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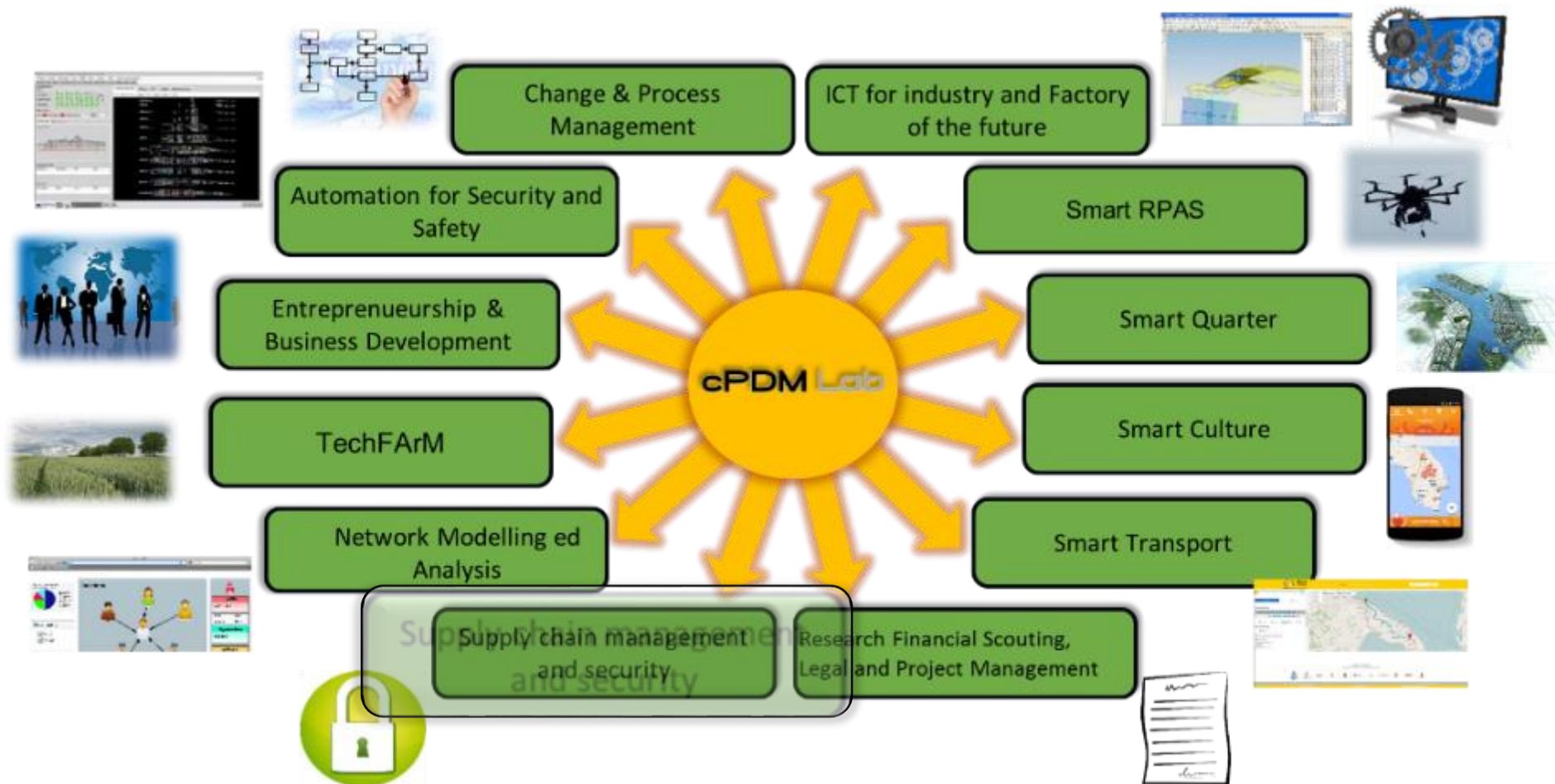
Privacy-Preserving Computation in the Cloud
<http://practice-project.eu/>

Collaborative Supply Chain and Data Protection

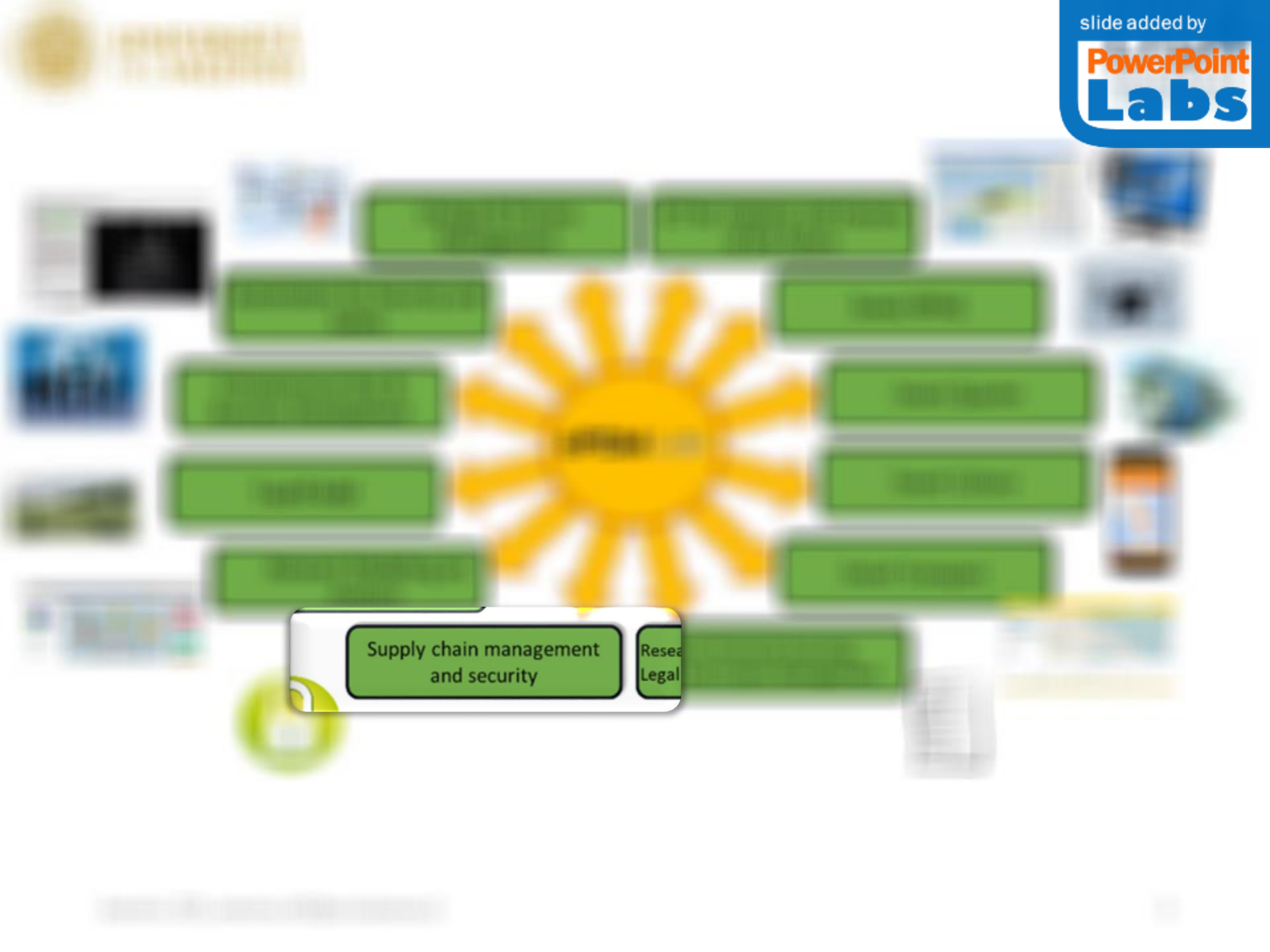
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Fabbrica Futuro, Bari, 05/10/2016





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L'innovazione tecnologica come fattore abilitante dello sviluppo e della crescita



Antonio Zilli

Aeronautic industry	Knowledge management	TeSCHeT	
	Social network analysis	iDF KITE.IT	
	Value and supply network	KHIRA	
	Secure collaboration	SecuSCM PRACTICE	

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(<http://bit.ly/2dmCDNS>)

Agenda

- PRACTICE project
- Aeronautic supply chain
- Process optimization requirements
- Data leakage risks and data protection levels
- Prototype application and economic benefits
- Conclusions

PRACTICE project

... a **secure cloud framework** ... of advanced and practical cryptographic technologies providing sophisticated **security and privacy** guarantees for all parties in cloud computing scenarios.

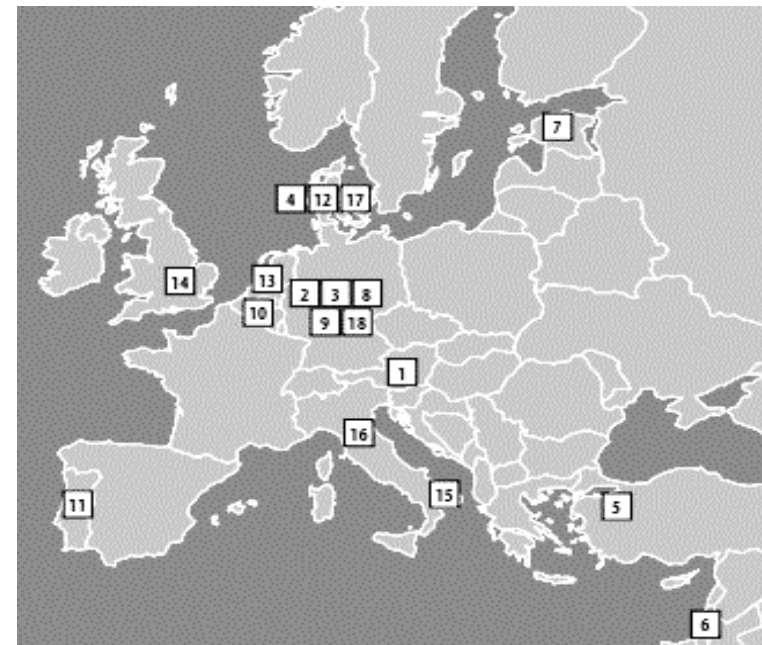
... PRACTICE project goals:

- **data confidentiality and integrity** (no need to trust cloud providers);
- **computation on encrypted data** (insiders cannot disclose secrets);
- **flexible architecture and tools** (seamless migration towards new platforms while gradually adding levels of protection).

... The PRACTICE project will:

- enable European customers to **save costs** by globally outsourcing to the cheapest providers while still maintaining guaranteed security and legal compliance;
- deliver a Secure Platform for Enterprise Applications and Services providing application servers and automatic tools enabling **privacy-sensitive applications on the cloud**;
- protect user data from cloud providers and other users, **supporting cloud-aided secure computations** by mutually distrusting parties.

PRACTICE project



Project start: 1st November, 2013

Project duration: 3 years

Total costs: 10.465.059

PRACTICE 

WP24: Supply chain prototype

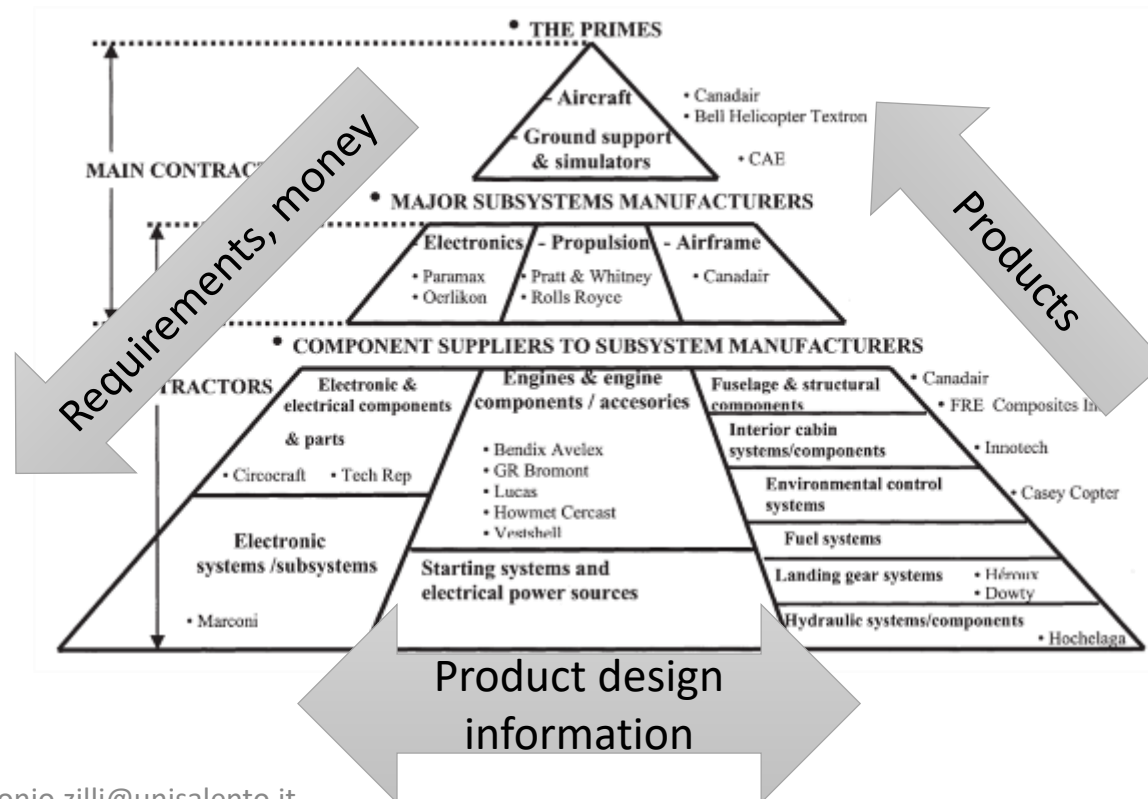
PRACTICE PROJECT



WP24: Supply chain prototype

Aeronautic new product development supply chain

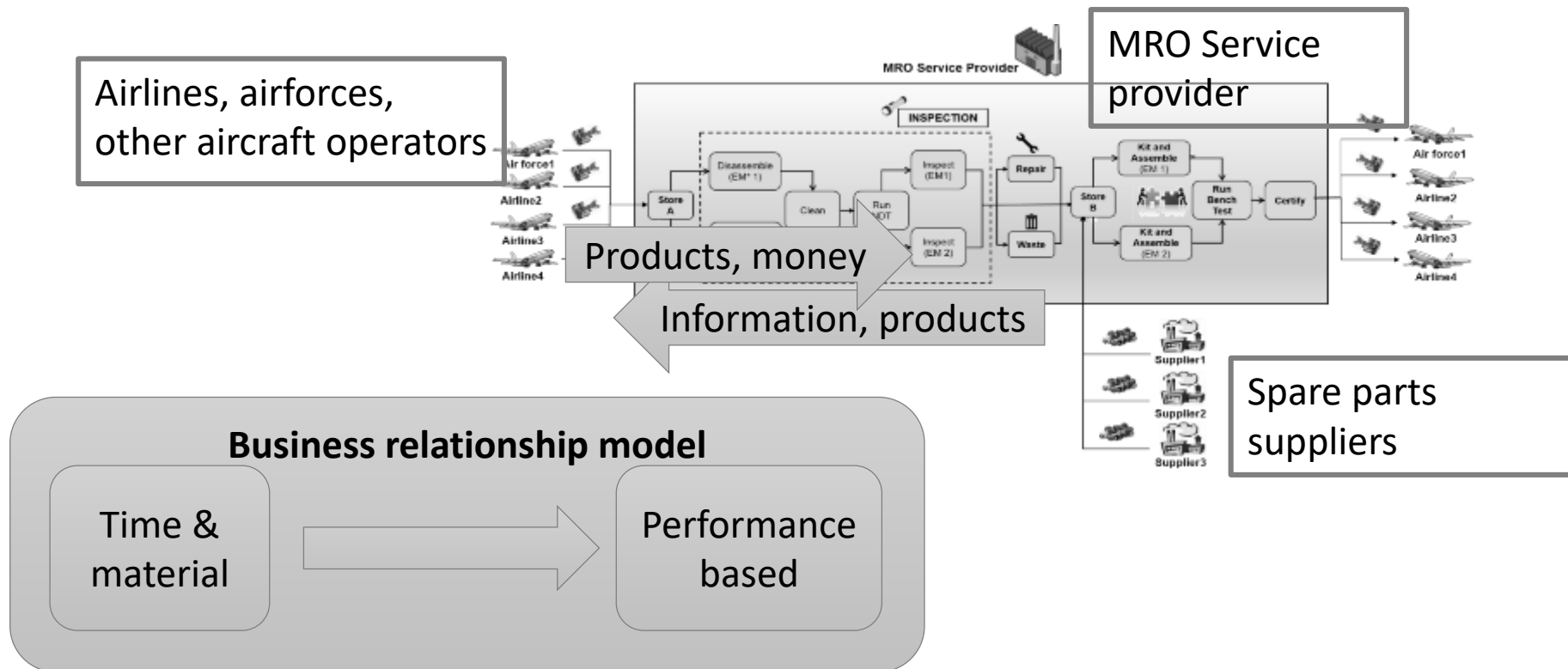
The supply chain is the set of actors sharing material, information and financial information within organizational units, so as to meet consumer' need and as a result, enhance the entire supply chain involved.



MRO supply chain

The aeronautic aftersales supply chain has the role of keeping aircraft systems into conditions where they can perform their function.

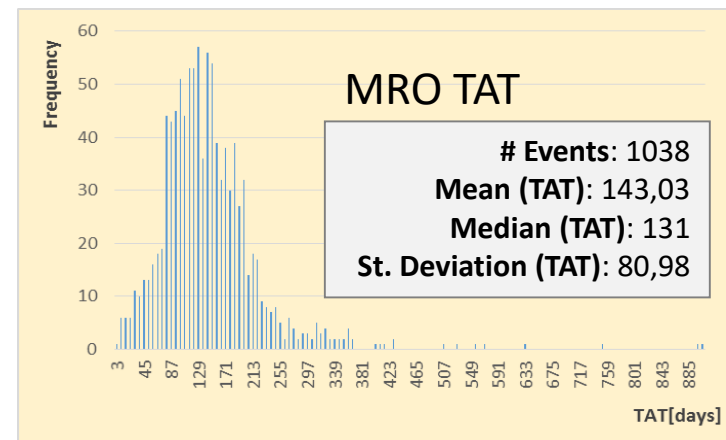
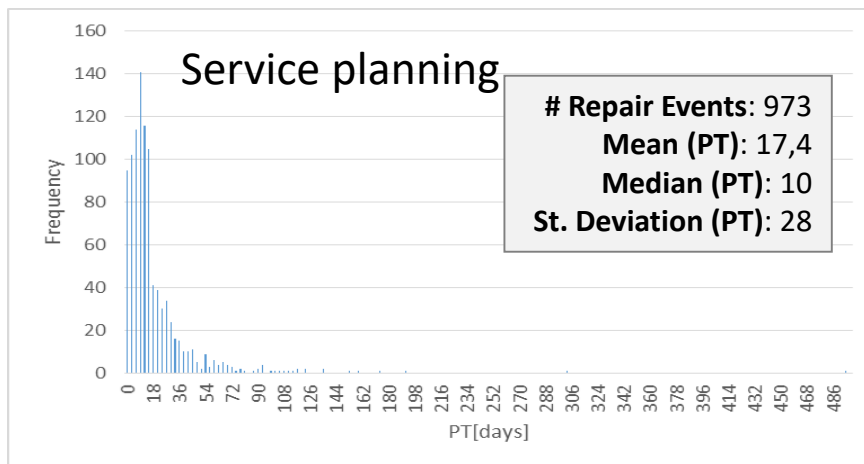
In many cases, aircrafts need to be shut down for maintenance.



MRO performances

Dataset related to the JT8 engine

About 1000 MRO events

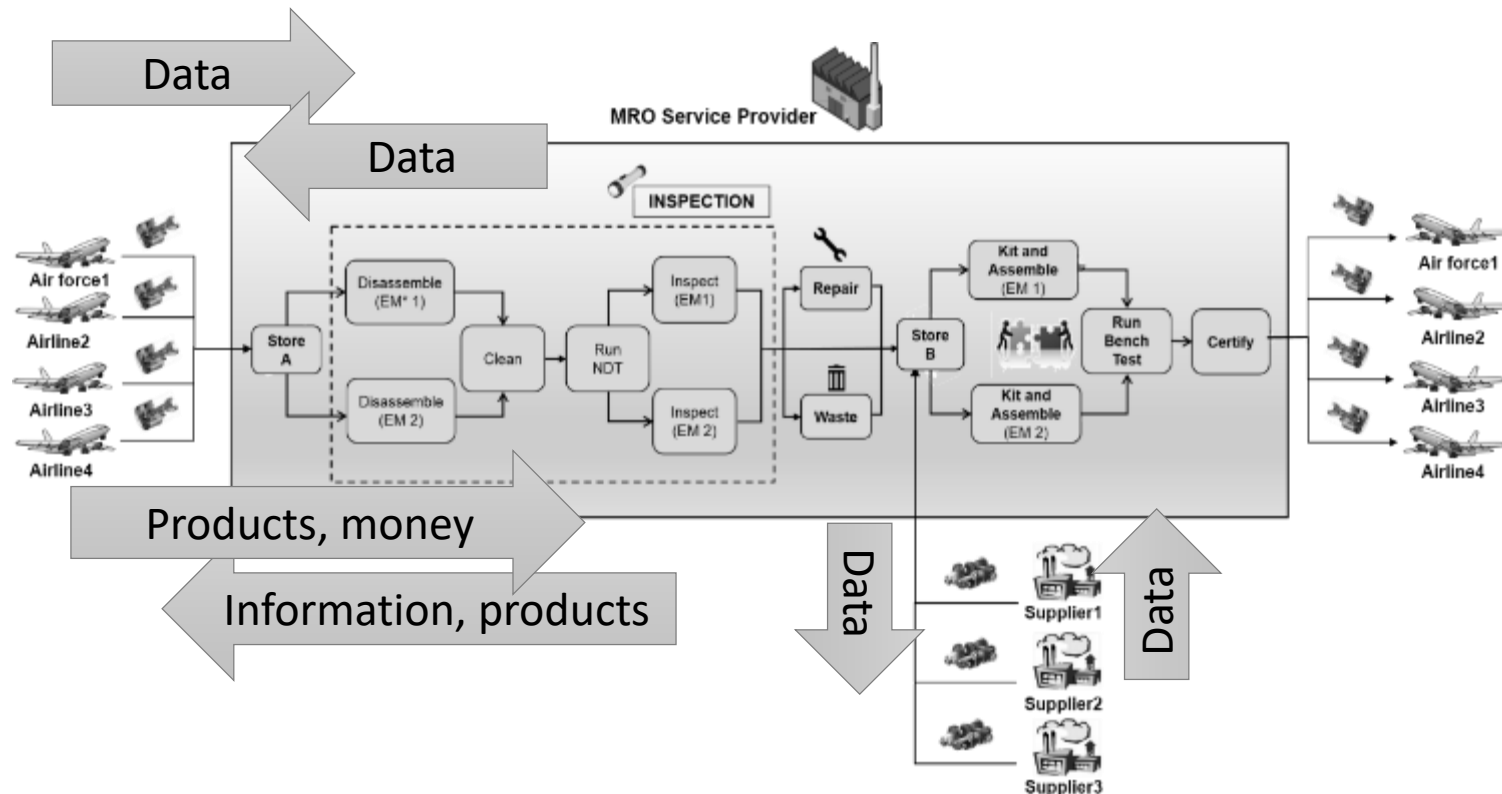


“... the main barriers to the fulfilment of the business objectives of MRO companies are component delays during procurement and repair. 41% of the surveyed companies answered that they have to deal with this delays.”

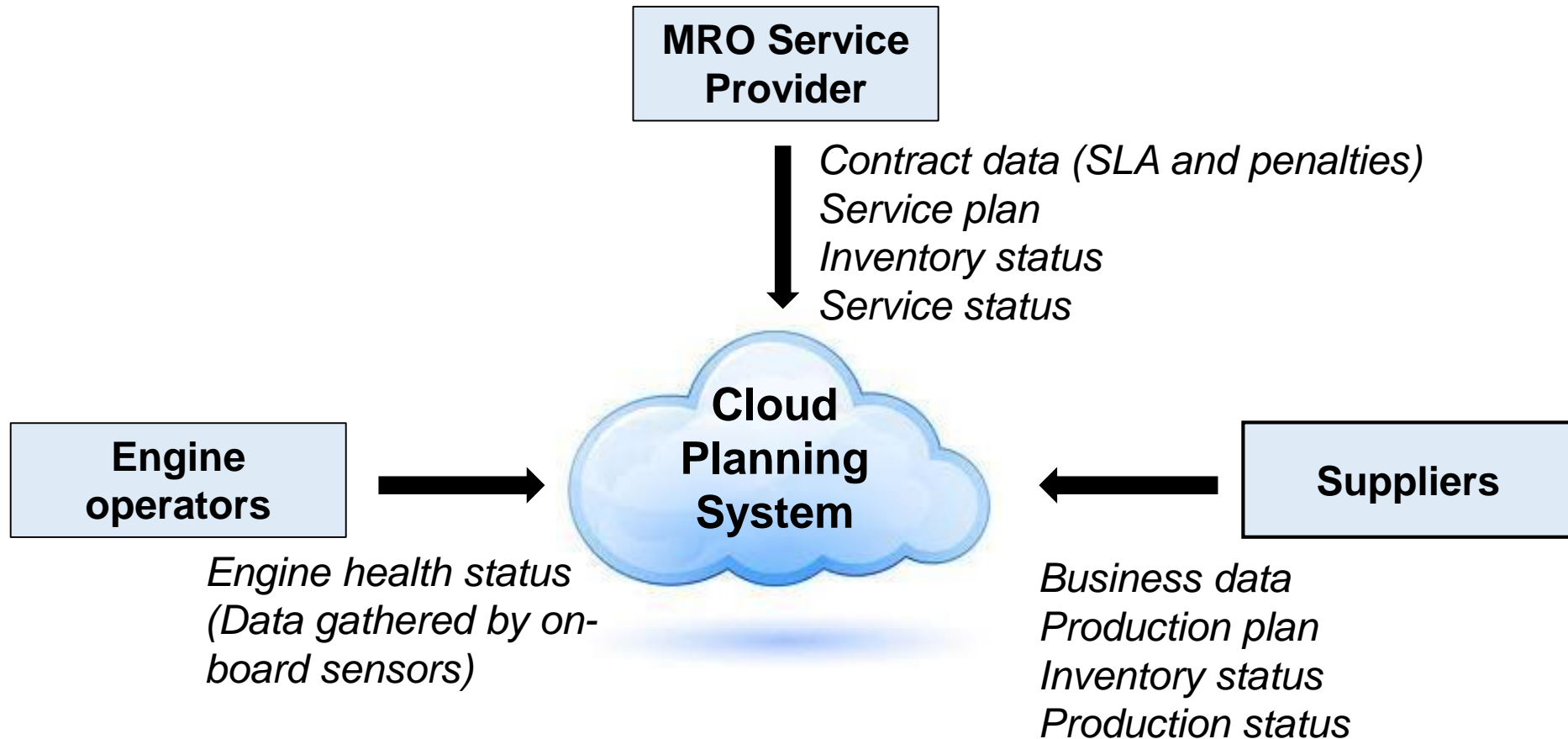
Remenyi, C., Staudacher, S., 2011. MRO: Organisation der Produktion sowie von Produktionsplanung und–steuerung. Wt Werkstattstechnikonline2011(4), 242–248.

MRO supply chain: optimization

To improve effectiveness and efficiency of inventory management policy, more accurate demand forecasts and service plans are required



Demand forecasting and service planning

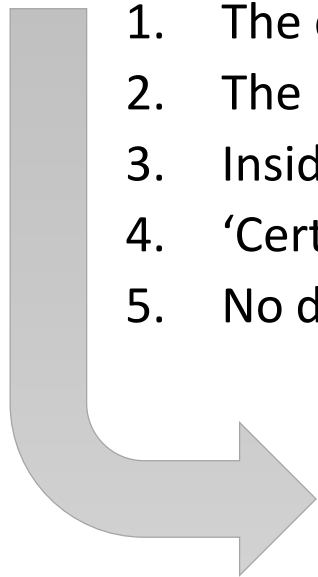


Survey on cloud application diffusion

Sample: ICT, Supply chain

- Results:

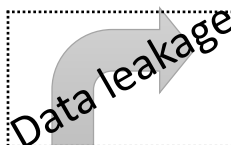
1. The cloud diffusion is obstructed by security issues;
2. The main source of threat is the cloud service provider;
3. Insiders are a concern, but not the main one;
4. 'Certification' is the main source of trust;
5. No data protection when data are shared with partners.



**Secure Computation technology satisfies
these requirements**

Data leakage risks

- Data leakage risks depend on leaked data, business role of owner and business role of leakage recipient
- Cloud service provider (admin) is part of the risks model

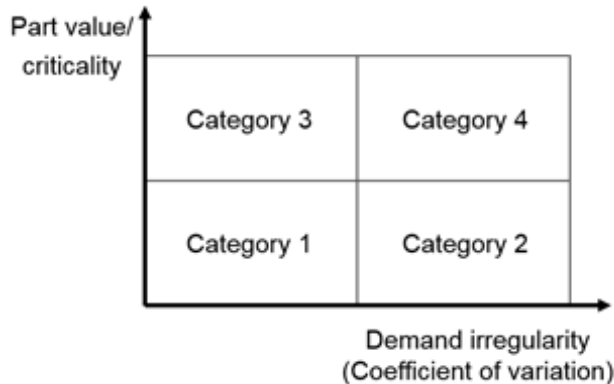
 Data leakage	Airline/Air Force	MRO SP		Supplier		Admin
		Same sc	Other sc	Components manufacturer	MRO SP	
Airline/Air force data	Competitive advantage	Bargaining power	Bargaining power	Bargaining power	Bargaining power	Lost profit
MRO SP data	Bargaining power	/	Competitive advantage	Bargaining power	Competitive advantage + Bargaining power	Lost profit
Supplier data	Bargaining power on MRO SP	Bargaining power	Competitive advantage on other MRO SP + Bargaining power	Competitive advantage	Competitive advantage + Bargaining power	Lost profit

Data protection level measurement

- Sample: IT, Supply chain dept
- People are asked to evaluate how much critical is if suppliers, competitors and customers access selected types of data,
- Individual evaluations are combined, public information and business historical relationships are taken in consideration too

CONFIDENTIAL DATA	PROTECTION LEVEL (scale: 0-75)
Usage condition of the engines fleet	51,3
MRO process data	57
Production plans and the inventory status of spare parts suppliers	55

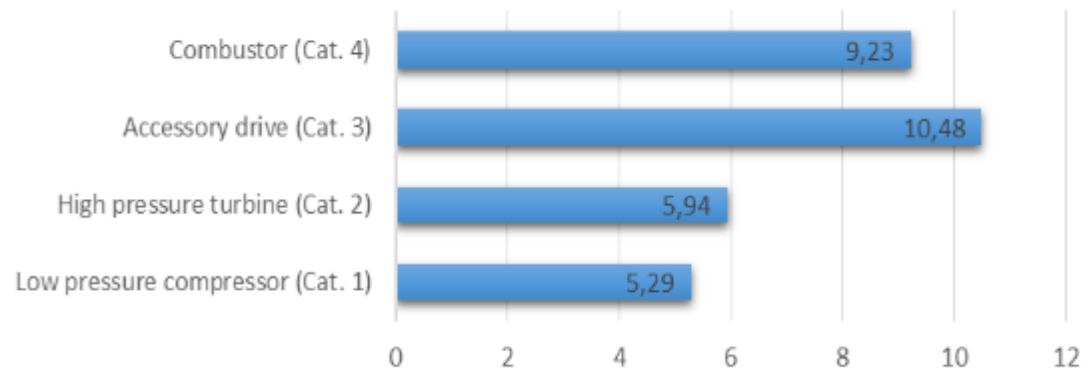
Benefit assessment simulation*



1 - Input: the inventory setting model (order costs, unit costs, penalty costs, lead times, ...) and the demand process (mean and std. dev of demand, ...) for a certain product

2 - Simulation (in 100 runs) of the costs over 24 periods (standard VS improved forecasts)

3 - Output: Where are the quick wins? What is the range of cost reduction we can expect?



Methodology design and development

**Simplified engine composition is considered, realistic part properties are used*

Methodology for securing supply chain collaboration (on cloud applications)

1. Design novel collaborative inter-organizational processes
2. Identify involved data
3. Evaluate data leakage risks (on a owner/receiver perspective)
4. Measure data protection level (wrt all possible receivers)
5. Develop secure cloud application
6. Assess application functionalities
7. Assess security performances

Result: a secure cloud supply chain management system implementing collaborative forecasting functionalities able to improve performance of the aeronautic MRO service supply chain by both increasing service level agreement and reducing service (inventory) costs

For more information: www.practice-project.eu

Conclusions

- Supply chain wide collaboration and cloud application diffusion are obstructed by confidential data protection needs
- Novel technologies (cloud + secure computation) provide higher security performances
- Process-customized algorithms and protocols are required
 - Firms are required to model supply chain collaborative processes with respect to their business models
 - Firms are required to measure data confidentiality and data protection level with respect to all type of partners
- Process models and data protection levels are mandatory input of any secure cloud supply chain system