



# Technology Foresight Dialogue



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

Warsaw, 16.05.2019

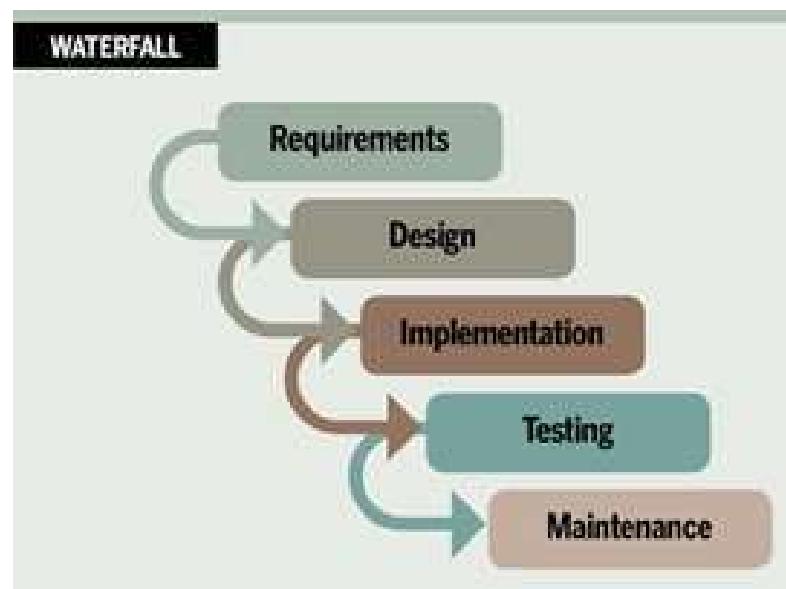
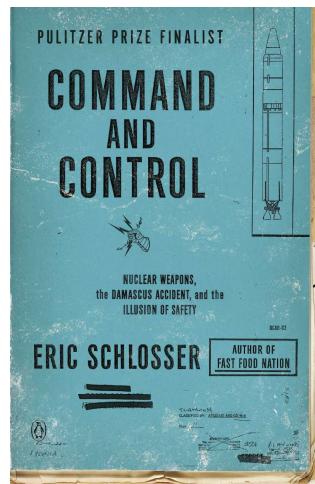


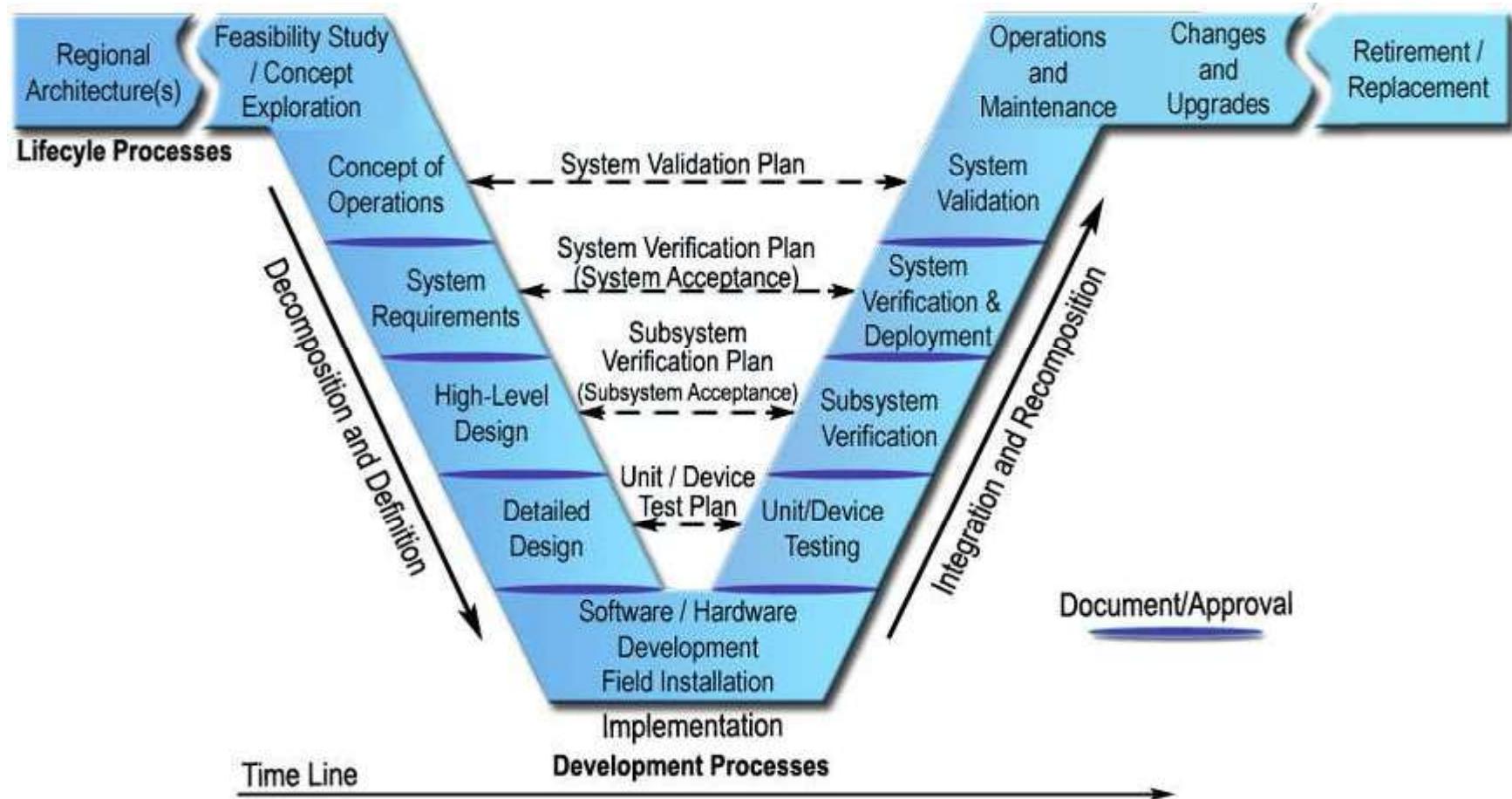
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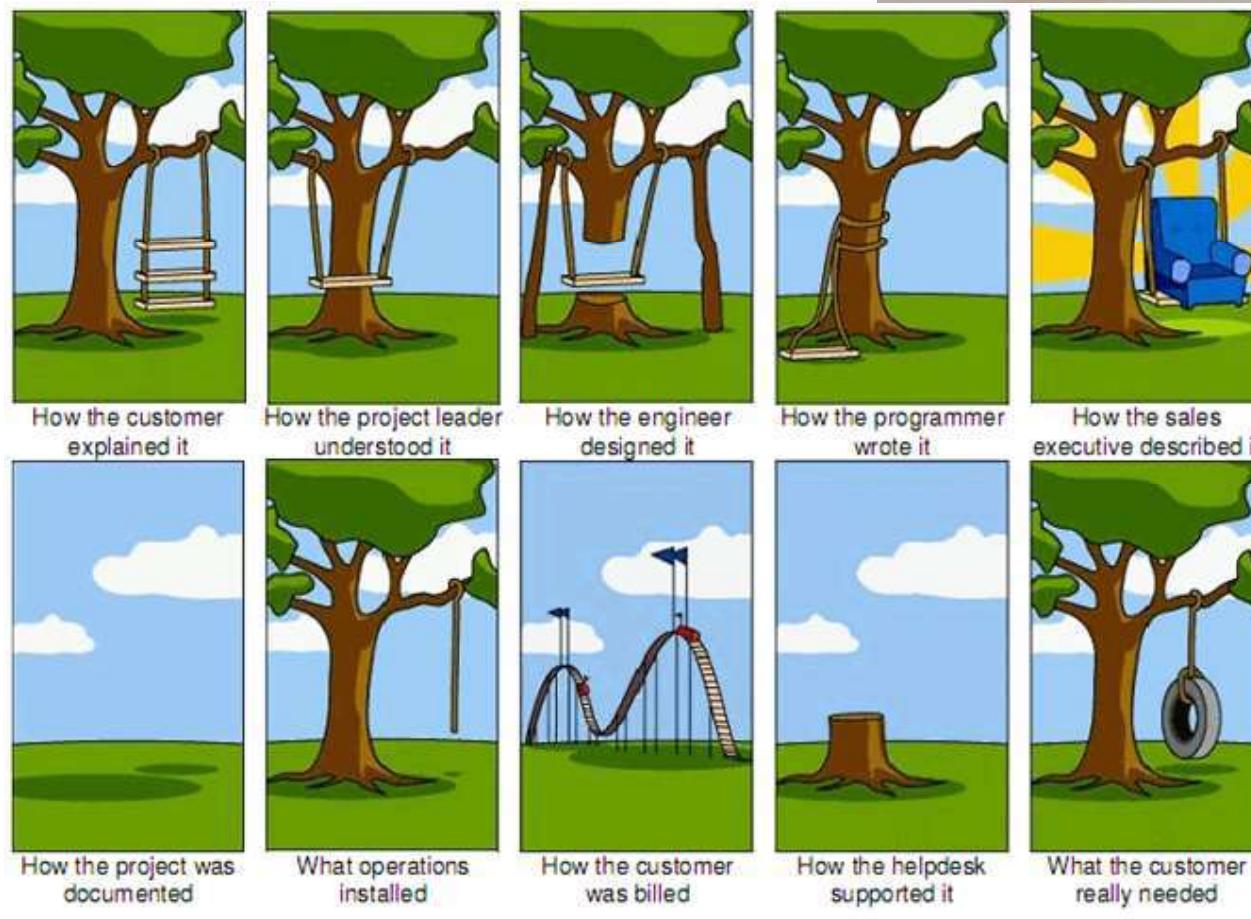


Douglas, Isle of Man, 1948

*source: collection D. Zwijnenburg, IALA Manual 2008*



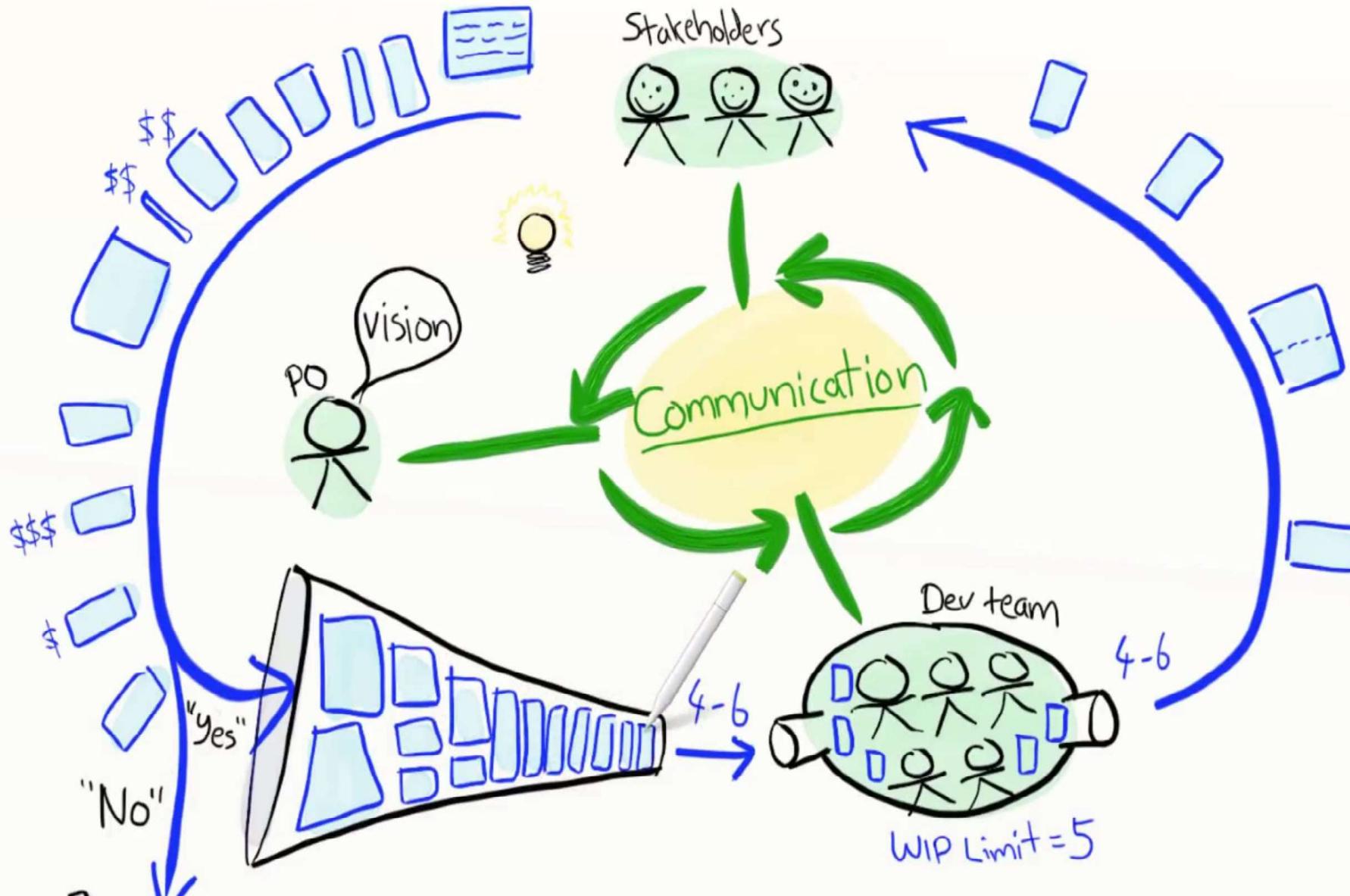


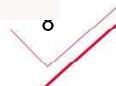
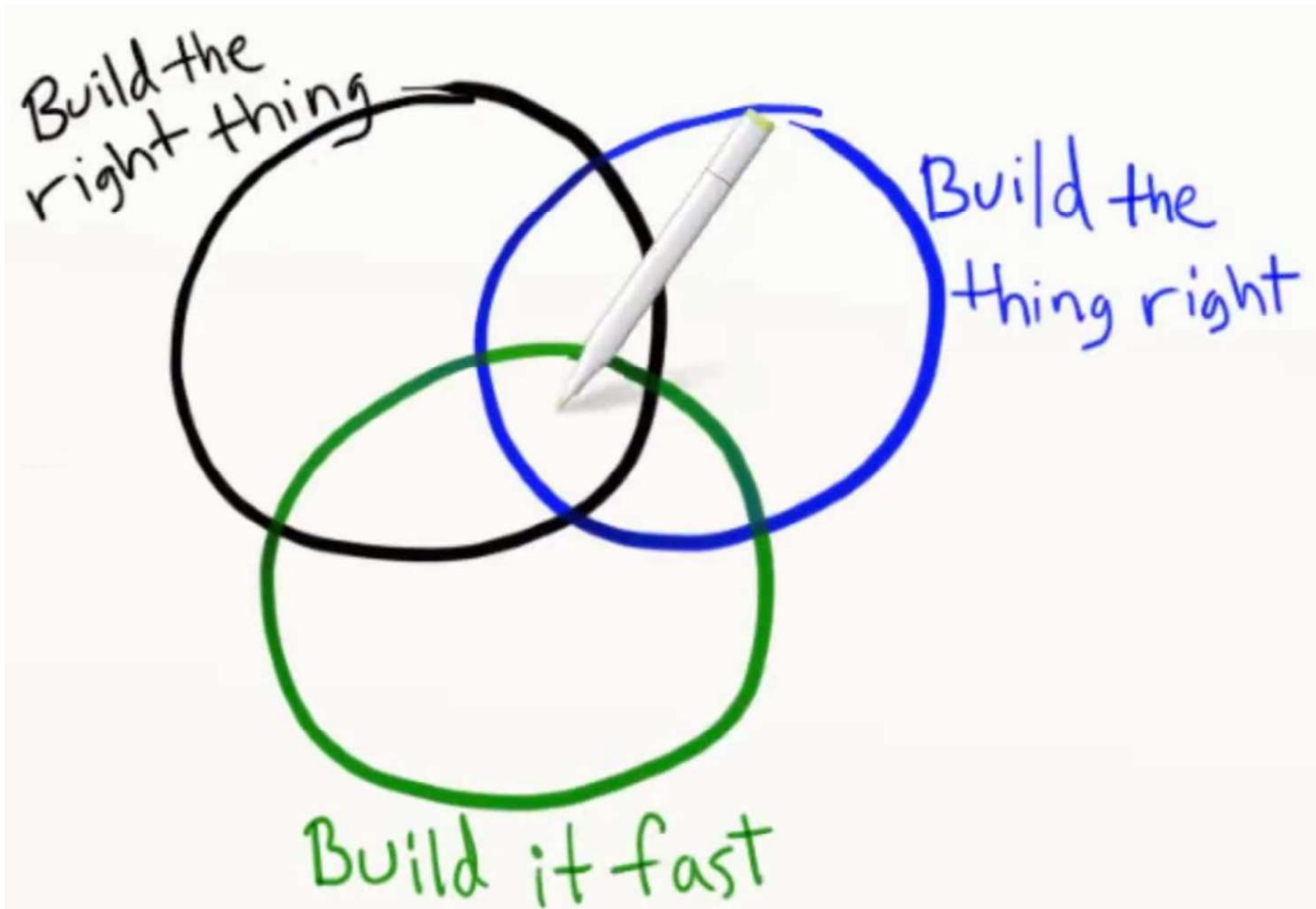


## Manifesto for Agile Software Dev.

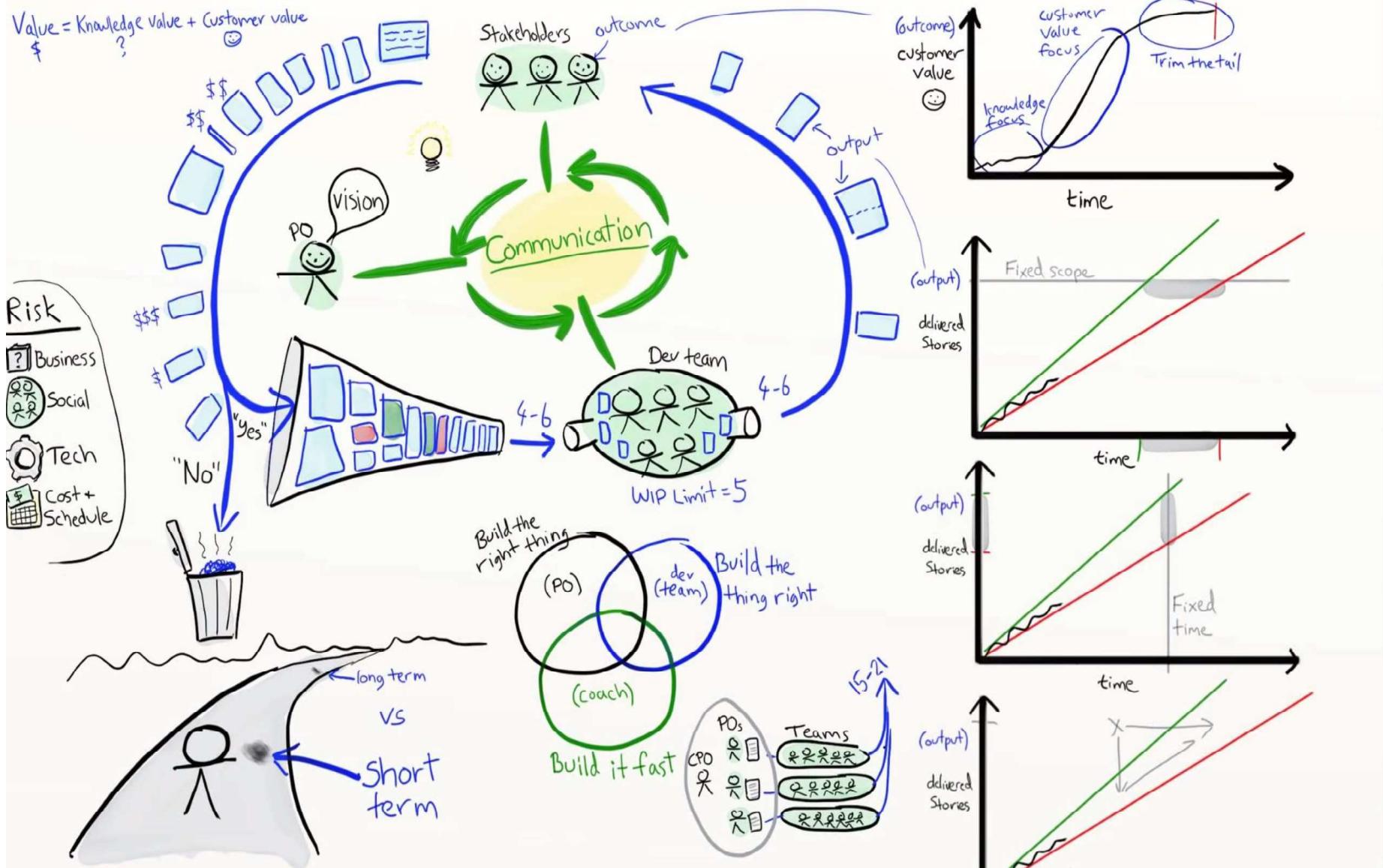
LI  
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- INDIVIDUALS AND INTERACTIONS OVER PROCESSES AND TOOLS
- WORKING SOFTWARE OVER COMPREHENSIVE DOCUMENTATION
- CUSTOMER COLLABORATION OVER CONTRACT NEGOTIATION
- RESPONDING TO CHANGE OVER FOLLOWING A PLAN





# System Engineering “Agile” Model 4/4



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

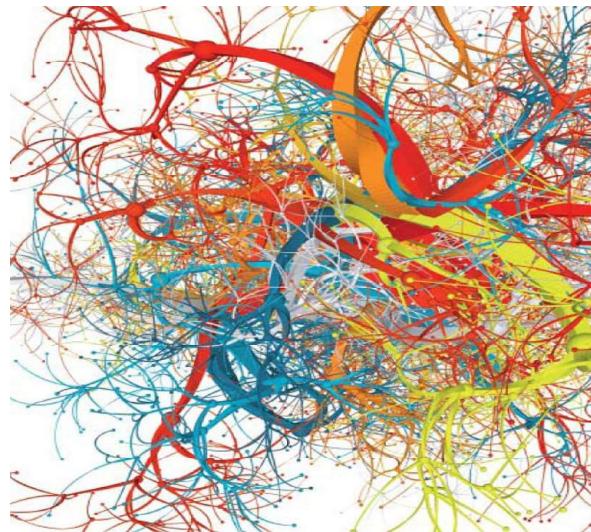
# Complexity

## AGILE FAILURE PATTERNS

"Agile doesn't work here"

No Vision	Tagline	Wi-Fi	Failure is no option	Agile light	Jim manag'	Lack of transparency	We know what needs to be built	Can't agile	Functional teams	Wrong tech stacks	No safety
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# HBR.ORG Harvard Business Review

SEPTEMBER 2011

46 The Big Idea  
Three Myths About Health Care Exploded  
Robert S. Kaplan and Michael E. Porter

123 Managing Yourself  
How Great Bosses Engage Their Employees  
Charalampos A. Vlachoutsicos

41 How I Did It  
eBay's Founder on Innovative Social Change  
Pierre Omidyar



## EMBRACING COMPLEXITY

You can't avoid it, but your business can profit from it.

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

## Physical Domain

where effects take place and where other supporting infrastructure and information systems exist

## Information Domain

where information is created, manipulated and shared

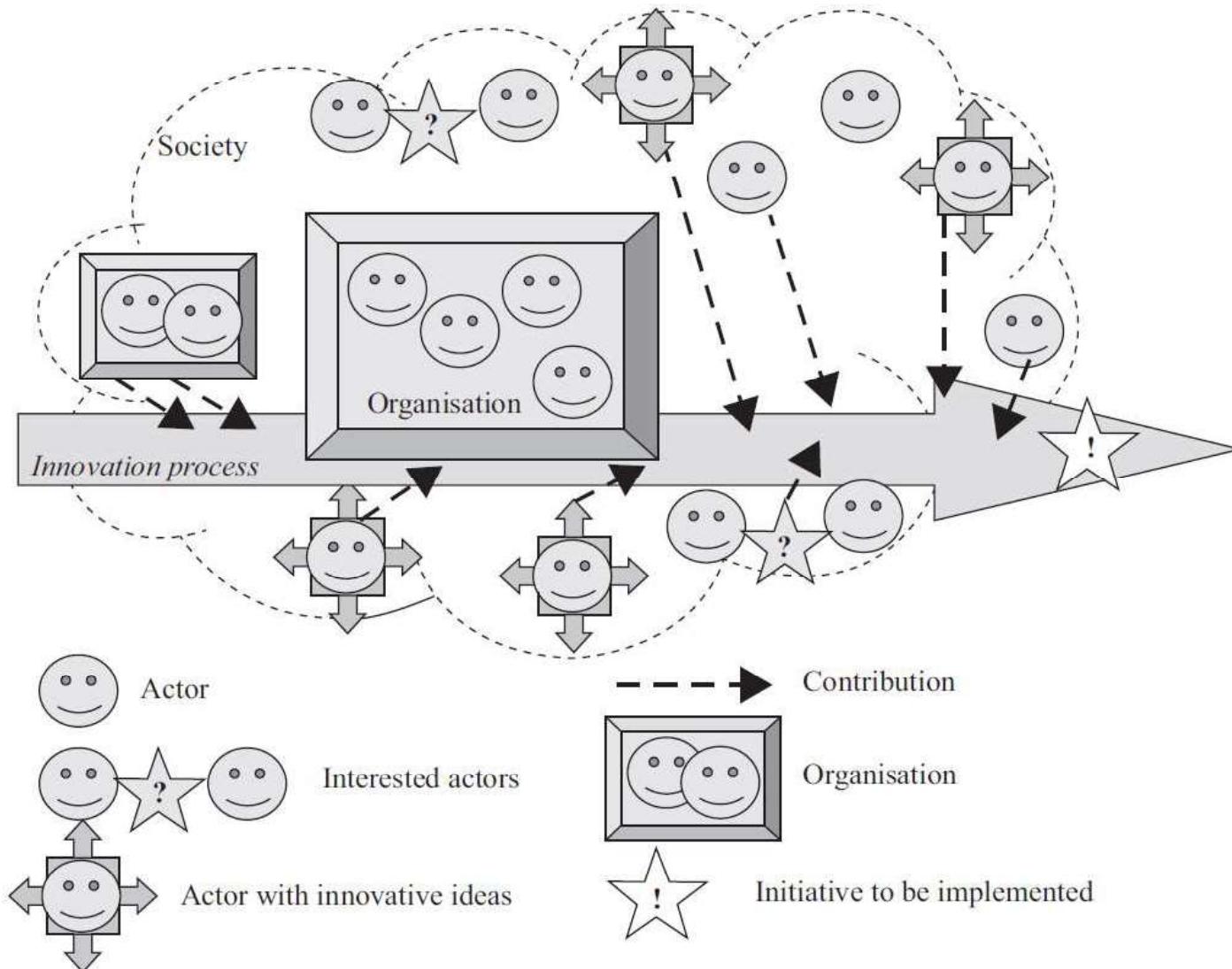
## Cognitive Domain

where perceptions, awareness, beliefs, and values reside and where, as a result of sensemaking, decisions are made

## Social Domain

set of interactions between and among force entities





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

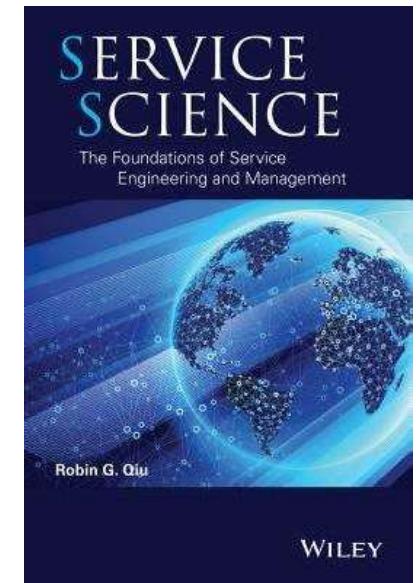
# Paradigm Shift

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



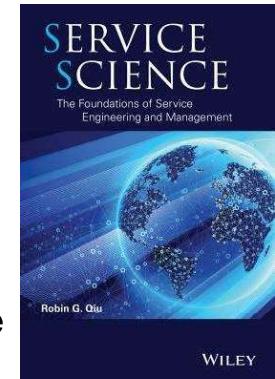
Public-private partnerships (PPP) oriented towards creation of services (PPPS)

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**.



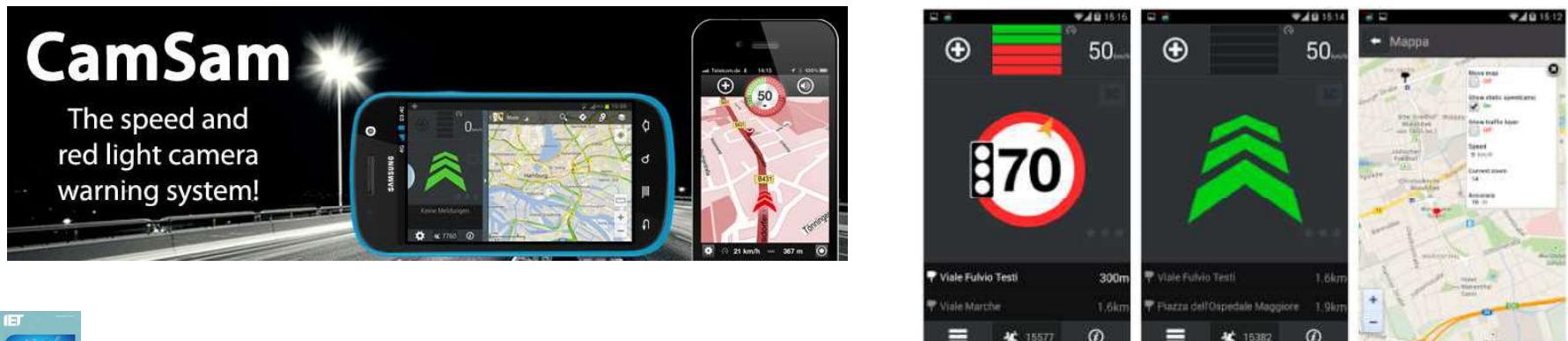
Michel Leonard and Anastasiya Yurchyshyna "Towards contributive development of services" Chapter 1 "**Clean Mobility and Intelligent Transport Systems**", Ed. Michele Fiorini and Jia-Chin Lin, The IET Transportation Series 1, ISBN 978-1-84919-895-0, London 2015, pp. 464

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.



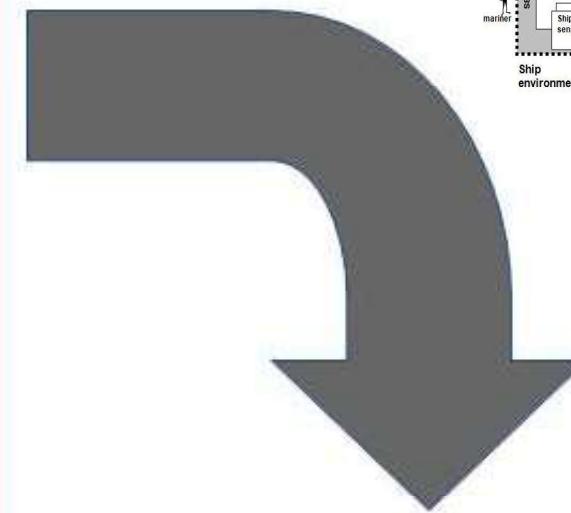
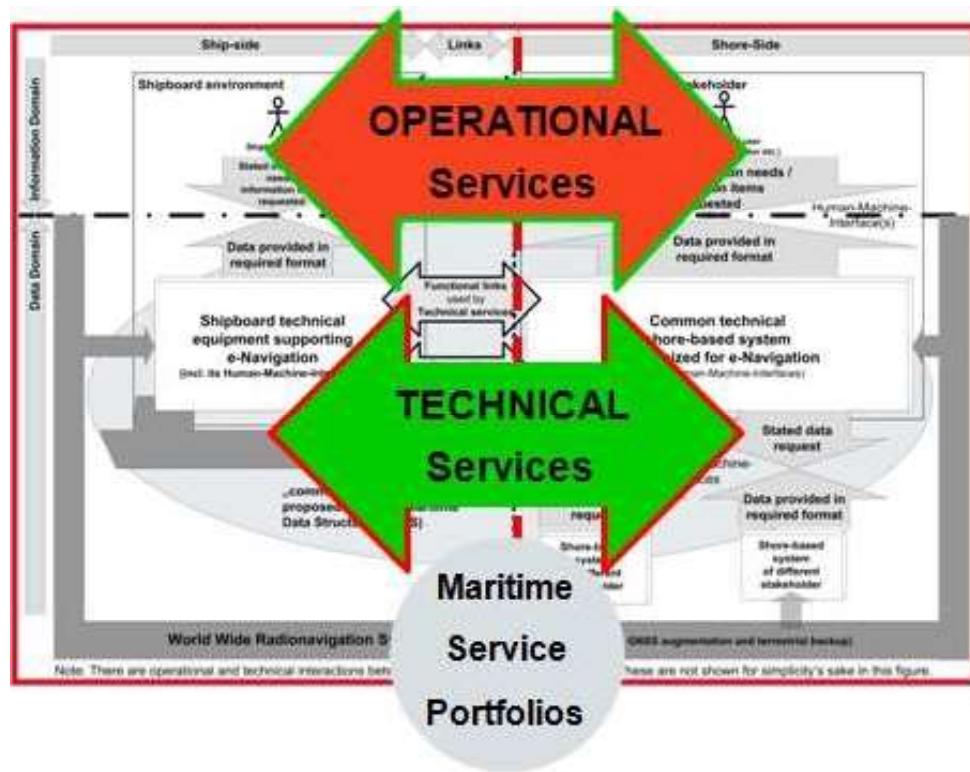
In the context of **knowledge based** and **service-enabled society**, the main risk is not the one of not returning one's investments, but the risk of 'no innovation'; the risk of being outside the revolutionary tendencies identifying the dynamics of society and participating in innovations arising 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**



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 (MSP)



Maritime  
Service  
Portfolios

The spectra of services

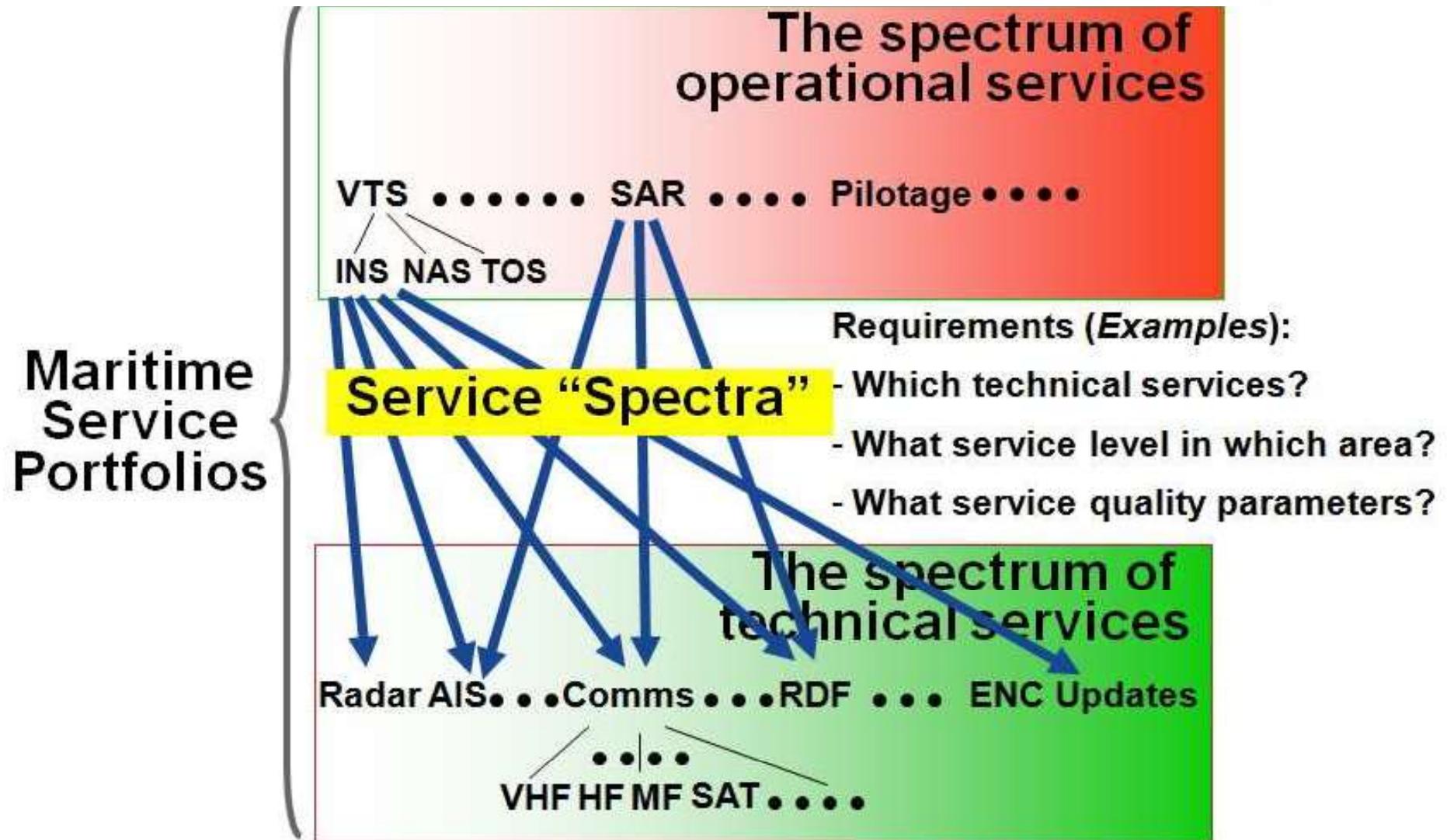
The spectrum of  
operational services

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

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**Harvard  
Business  
Review**

HBR.ORG DECEMBER 2014

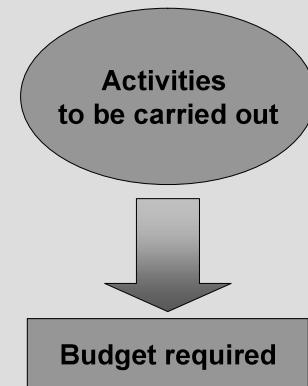
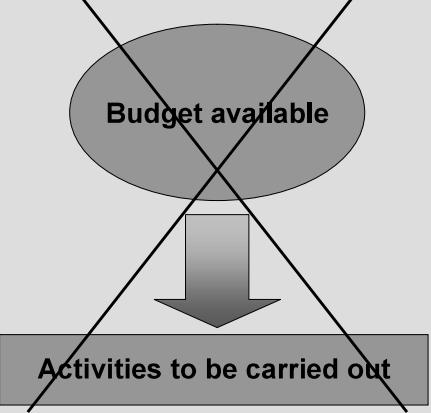
30 Leadership Why HR Chiefs Make Great CEOs—Really!

30 Decision Making Making Dumb Groups Smarter Cass R. Sunstein and Reid Hastie

48 The Big Idea How to Harness "New Power" Jeremy Heimans and Henry Timms

Innovate Faster **Cheaper** Smarter

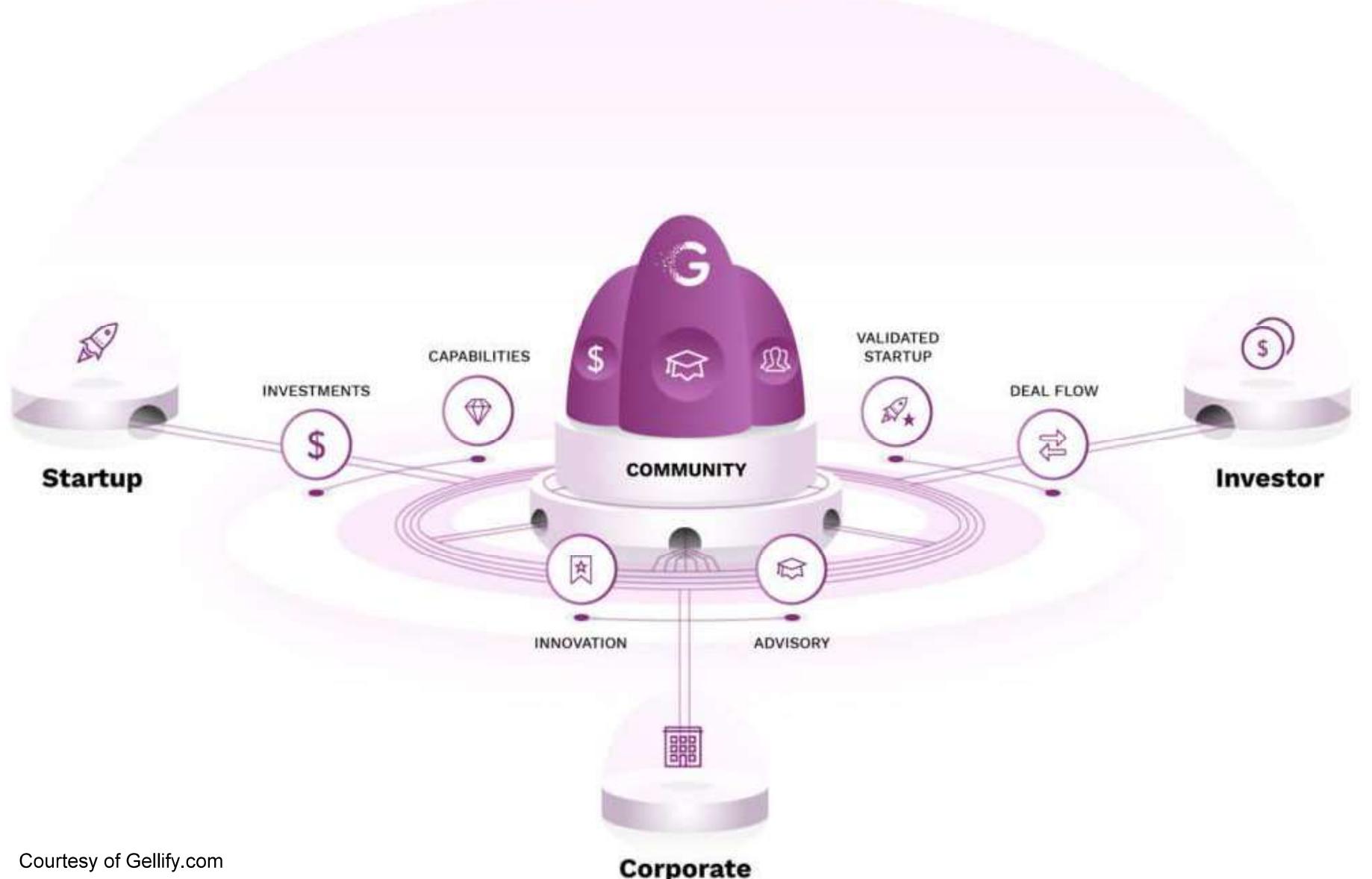
How to lead experiments that actually work PAGE 59

**Two approaches to decide the project budget****THE RIGHT WAY****THE WRONG WAY**

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

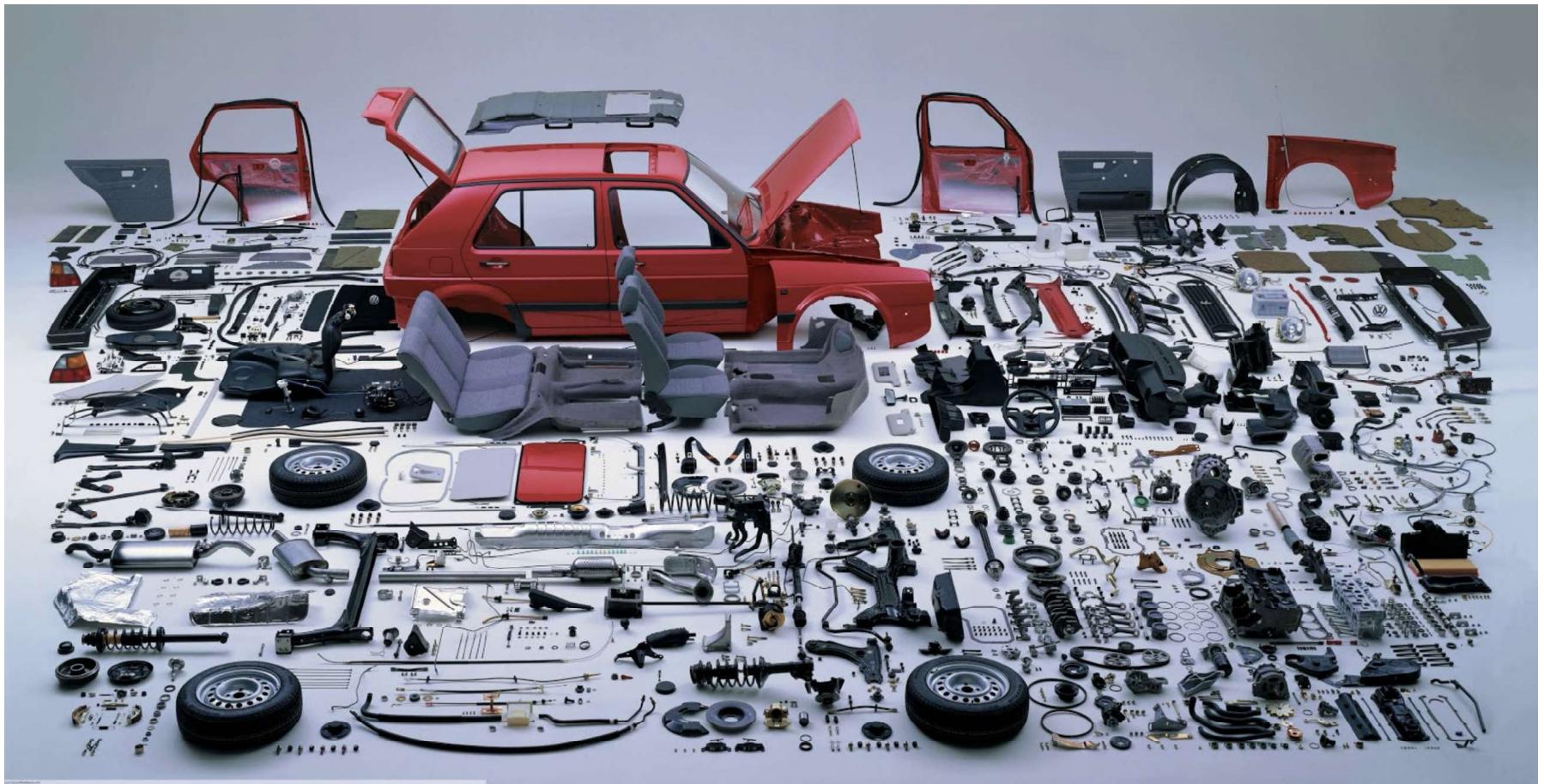
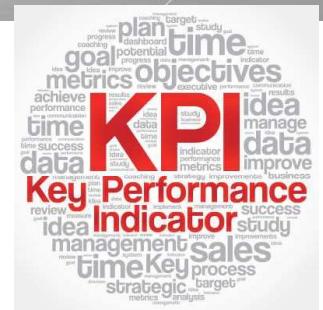
The concept should be extended to all resources required to complete each piece of work; **budget is synonymous with resources.**

# The World of Innovation



Courtesy of Gellify.com

# Key Performance Indicator



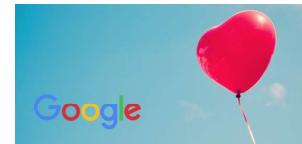
# From Performance to Experience



Start measuring the experience

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

**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



## Google's HEART Framework

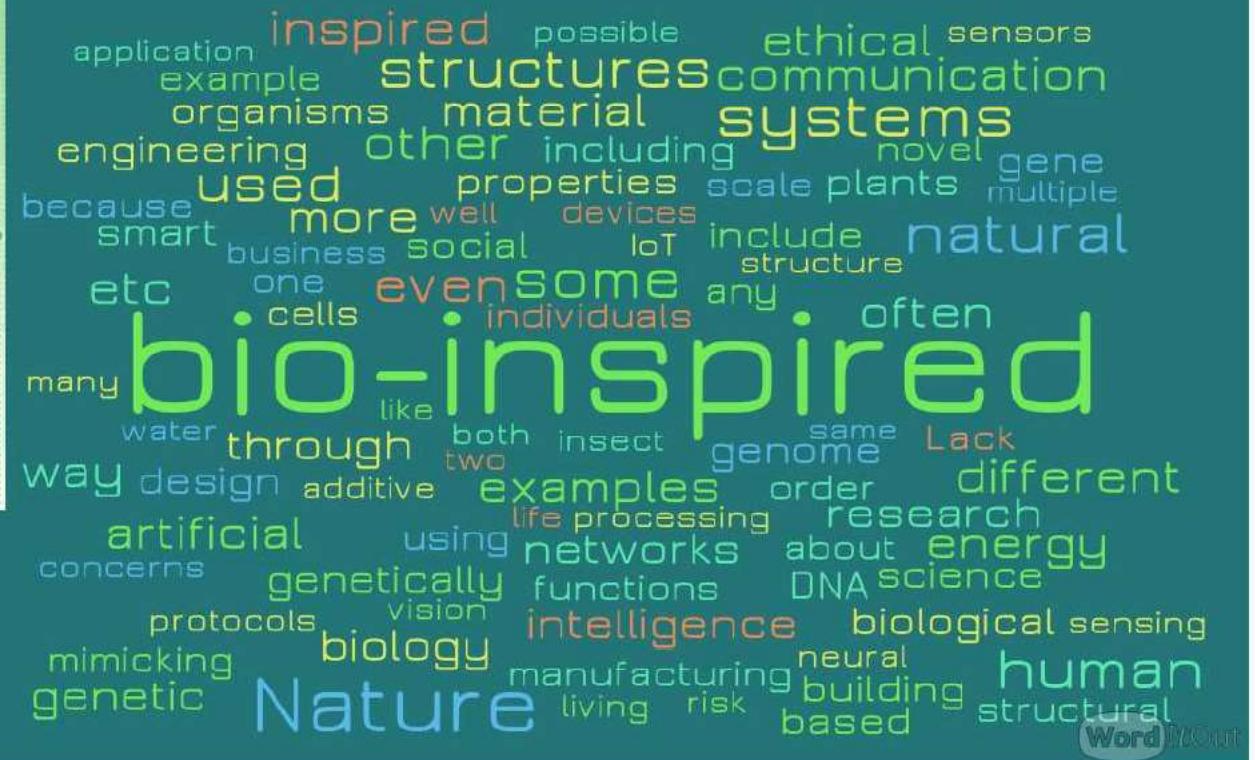
Google HEART Framework Example

CleverTap

	GOALS	SIGNALS	METRICS
<b>Happiness</b>	Users find the app helpful, fun, and easy to use	<ul style="list-style-type: none"> <li>Responding to surveys</li> <li>Leaving 5-star ratings</li> <li>Leaving user feedback</li> </ul>	<ul style="list-style-type: none"> <li>Net Promoter Score</li> <li>Customer satisfaction rating</li> <li>Number of 5-star reviews</li> </ul>
<b>Engagement</b>	Users enjoy app content and keep engaging with it	<ul style="list-style-type: none"> <li>Spending more time in the app</li> </ul>	<ul style="list-style-type: none"> <li>Average session length</li> <li>Average session frequency</li> <li>Number of conversions (consuming content, uploading files, purchases, etc.)</li> </ul>
<b>Adoption</b>	New users see the value in the product or new feature	<ul style="list-style-type: none"> <li>Downloading, launching app</li> <li>Signing up for an account</li> <li>Using a new feature</li> </ul>	<ul style="list-style-type: none"> <li>Download rate</li> <li>Registration rate</li> <li>Feature adoption rate</li> </ul>
<b>Retention</b>	Users keep coming back to the app to complete a key action	<ul style="list-style-type: none"> <li>Staying active in the app</li> <li>Renewing a subscription</li> <li>Making repeat purchases</li> </ul>	<ul style="list-style-type: none"> <li>Churn rate</li> <li>Subscription renewal rate</li> </ul>
<b>Task Success</b>	Users complete their goal quickly and easily	<ul style="list-style-type: none"> <li>Finding and viewing content quickly</li> <li>Completing tasks efficiently</li> </ul>	<ul style="list-style-type: none"> <li>Search exit rate</li> <li>Crash rate</li> </ul>



## Chapter 1 BIO-Inspired TECHNOLOGIES



# Why hexagonal form?

## Optimized solutions

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

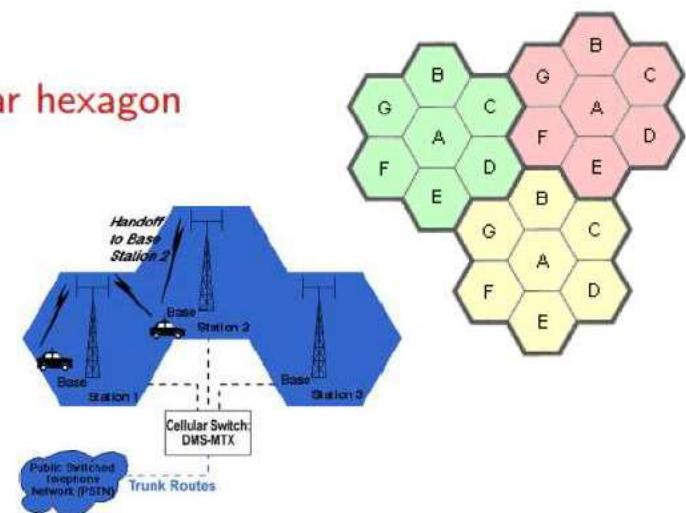
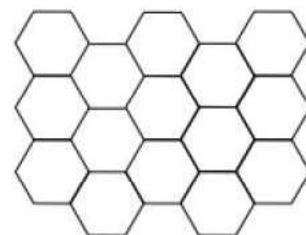
*Why the bees' honeycomb has hexagonal form?*

**Theorem** [Hales, 2001]

Any partition of the plane into regions of equal area has perimeter at least that of the regular hexagonal honeycomb tiling.

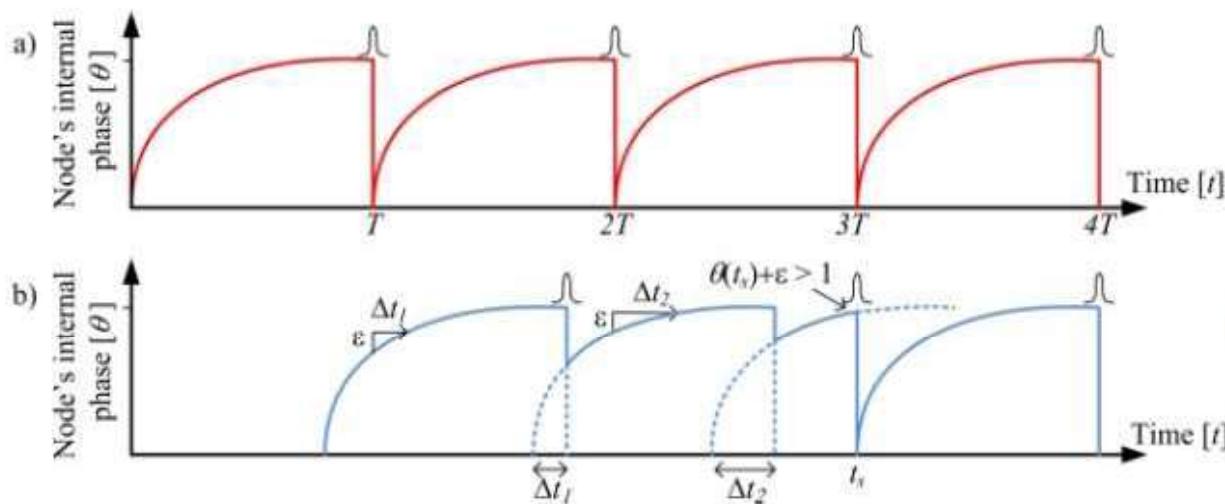
$$m_k(\Omega) = \inf \left\{ \sum_{i=1,\dots,k} \text{Per}(E_i) : E_i \subseteq \Omega, |E_i| \in (0,+\infty), |E_i \cap E_j| = 0 \right\}.$$

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



# 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)





# Vision Based Tracking



Barchino



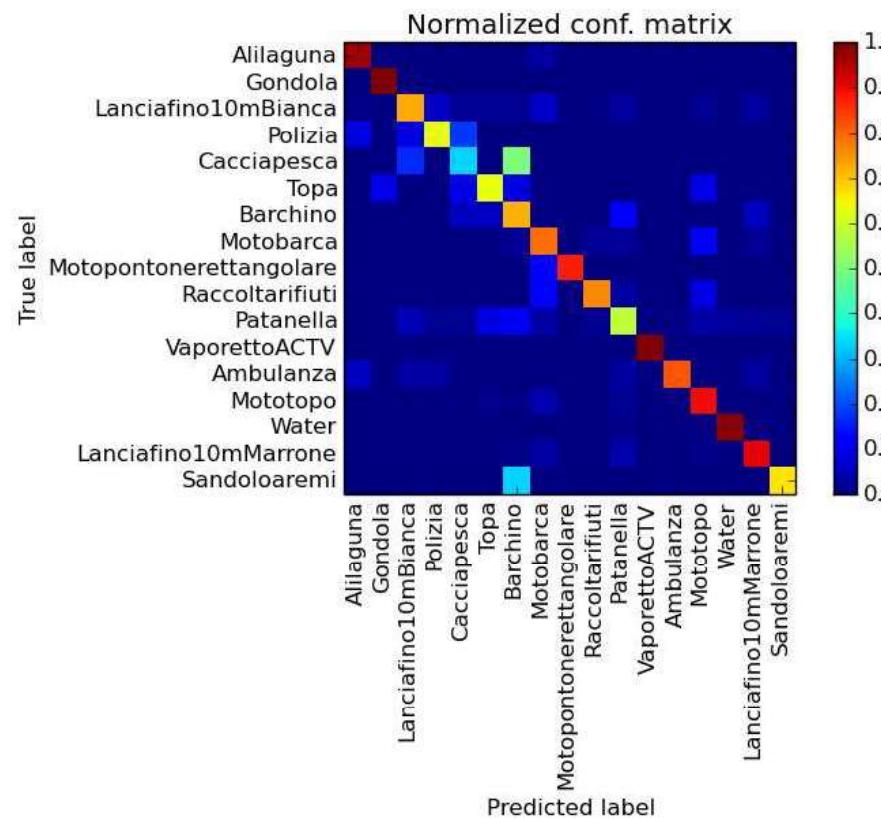
Patanella



Cacciapesca



Topa

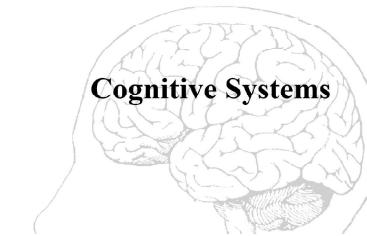




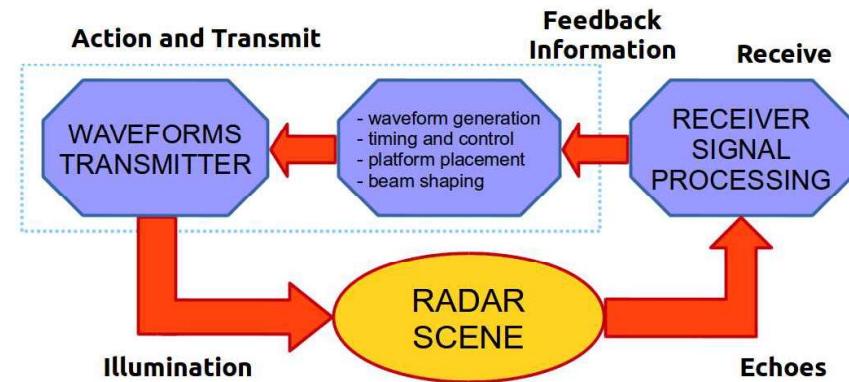
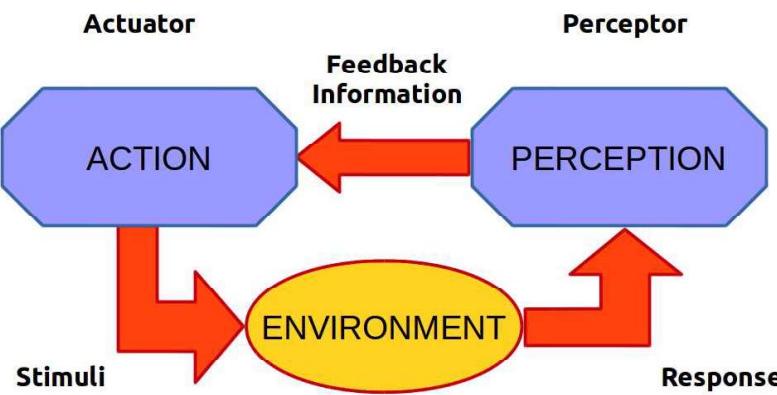
It doesn't  
produce  
electromagnetic  
pollution



# Cognitive radar 1/2



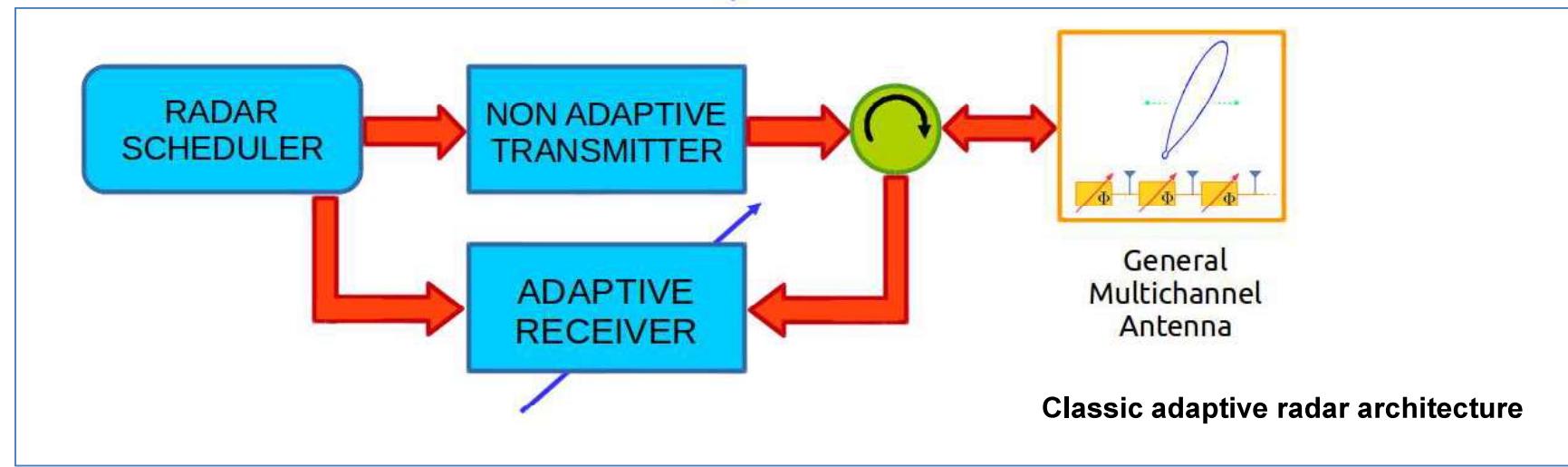
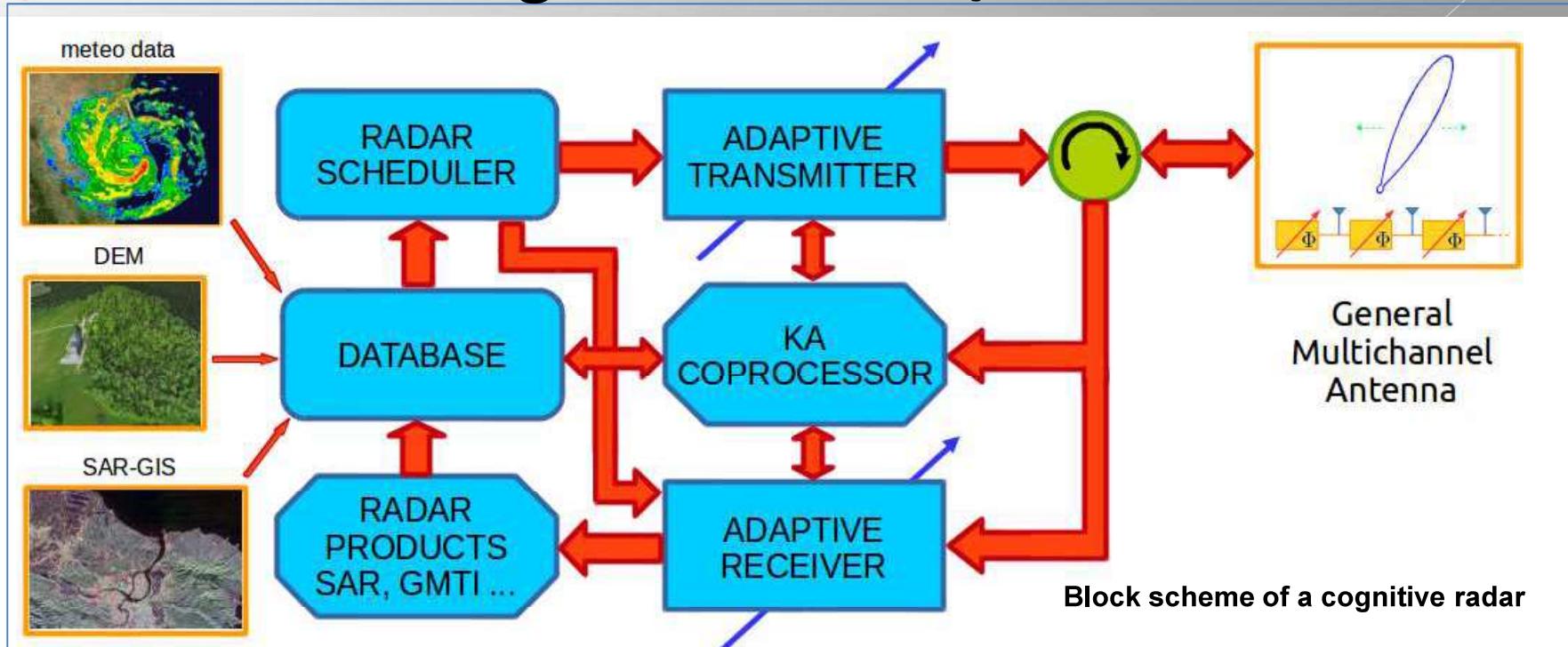
*Cognitive radars are systems based on the perception-action cycle of cognition that sense the environment, learn from it relevant information about the target and the background, then adapt the radar sensor to optimally satisfy the needs of their mission according to a desired goal.*



Credit: /

NATO lecture, EN-SET-216 -06

# Cognitive radar 2/2



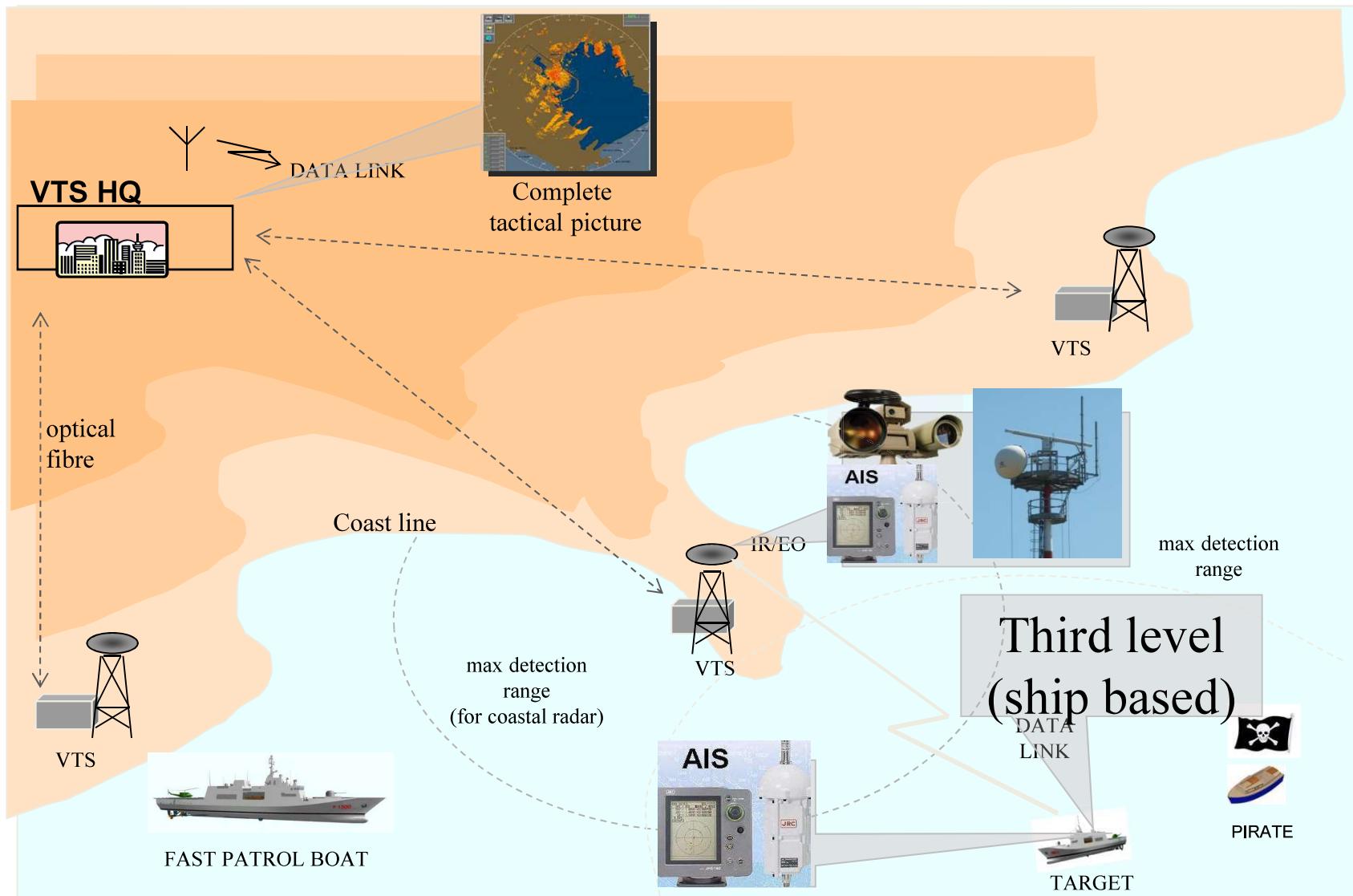
Credit: ...

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IATO lecture, EN-SET-216 -06

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# COPERNICO (Safety Box)

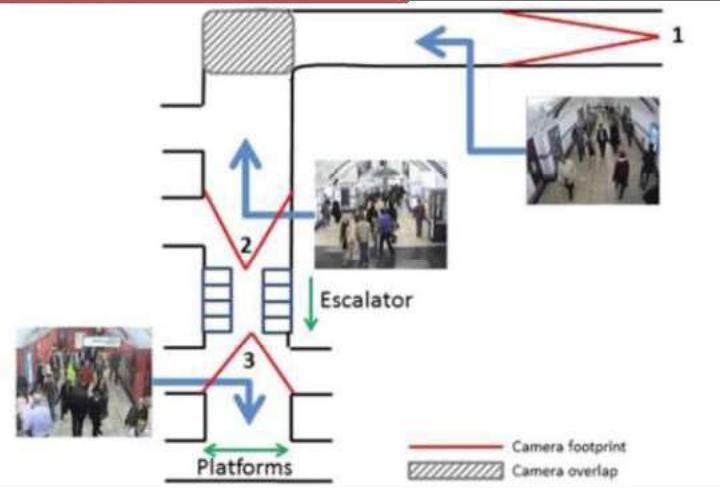


PCT application number:  
**WO2012017470 (A1)**

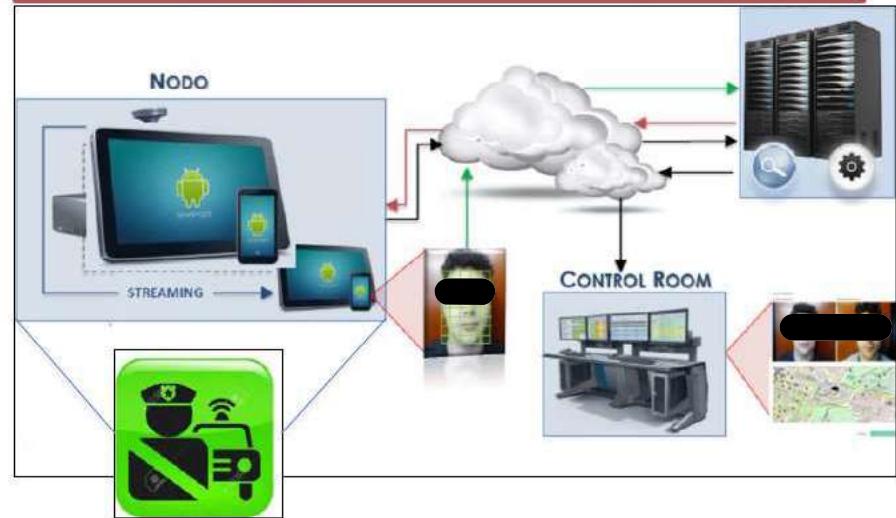
[https://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=2012017470&KC=&locale=en\\_EP&FT=E#](https://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=2012017470&KC=&locale=en_EP&FT=E#)

# Face Recognition - Scenario

**Non collaborative**



**Face recognition in the wild with central processing**



**Collaborative**

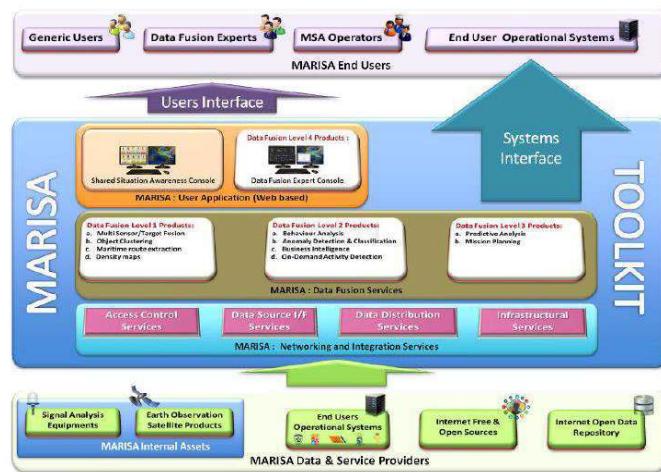
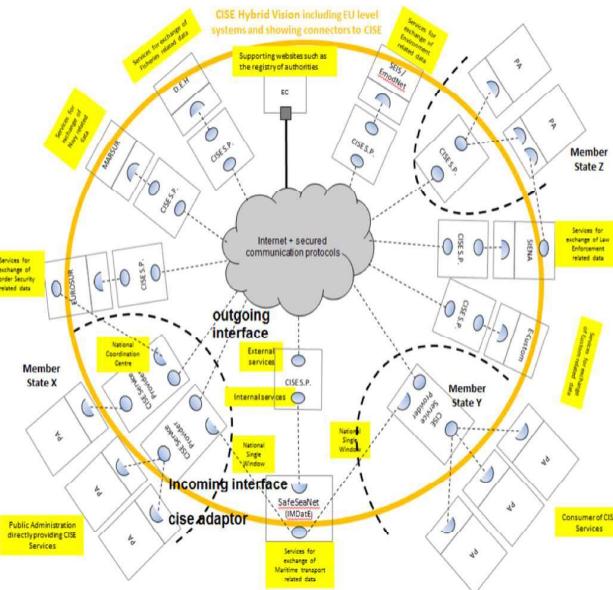


# EUCISE 2020

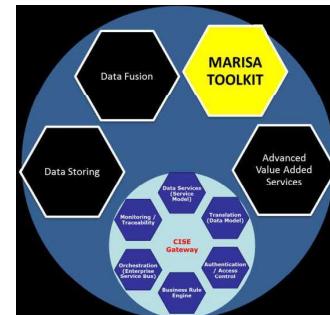
EUCISE 2020

Courtesy of EUCISE2020 Consortium

[www.eucise2020.eu](http://www.eucise2020.eu)



[www.marisaproject.eu](http://www.marisaproject.eu)



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**SECTOR**

[www.fp7-sector.eu](http://www.fp7-sector.eu)

# ZSRN – Sensors and Means



Zautomatyzowany  
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