC INITIATIVES

Envisaged Research test-bed

Funding Agency	NSF	Big Data Hub or Industry initiative funding		NWO Topsector Funding
International Networking	INTERNET2	ESnet		GÉANT
Regional / National Networking	CENIC Connecting California	SoX Southern Crossroads	LEARN Lonestar Education and Research Network	SURFNET
Local University	Stanford	Georgia Tech	UT Dallas	Universiteit van Amsterdam
Aircraft MRO & OEM	Boeing	Delta Air Lines	Bell Helicopter	Air France KLM
Industry Standards Body	SAE International	SAE AeroSpace Group HM-1 working group Use Case on accelerometer sensor Big Data		

Envisaged Economic Use

amsterdam economic board · Amsterdam Science Park · Universiteit van Amsterdam · VU Vrije Universiteit Amsterdam



Open Digital Market

dutch digital delta connect and create · NWO · BIG DATA VALUE CENTER · ECP · TNO innovation for life · ciena · ABN·AMRO · ING · KPMG

UNLOCKING THE DATA ECONOMY

CONCLUSION

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.