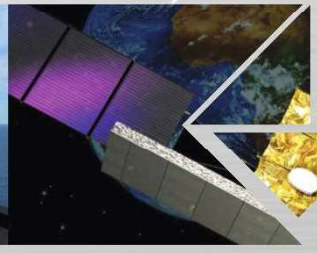
FRONTEX
EUROPEAN BORDER AND COAST GUARD AGENCY

Technology Foresight Dialogue

Frontex - European Border and Coast Guard Agency
Pl. Europejski 6, 00-844 Warsaw, Poland

Warsaw, 16.05.2019



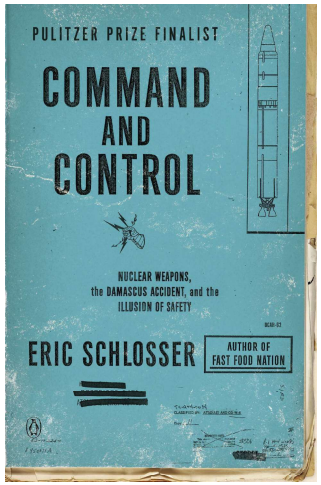
LEONARDO

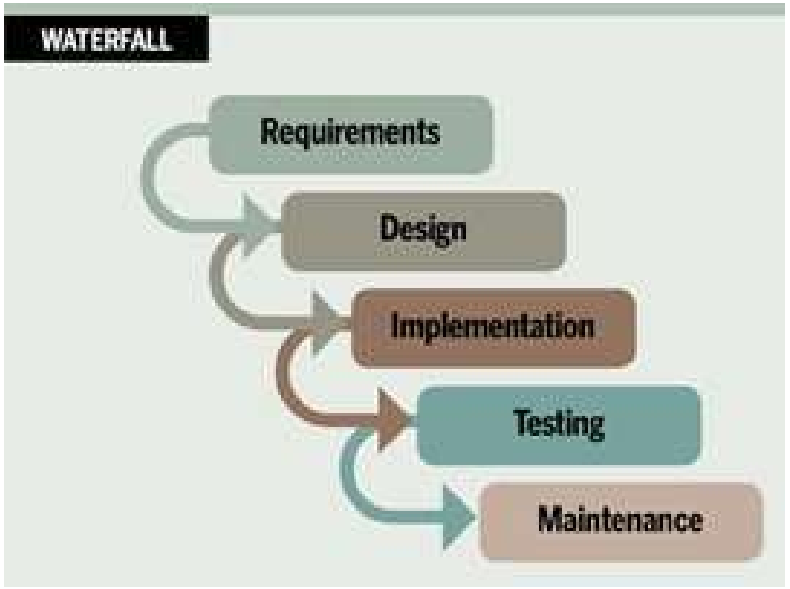
1948 • 2018

Douglas, Isle of Man, 1948

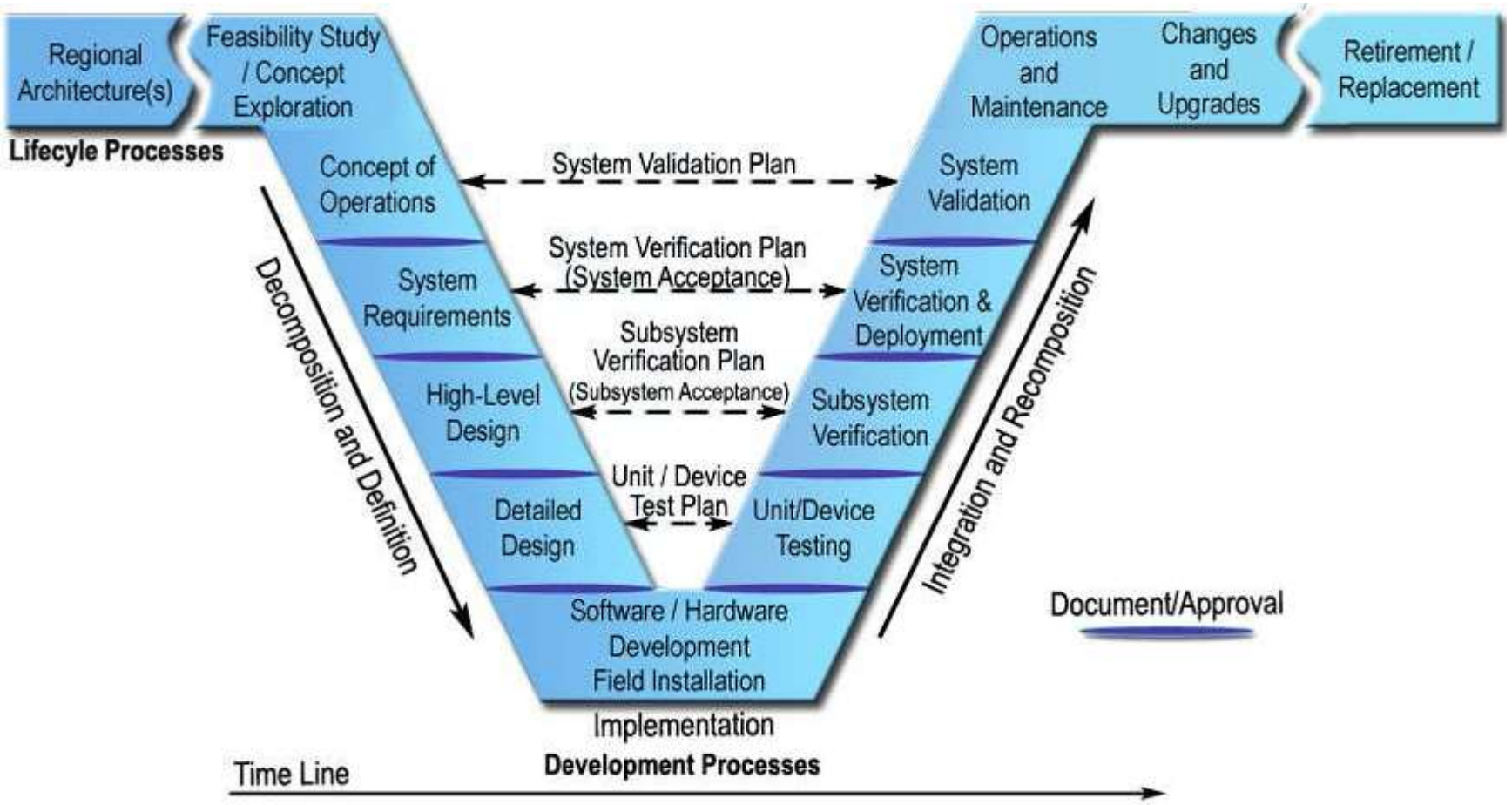
source: collection D. Zwijnenburg, IALA Manual 2008

System Engineering “Waterfall” Model

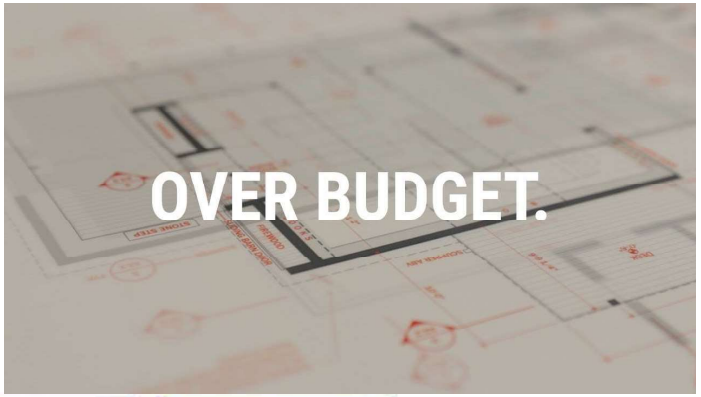


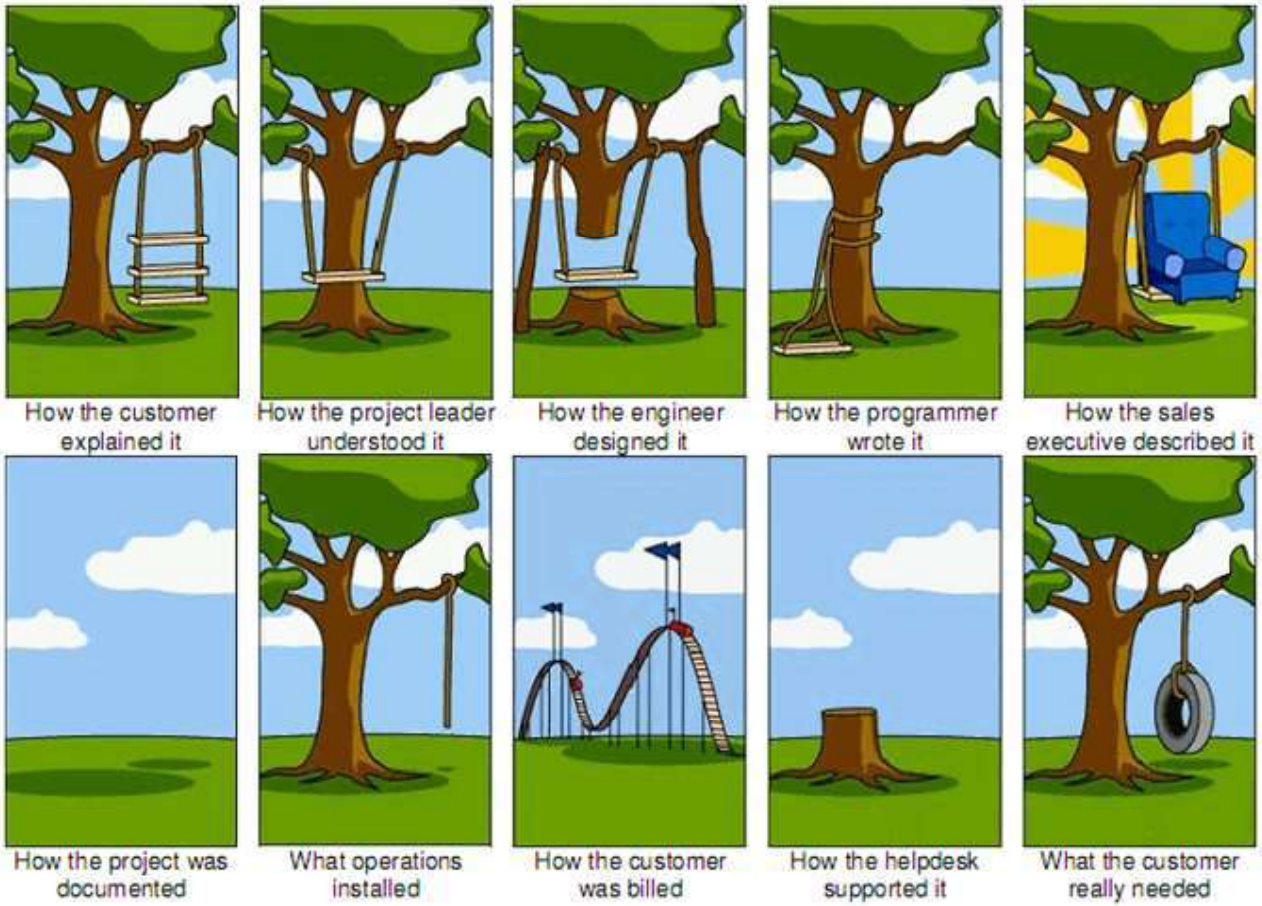


System Engineering “V” Model 1/2



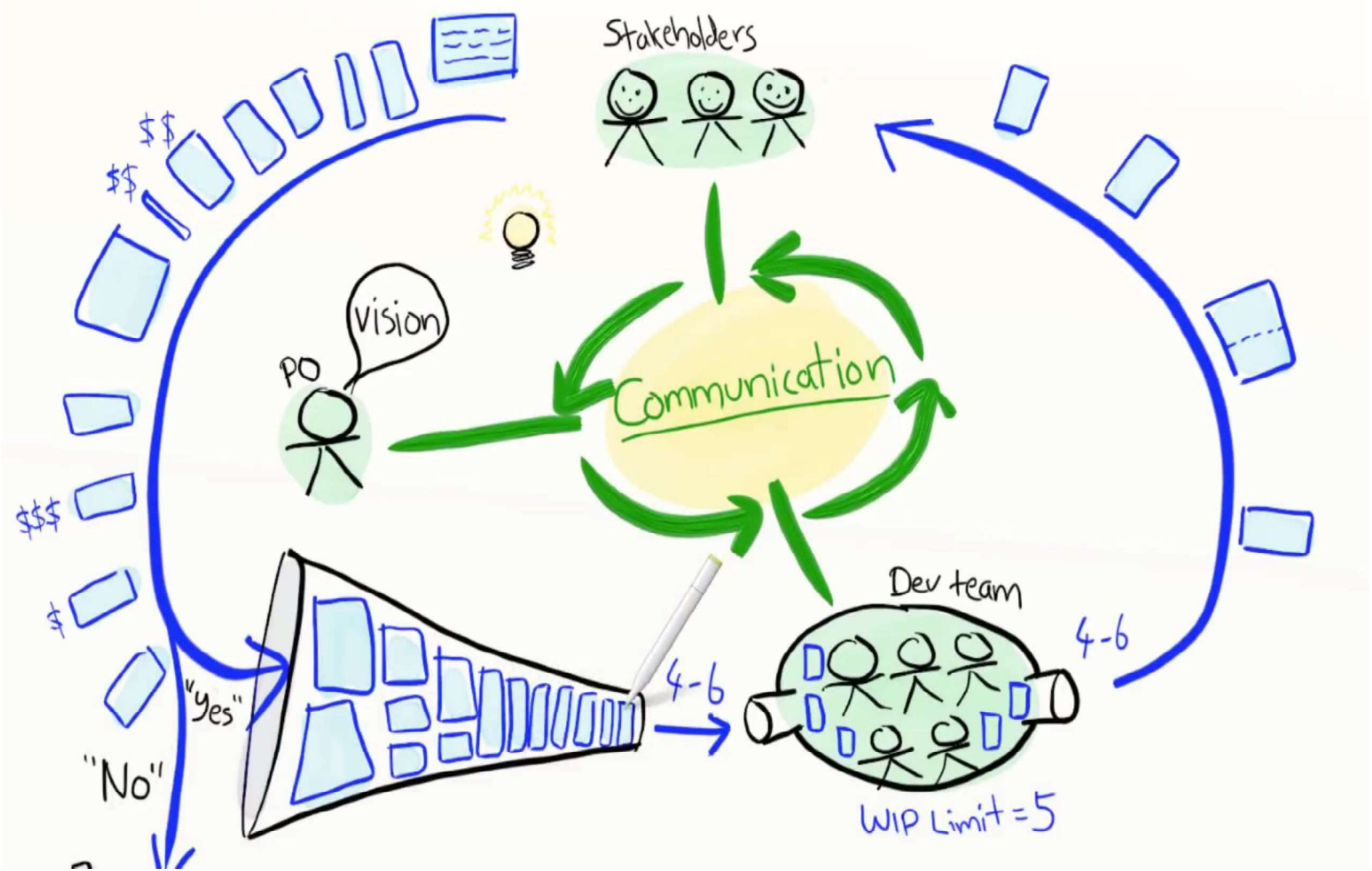
System Engineering "V" Model 2/2





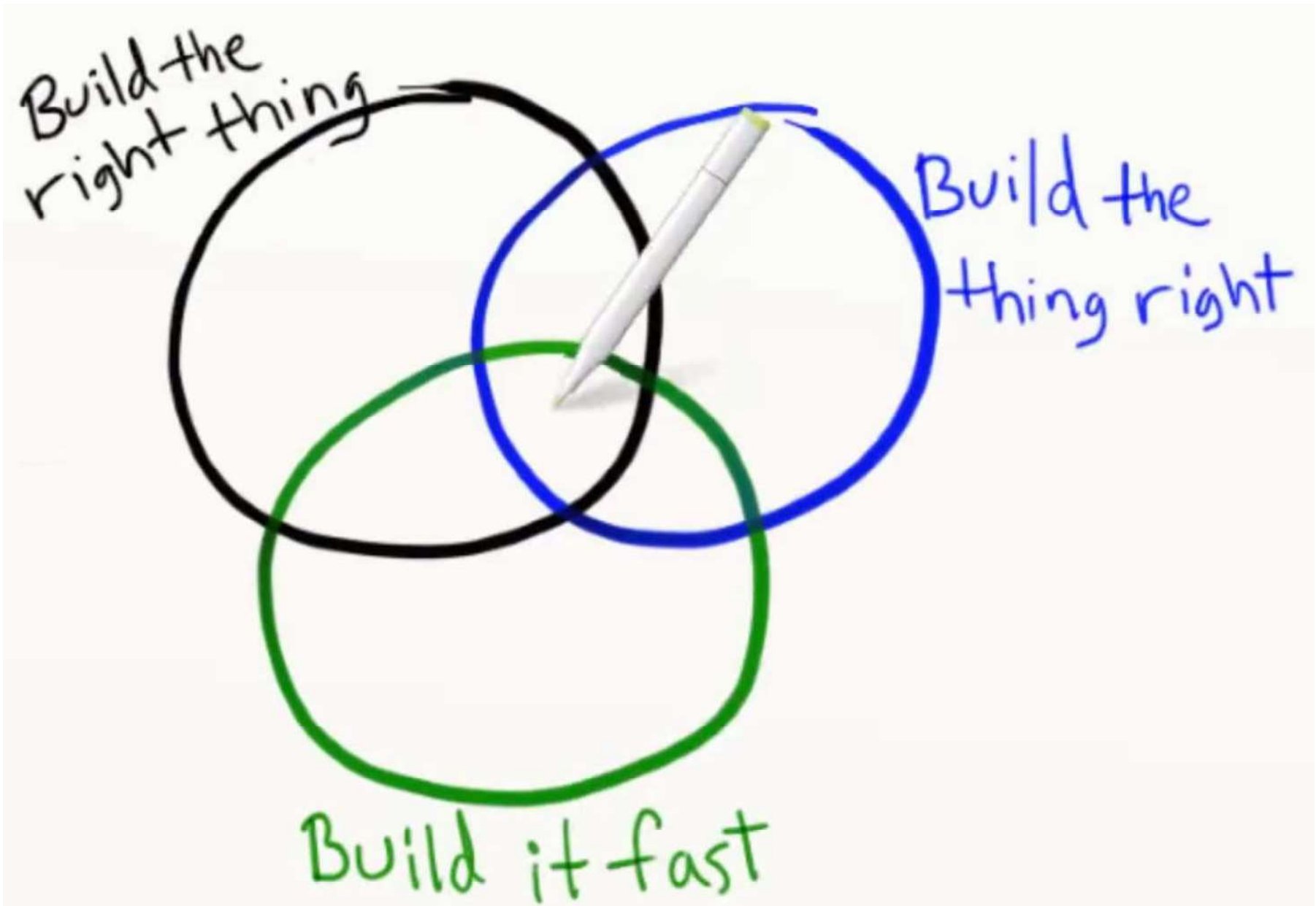
System Engineering “Agile” Model 1/4

System Engineering “Agile” Model 2/4



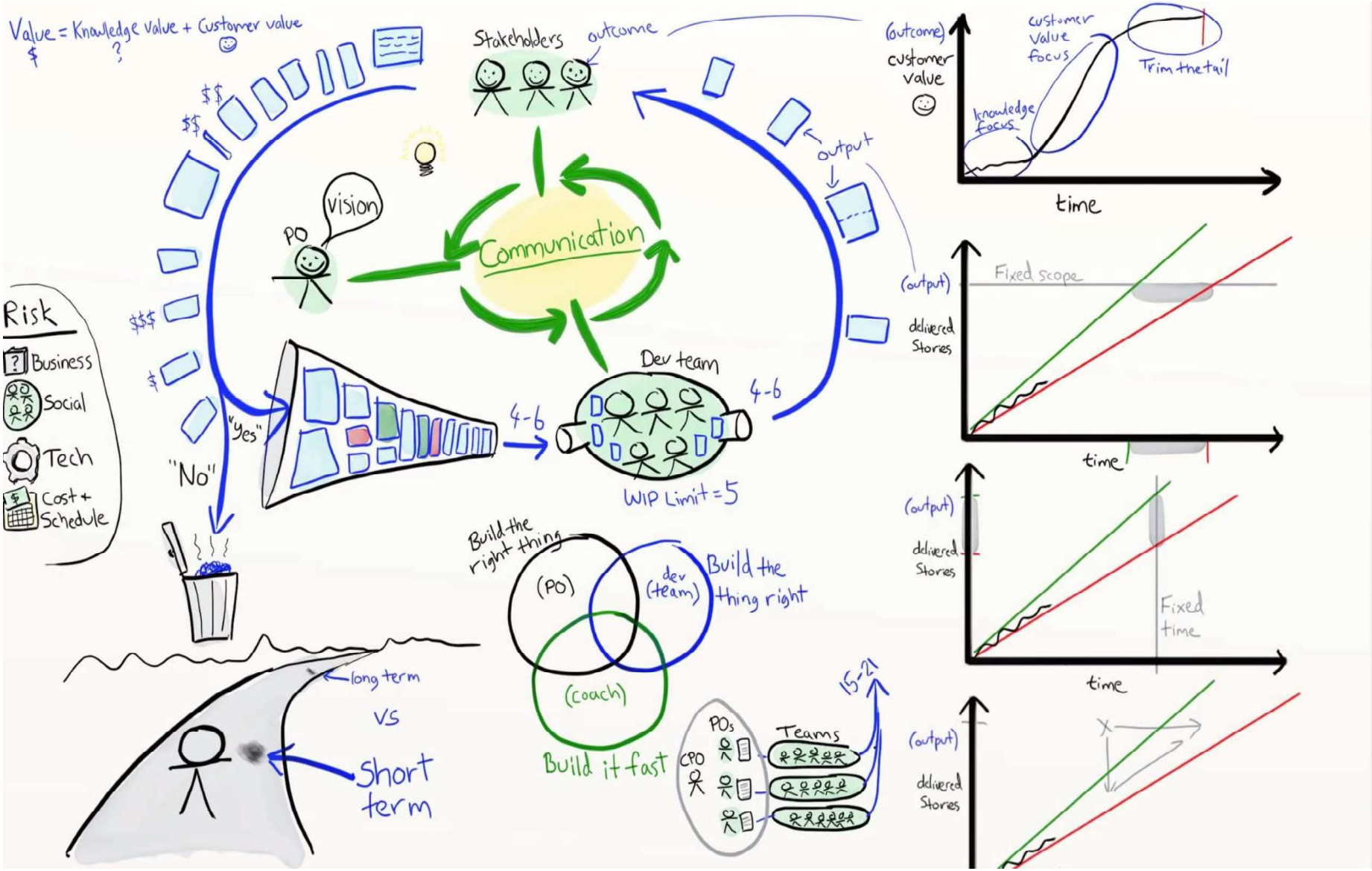
Source: Henrik Kniberg “Agile Product Ownership in a Nutshell”, 2012

System Engineering “Agile” Model 3/4



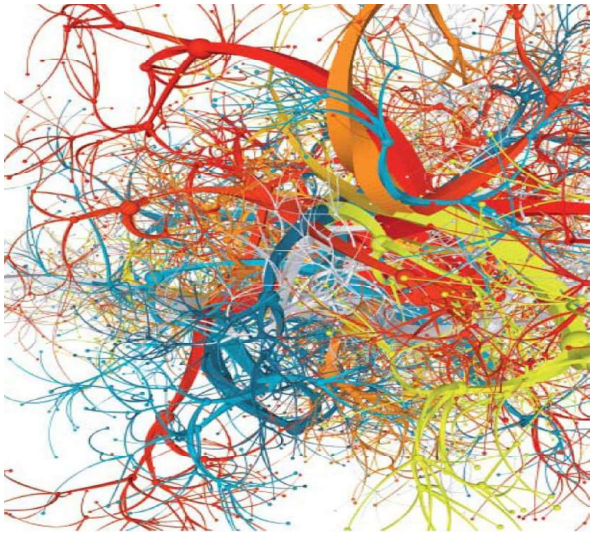
Source: Henrik Kniberg “Agile Product Ownership in a Nutshell”, 2012

System Engineering "Agile" Model 4/4



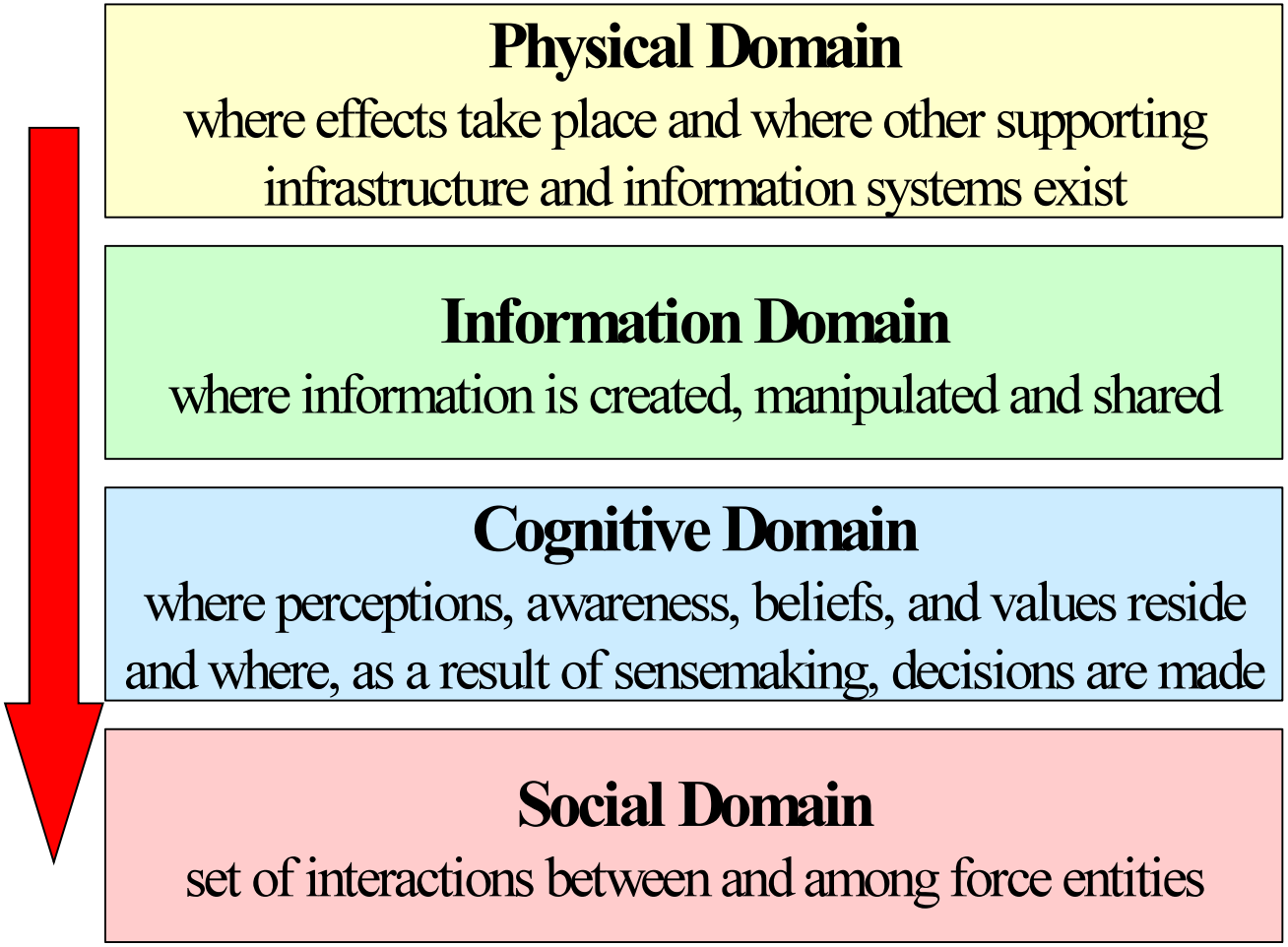
Source: Henrik Kniberg "Agile Product Ownership in a Nutshell", 2012

Complexity

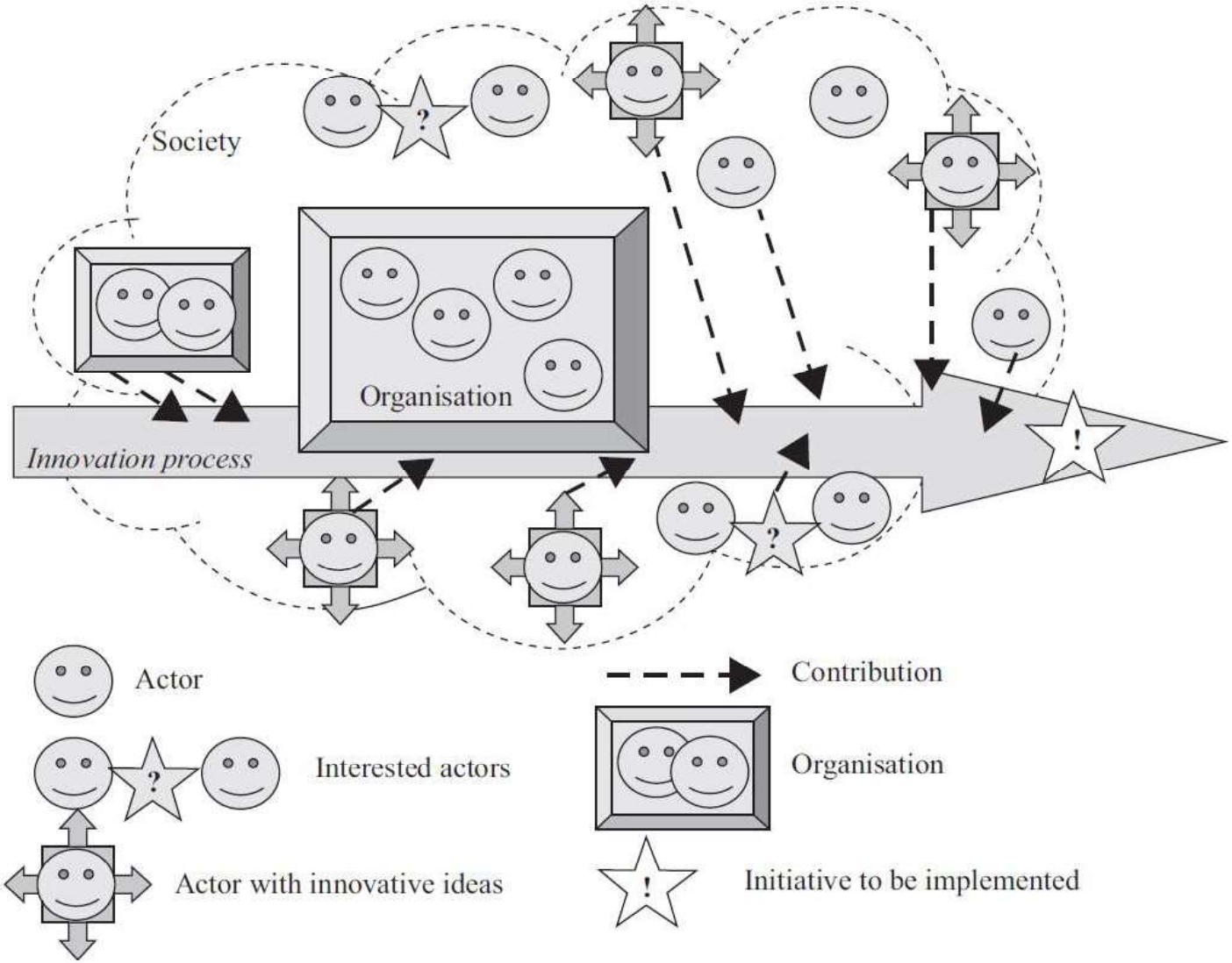


4 Domains

Run the Risk of focusing upon the technology-oriented development, at the expense of consideration for the human-oriented development



Society, organisations, actors and innovations

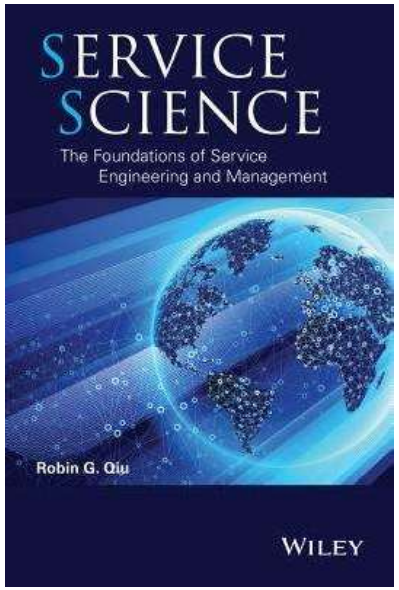


Michel Leonard and Anastasiya Yurchyshyna "Towards contributive development of services" Chapter 1 "***Clean Mobility and Intelligent Transport Systems***", Ed. Michele Fiorini and Jia-Chin Lin, The IET Transportation Series 1, ISBN 978-1-84919-895-0, London 2015, pp. 464

Paradigm Shift

To run the risk of focusing upon the technology-oriented development, at the expense of consideration for the human-oriented development

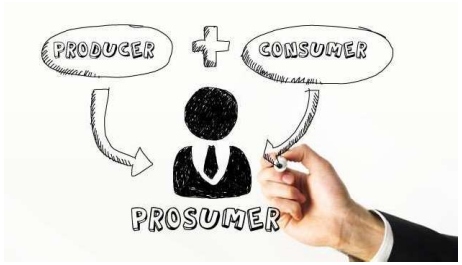
our society becomes more complex and heterogeneous, it has to face the challenges of new situations typical for new domains



Services are:

- Information-driven;
- Customer-centric;
- Digital oriented (e-government, e-business, e-commerce…)
- Situation-orientation vs. problem-orientation

Public-private partnerships (PPP) oriented towards creation of services (PPPS)

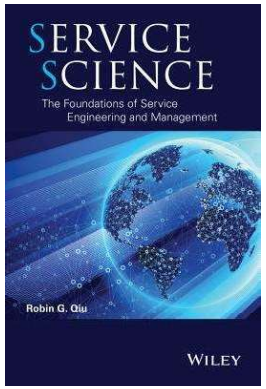


A service is **trans-disciplinary** and **trans-organisational**, as a service is created by a multidisciplinary approach with the involvement of multiple organisations, but it **does not belong to any discipline or any organisation.**

Michel Leonard and Anastasiya Yurchyshyna "Towards contributive development of services" Chapter 1 "***Clean Mobility and Intelligent Transport Systems***", Ed. Michele Fiorini and Jia-Chin Lin, The IET Transportation Series 1, ISBN 978-1-84919-895-0, London 2015, pp. 464

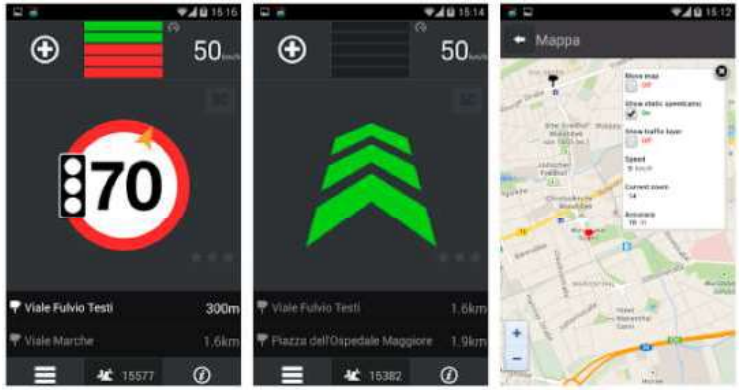
Society, organisations, actors and innovations

In the context of the traditional economy, guided by added value and the copyright principles of protecting the rights for the goods developed by businesses, it becomes unclear why they should be encouraged to contribute 'free of charge'; why the actors need to share their own knowledge, skills and make efforts to develop something, the results of which do not belong to them.



In the context of knowledge based and service-enabled society, the main risk is not the one of not returning one's investments, but the risk of 'no innovation'; the risk of being outside the revolutionary tendencies identifying the dynamics of society and participating in innovations arising around them, the risk of losing the knowledge and skills allowing sustainable leadership in each domain.

The main challenge here, in comparison to the traditional approach, is to accept the vision that a service is not a product… each actor (private, public or individual) is not any more seen as just a consumer or creator of a service, but has become a co-creator (PROSUMER) → **the cognitive unity in service creation**



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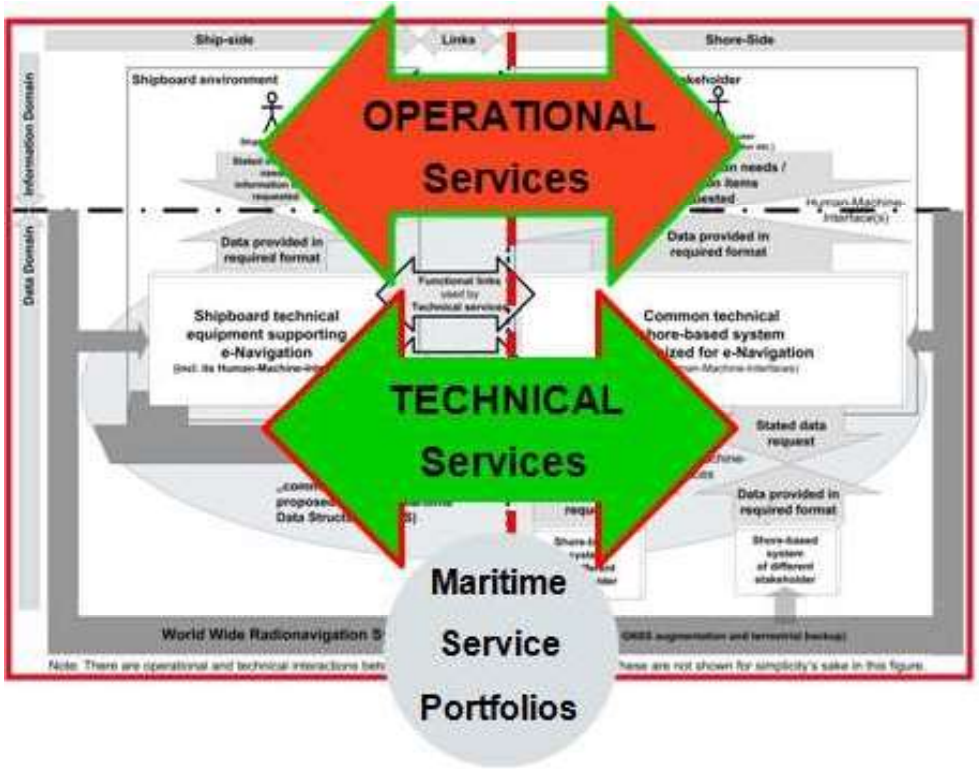
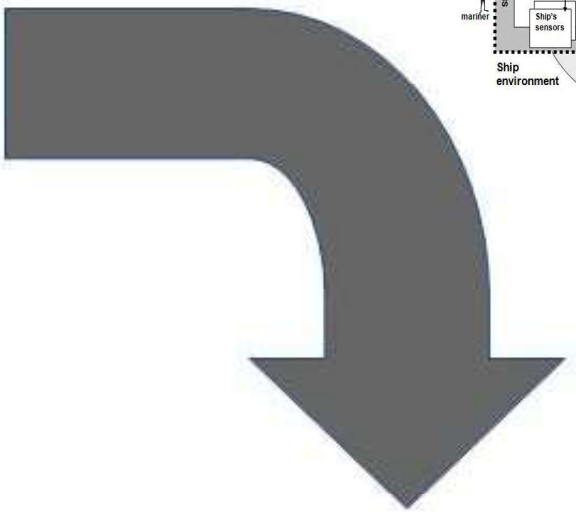
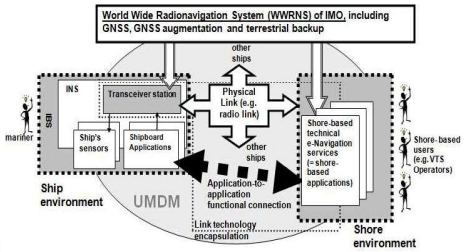
Paradigm Shift (MSP)







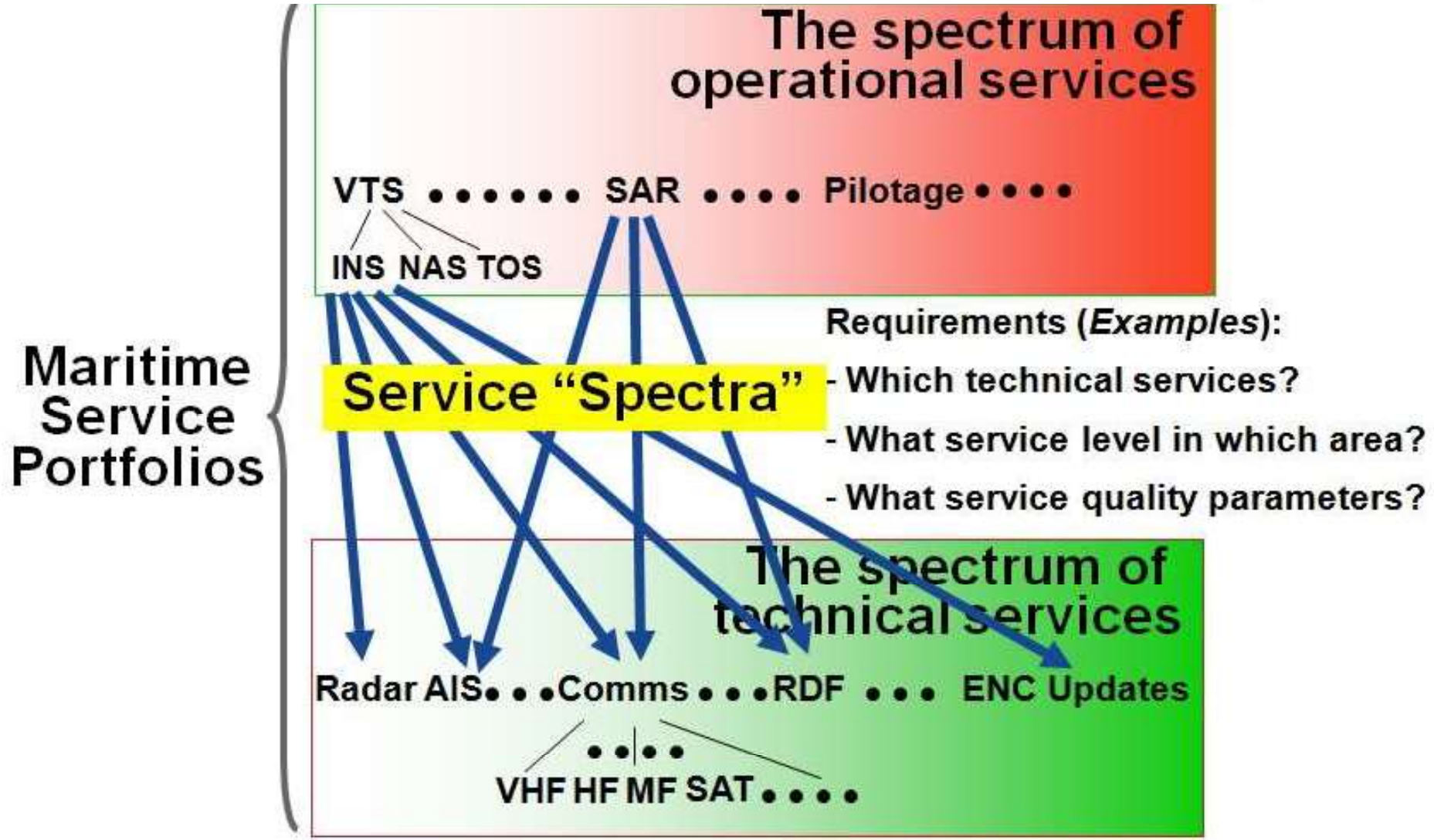
The spectra of services

Maritime Service Portfolios

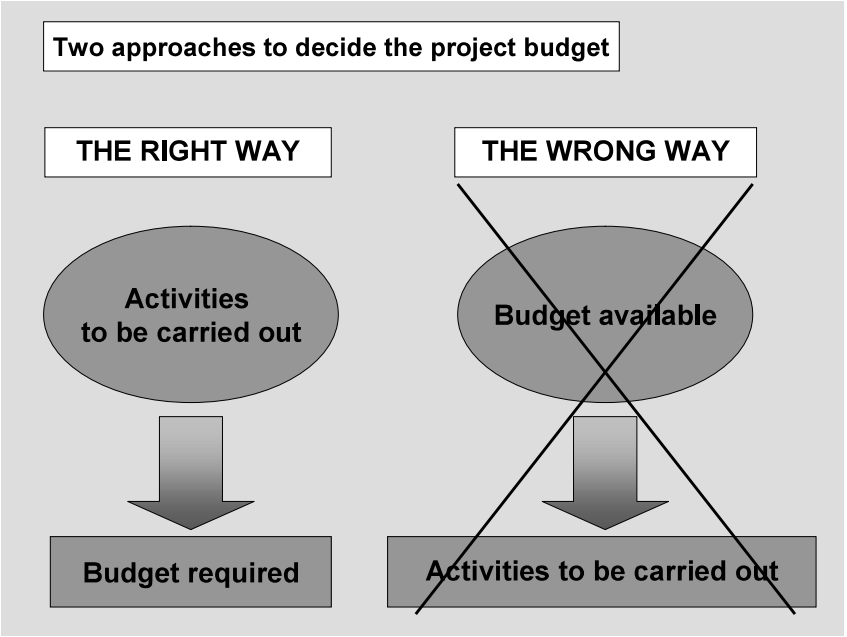
- The spectrum of operational services
- The spectrum of technical services

M. Fiorini, "***From Vessel Traffic Services (VTS) to e-Navigation Service Portfolios***", Proc. MAST 2013, 10th Maritime Systems and Technology conference, Amber Expo, Gdańsk, Poland, 4-6 June 2013, pp. 1-6

MSP – The spectra of services



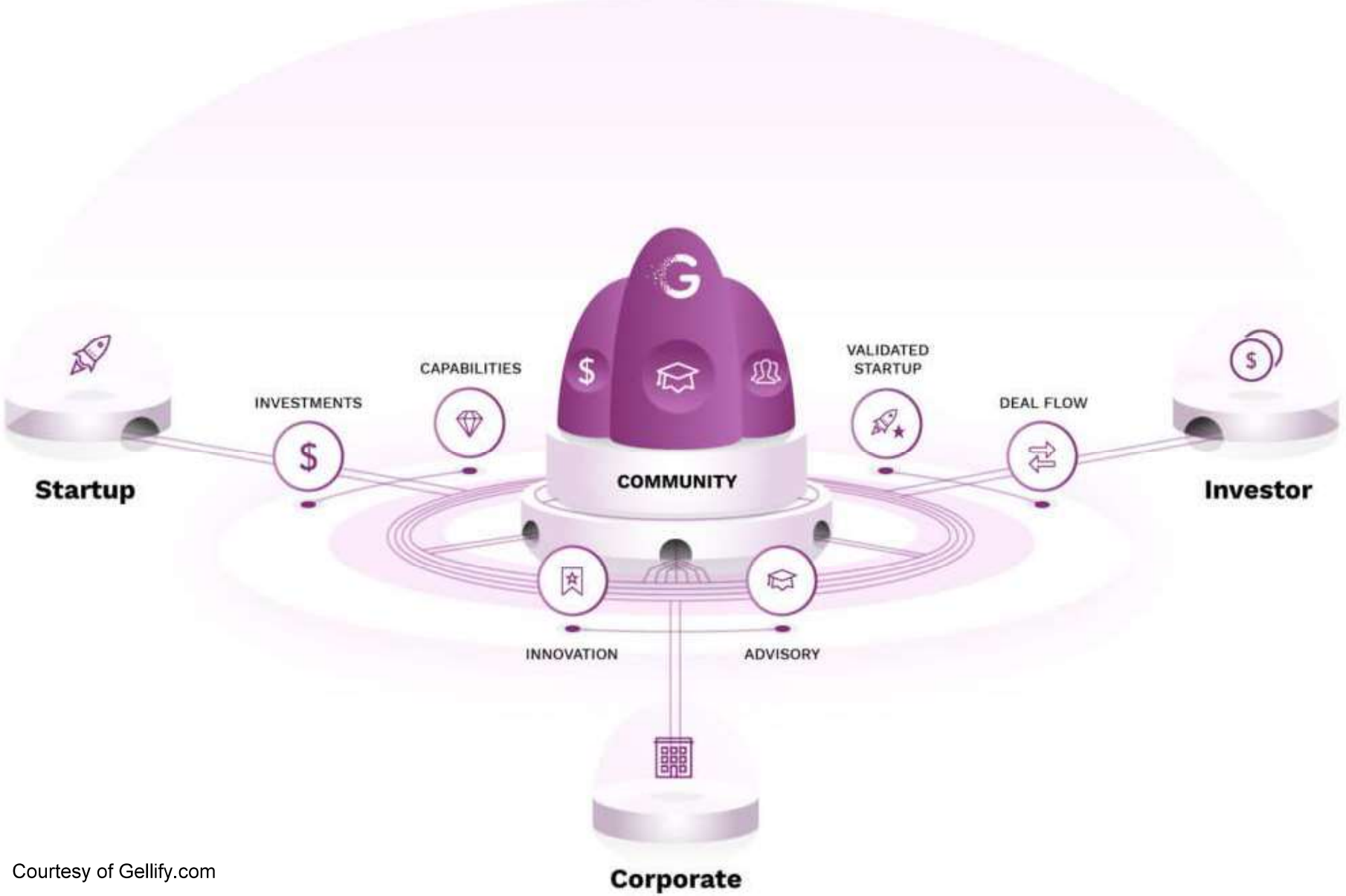
How to do more with less?



(Source: Interact Point Qualification and Transfer: "Financial Management Handbook"; 2006; p. 80)

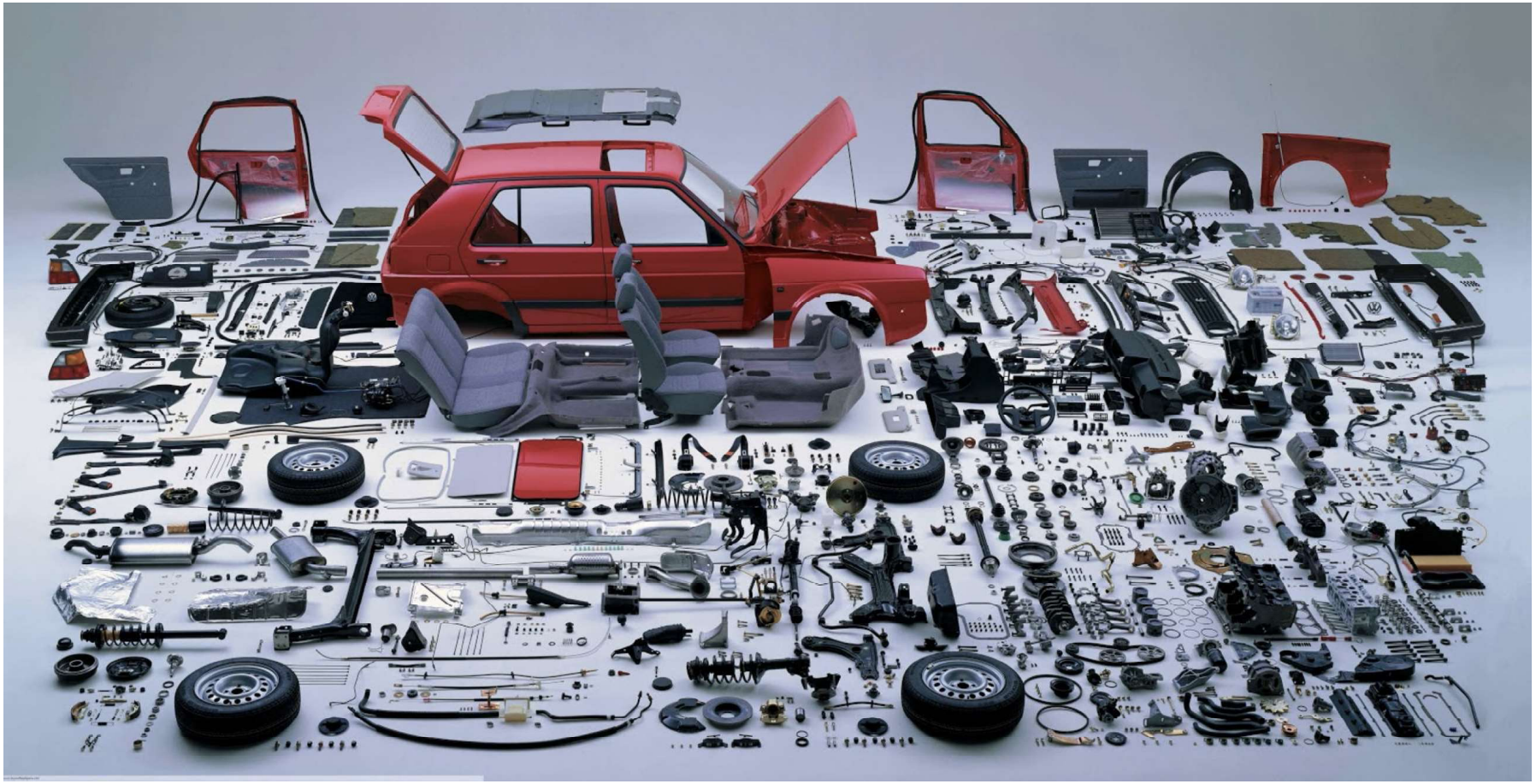
The concept should be extended to all resources required to complete each piece of work; **budget** is synonymous with **resources**.

The World of Innovation



Courtesy of Gellify.com

Key Performance Indicator



From Performance to Experience

Key Experience Indicators (**KEIs**) provide a quantitative score of a specific, important, and actionable phenomenon related to using a product or service.

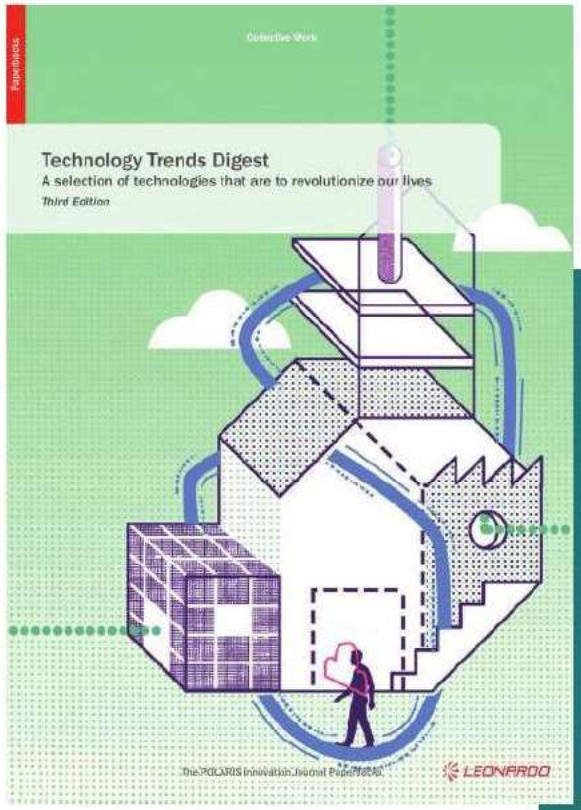
Google's HEART Framework

Google HEART Framework Example — CleverTap

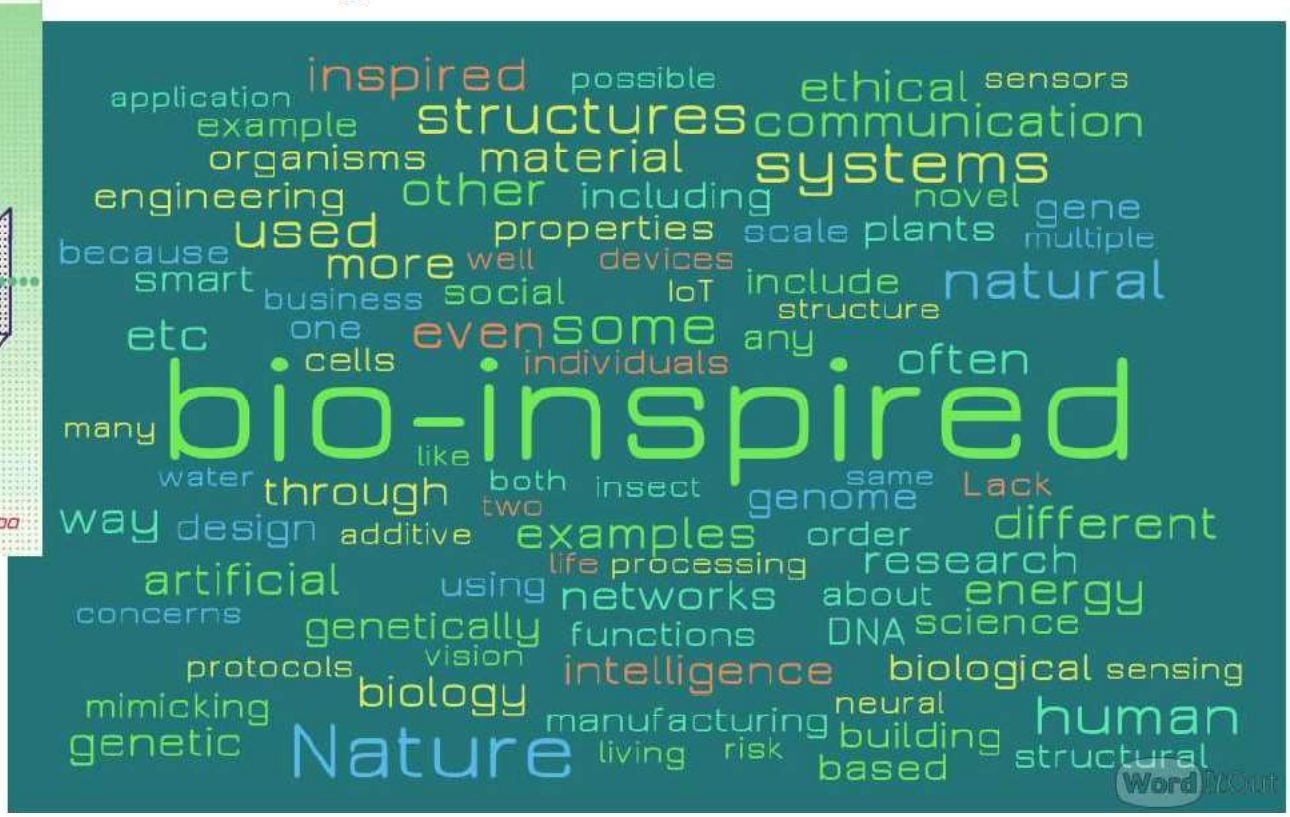
	GOALS	SIGNALS	METRICS
Happiness	Users find the app helpful, fun, and easy to use	• Responding to surveys • Leaving 5-star ratings • Leaving user feedback	• Net Promoter Score • Customer satisfaction rating • Number of 5-star reviews
Engagement	Users enjoy app content and keep engaging with it	• Spending more time in the app	• Average session length • Average session frequency • Number of conversions *(consuming content, uploading files, purchases, etc.)*
Adoption	New users see the value in the product or new feature	• Downloading, launching app • Signing up for an account • Using a new feature	• Download rate • Registration rate • Feature adoption rate
Retention	Users keep coming back to the app to complete a key action	• Staying active in the app • Renewing a subscription • Making repeat purchases	• Churn rate • Subscription renewal rate
Task Success	Users complete their goal quickly and easily	• Finding and viewing content quickly • Completing tasks efficiently	• Search exit rate • Crash rate

Happiness – Users' attitudes regarding product
Engagement – User involvement with project
Adoption – Rate of gaining new users
Retention – Number of returning users
Task Success – Effectiveness, Efficiency, and Ease of Use of the product

Technology Trends



Chapter 1
BIO-Inspired TECHNOLOGIES



Why hexagonal form?

Optimized solutions

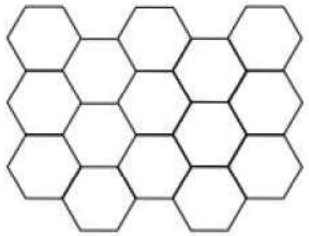
Question [Varro 36 b.C., Pappus of Alexandria, Fejes Tóth, Morgan]

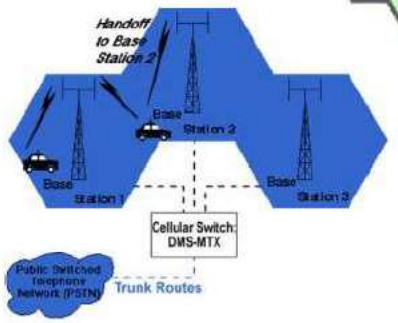
Why the bees' honecomb has hexagonal form?

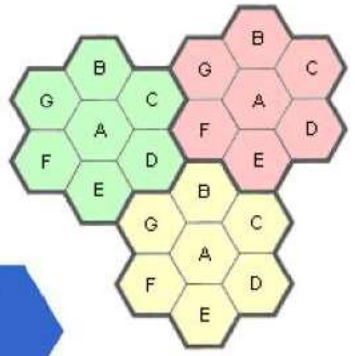
Theorem [Hales, 2001]
Any partition of the plane into regions of equal area has perimeter at least that of the regular hexagonal honeycomb tiling.

$$m_k(\Omega) = \inf\left\{ \sum_{i=1,\dots,k} \mathrm{Per}(E_i) \ : \ E_i \subseteq \Omega,\ |E_i| \in (0,+\infty),\ |E_i \cap E_j| = 0 \right\}.$$

$$\lim_{k\to+\infty} \frac{|\Omega|}{k^\gamma} m_k(\Omega) = \mathrm{Per}(H), \quad H = \text{regular hexagon}$$

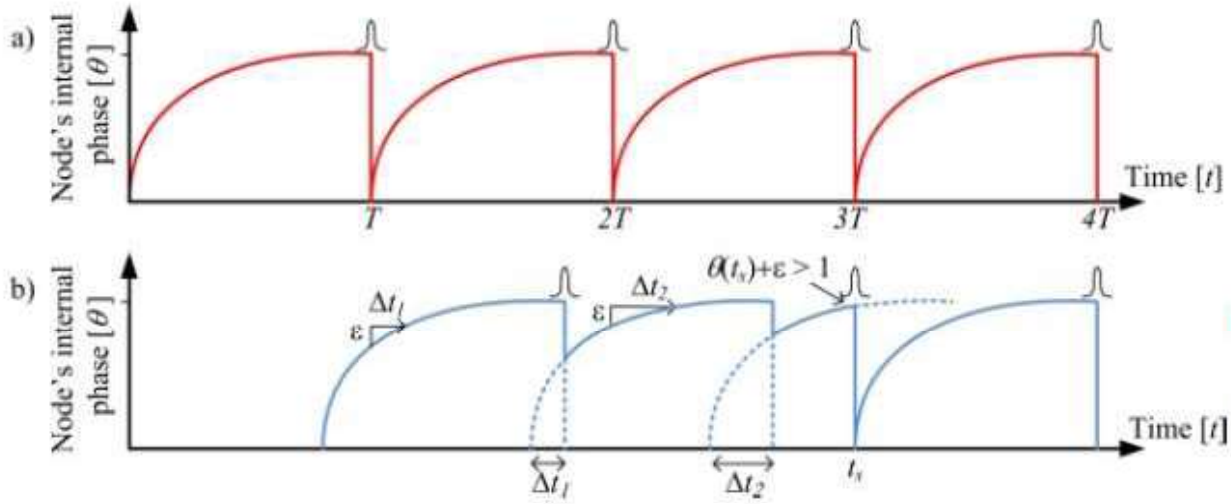






Swarm Intelligence

Cognition, Information and Communication (Swarm Intelligence)



Each individual firefly has its own blinking frequency, but it perceives the local flashing of nearby fireflies. If the flash of other fireflies exceeds a given luminosity threshold, the firefly receives an excitation reinforcement feedback, so it flashes and it reset its excitation to zero, immediately after having flashed; otherwise it receives an inhibition feedback and it reset its excitation to zero, without flashing, as if it had just flashed. This simple, distributed algorithm results in swarm blinking synchronization.

This MAC (Medium Access Control) protocol, suitable for synchronizing a "swarm" of impulsive jammers, could be named CSMA-CE (Carrier Sense Multiple Access Collision Engagement, as opposite to Collision Avoidance).

SWARM

Swarm Intelligence

The swarm intelligence algorithms are characterised of **simplicity, uncertainty**, **interactivity**, **distributed parallelism**, **robustness**, **scalability**, and **self-organisation**.

Emirates announced that the drones will made available to Emirates Skywards Platinum members from April 2020. (Source: arabianbusiness.com)

In 2019 the new AWHERO will be used for maritime surveillance capability demonstrations on ships in the framework of the **OCEAN 2020** initiatives contracted to Leonardo which will lead a team of 42 prime European aerospace companies. OCEAN 2020 is a European Defence Fund strategic research programme for naval surveillance technology and maritime safety.

EUROPEAN DEFENCE AGENCY

Counter Unmanned Air System (C-UAS)

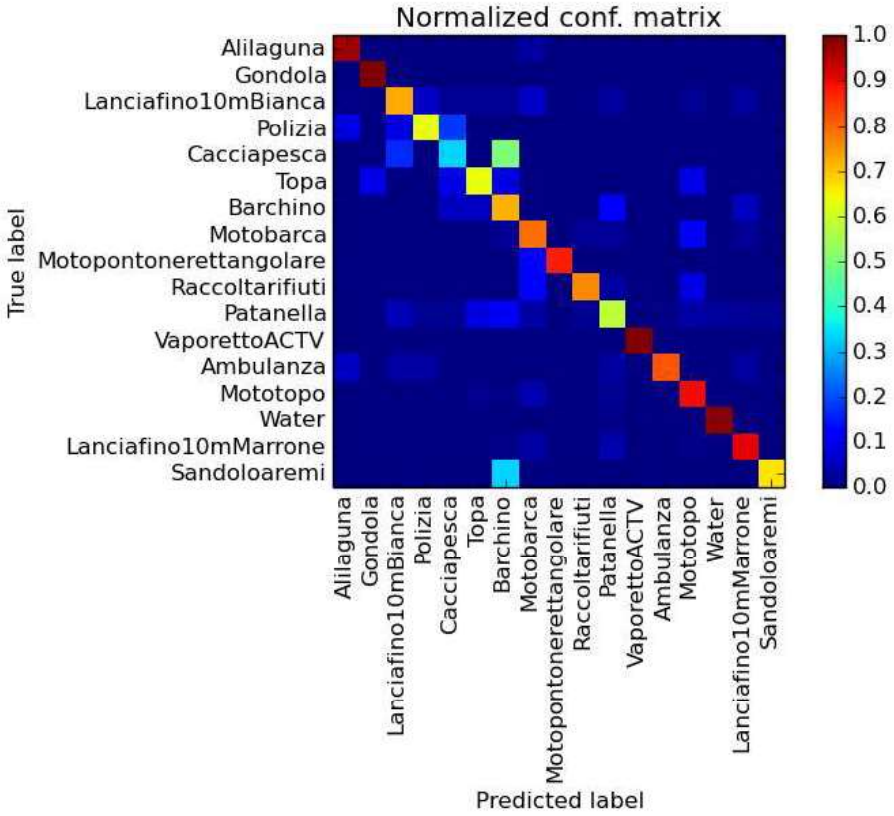
Vision Based Tracking


Barchino


Patanella

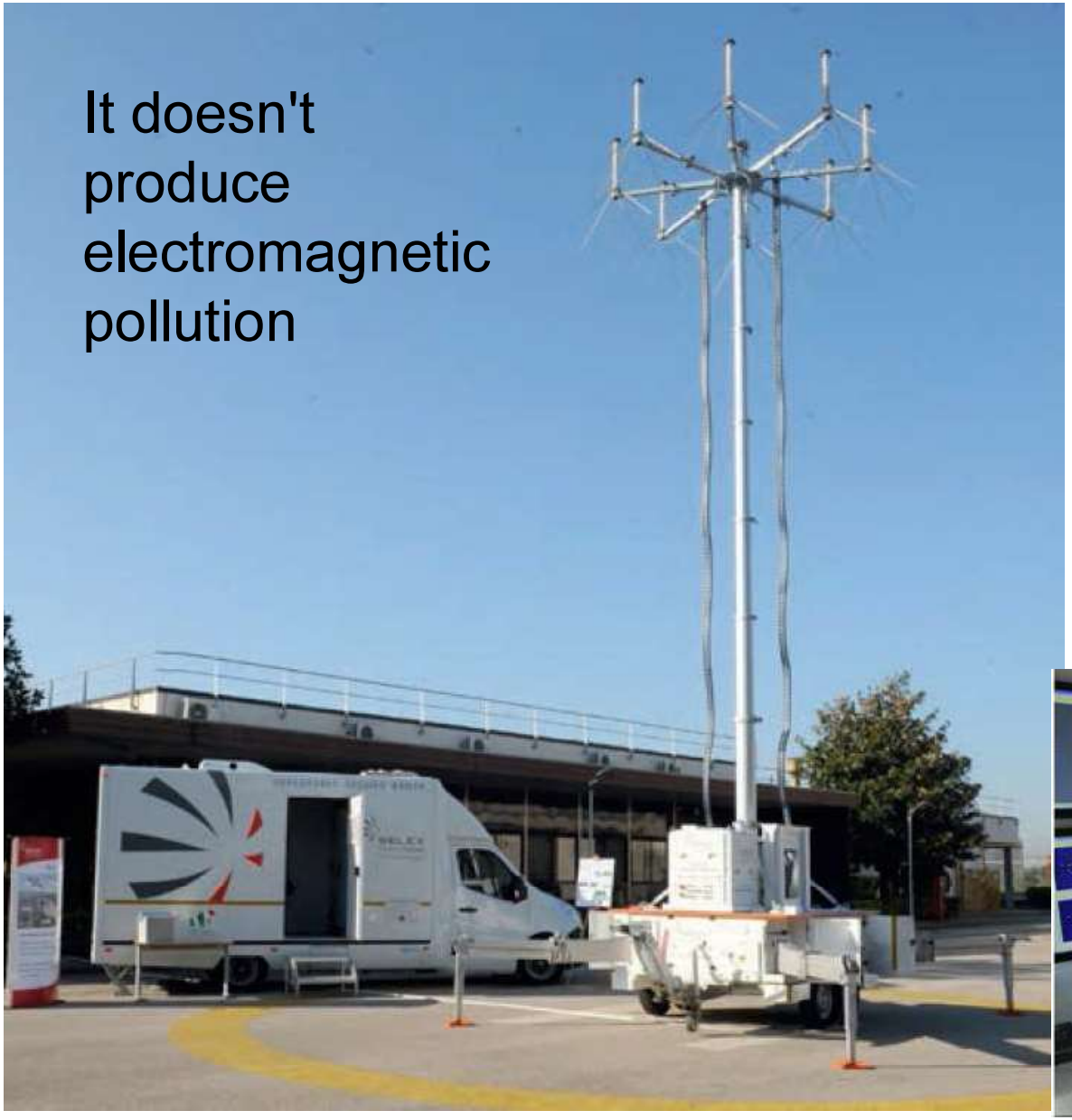

Cacciapesca


Topa

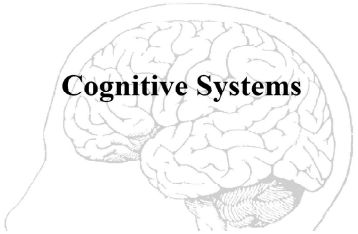


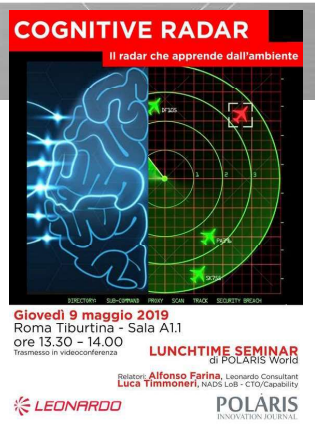
Passive Covert Radar AULOS®

It doesn't produce electromagnetic pollution

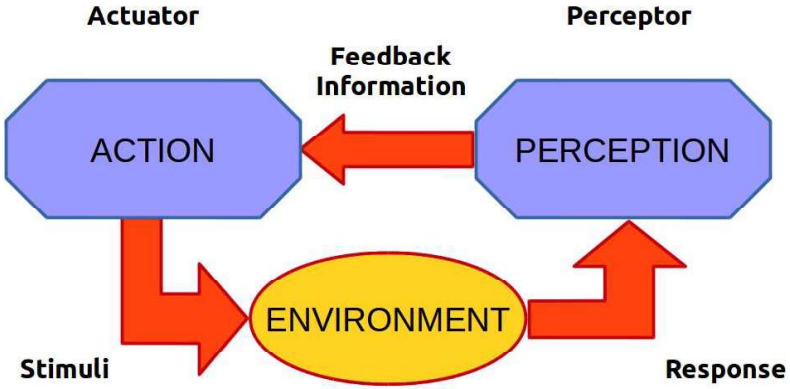


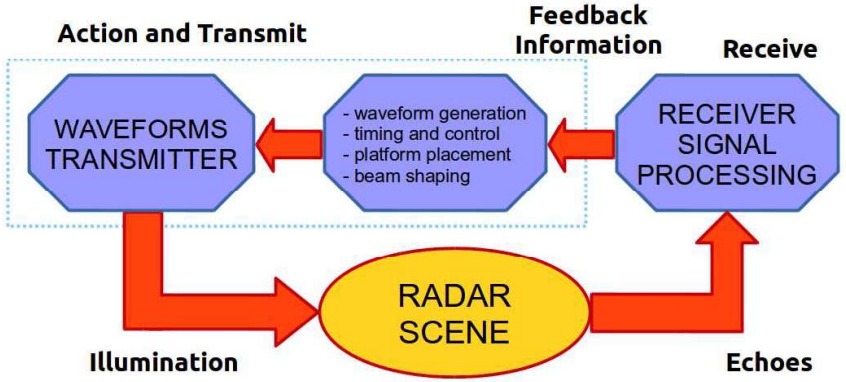
Cognitive radar 1/2





Cognitive radars are systems based on the perception-action cycle of cognition that sense the environment, learn from it relevant information about the target and the background, then adapt the radar sensor to optimally satisfy the needs of their mission according to a desired goal.

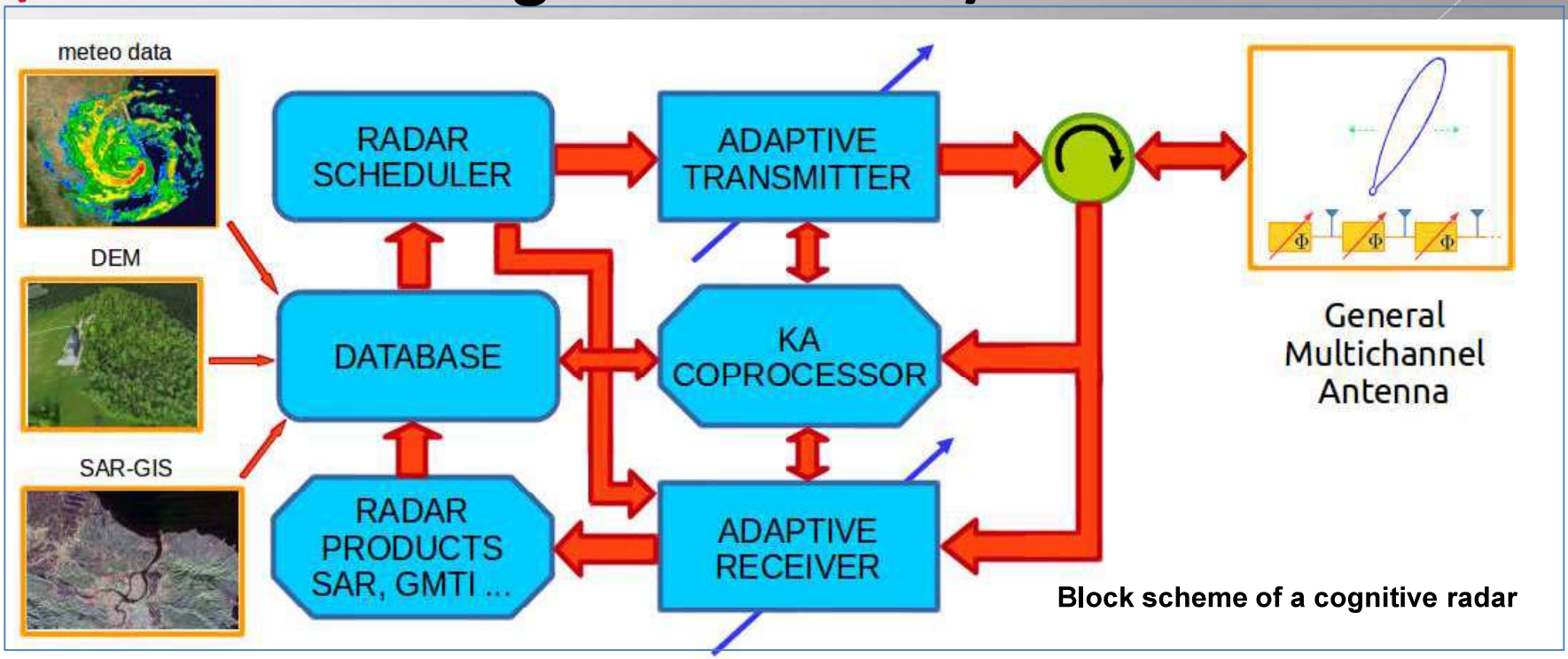




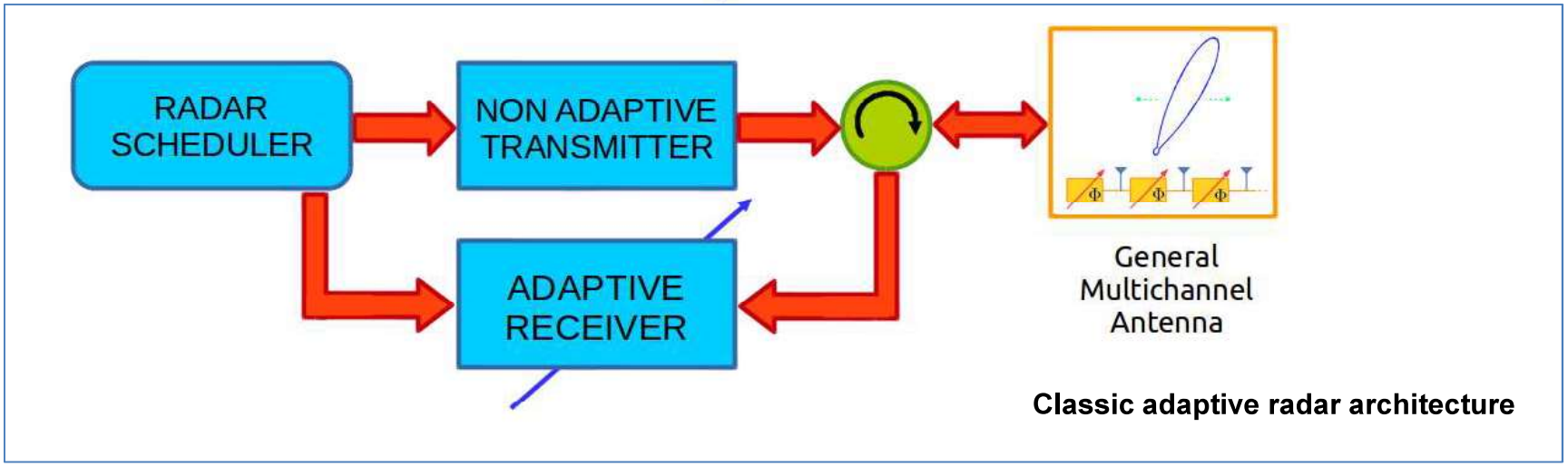
Credit: /

NATO lecture, EN-SET-216 -06

Cognitive radar 2/2



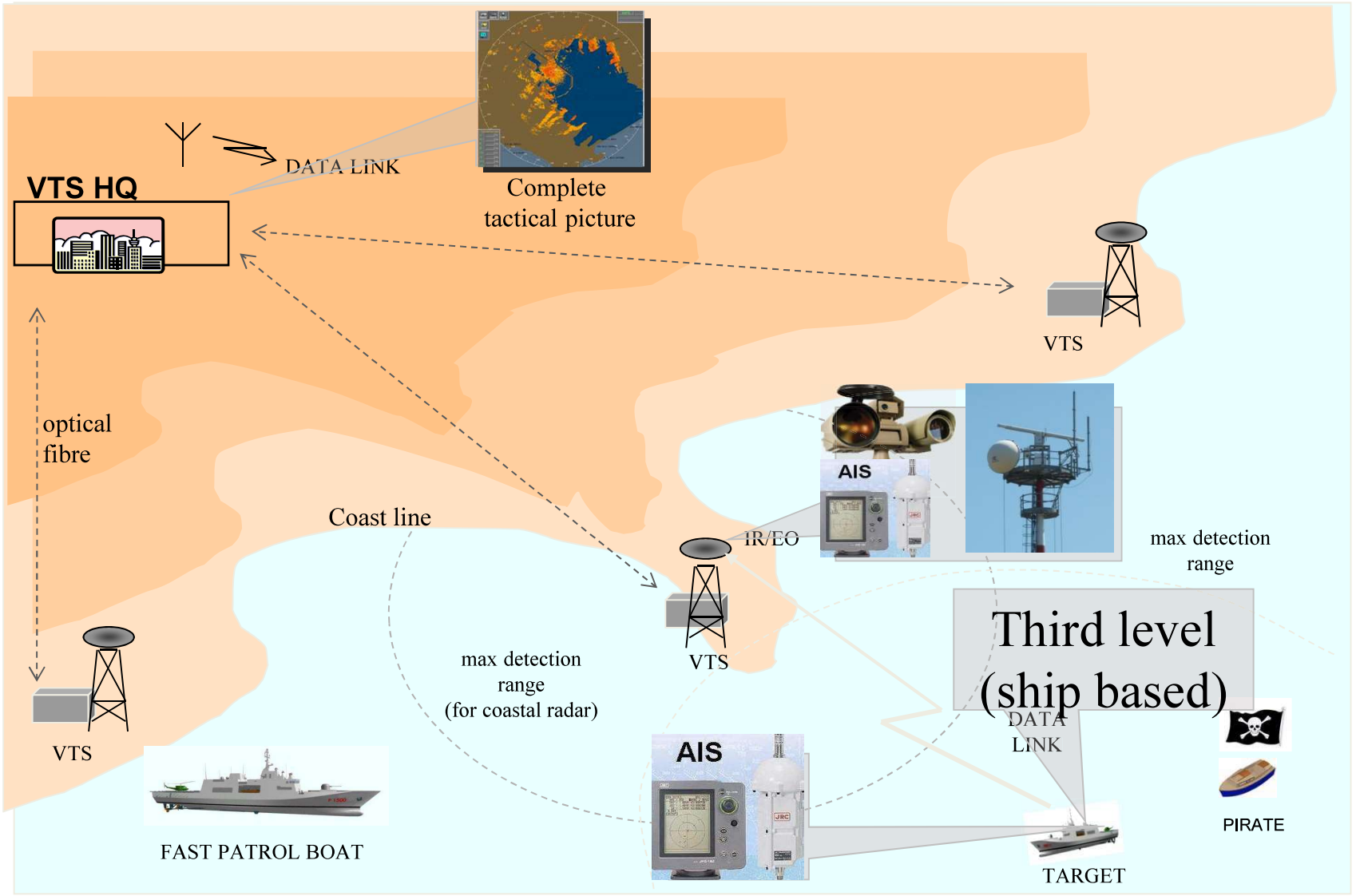
Block scheme of a cognitive radar



Classic adaptive radar architecture

Credit: [illegible]

COPERNICO (Safety Box)

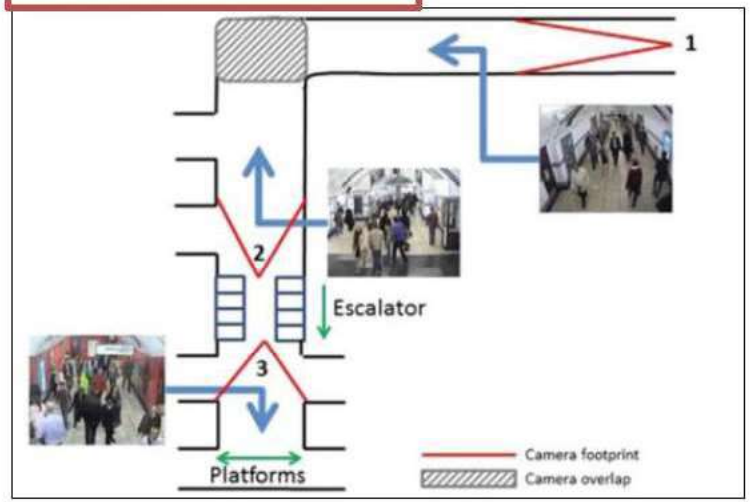


PCT application number:
WO2012017470 (A1)

https://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=2012017470&KC=&locale=en_EP&FT=E#

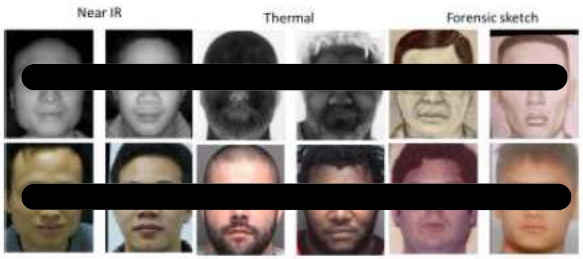
Face Recognition - Scenario

Non collaborative

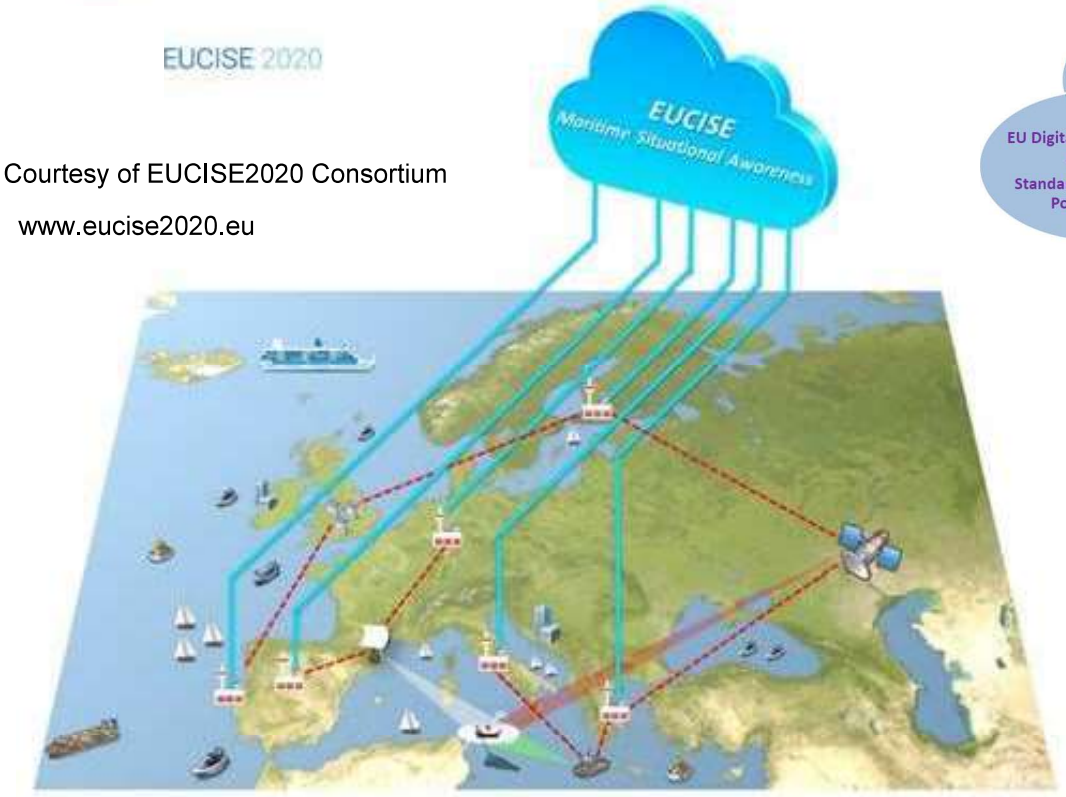


Face recognition in the wild with central processing

Collaborative

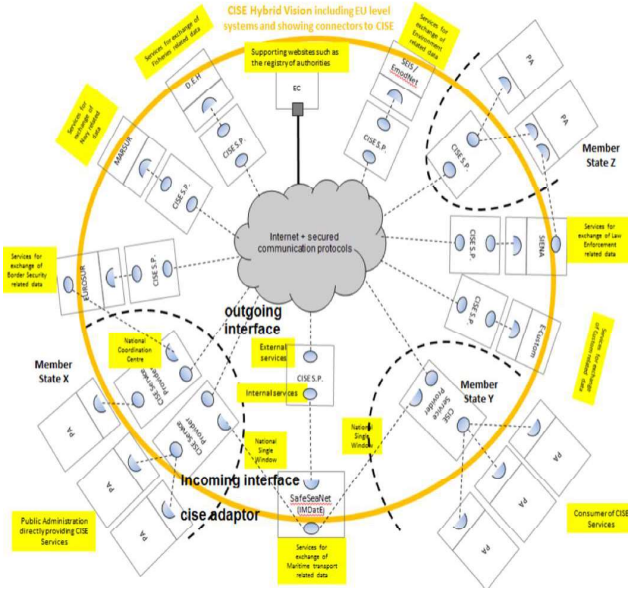


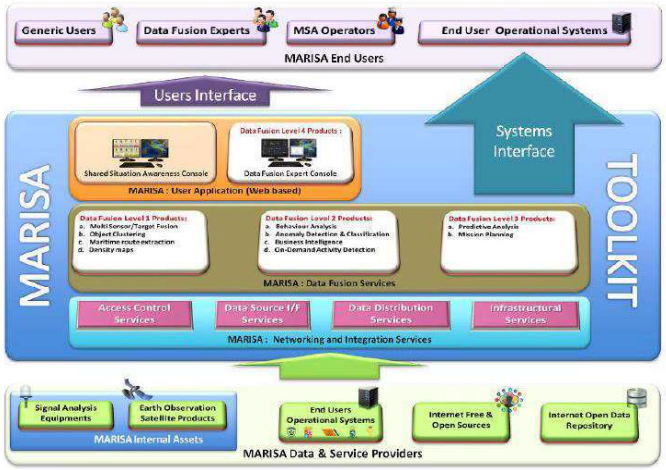
EUCISE 2020



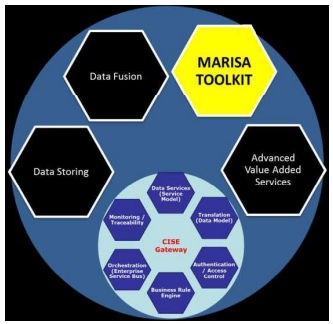
Courtesy of EUCISE2020 Consortium

www.eucise2020.eu





www.marisaproject.eu

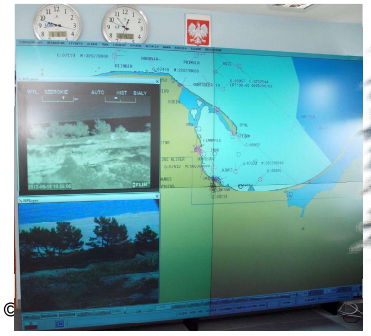


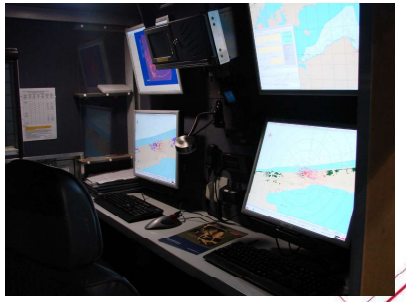
SECTOR

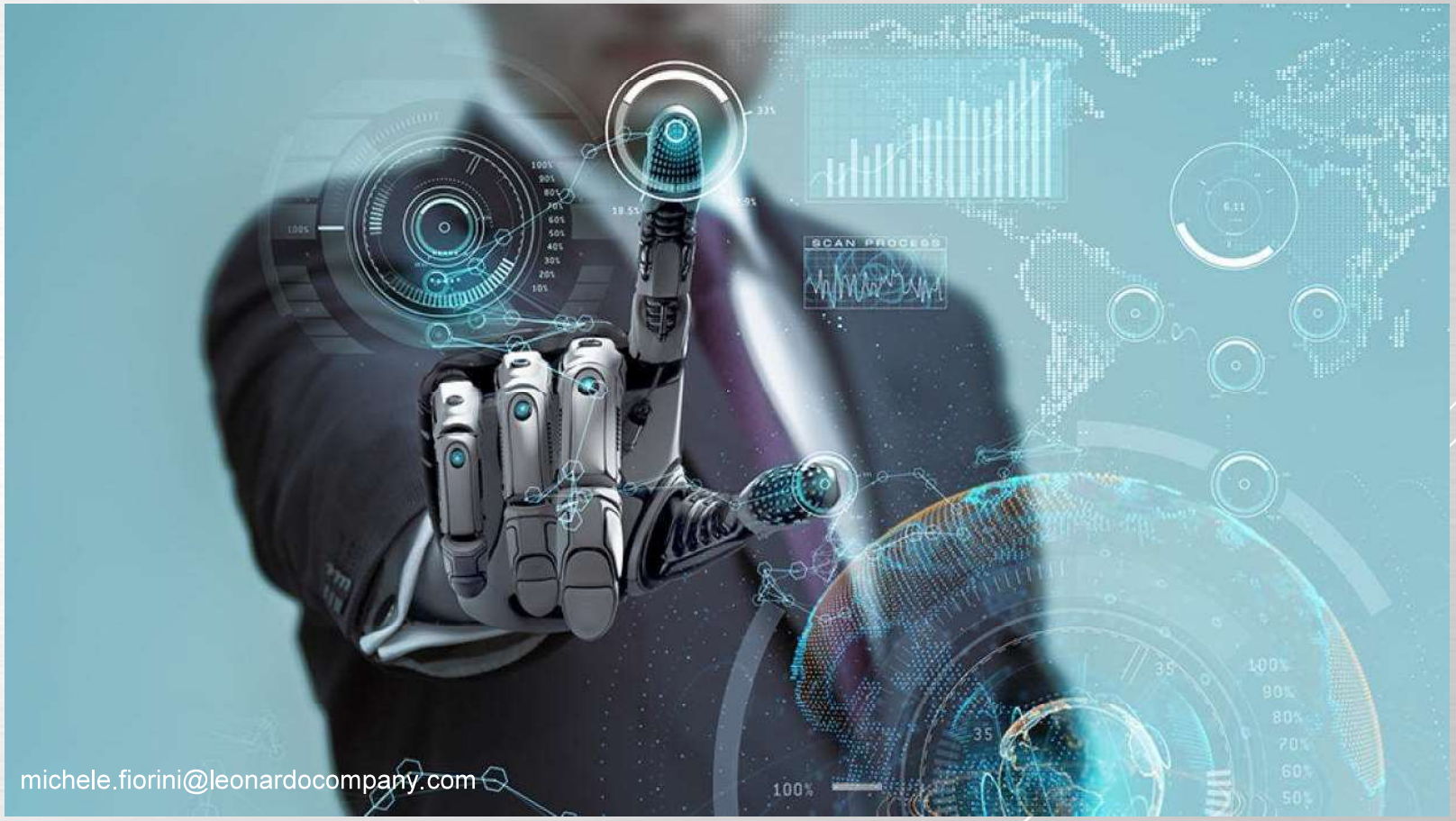
www.fp7-sector.eu

ZSRN – Sensors and Means

Zautomatyzowany
System
Radarowego
Nadzoru







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THANK **YOU** FOR YOUR ATTENTION

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