



# Las taxonomías de la PAE

Héctor Guerrero – INTA  
Vicente Gómez - PAE

Asamblea General  
13 de abril de 2018

# Las taxonomías de la PAE

## CONTENIDO

1. Motivación
2. Las taxonomías de la PAE
3. Aplicación a las entidades de la PAE
4. Conclusiones y próximos pasos

# 1. MOTIVACIÓN



**tedae**  
Asociación Española de  
Empresas Tecnológicas de  
Defensa, Aeronáutica y Espacio

## Centros I+D



## Otros



## Universidades



## Parte Interesada

## Miembros

### Industria



### Centros I+D



### Otros



### Universidades



### Industria



Gran número de entidades (>90... *y creciendo*)

+

Diferentes fines y clases de organizaciones

+

Sectores y campos de actividad muy variados

+

*Todo ello en un país diverso y montañoso*

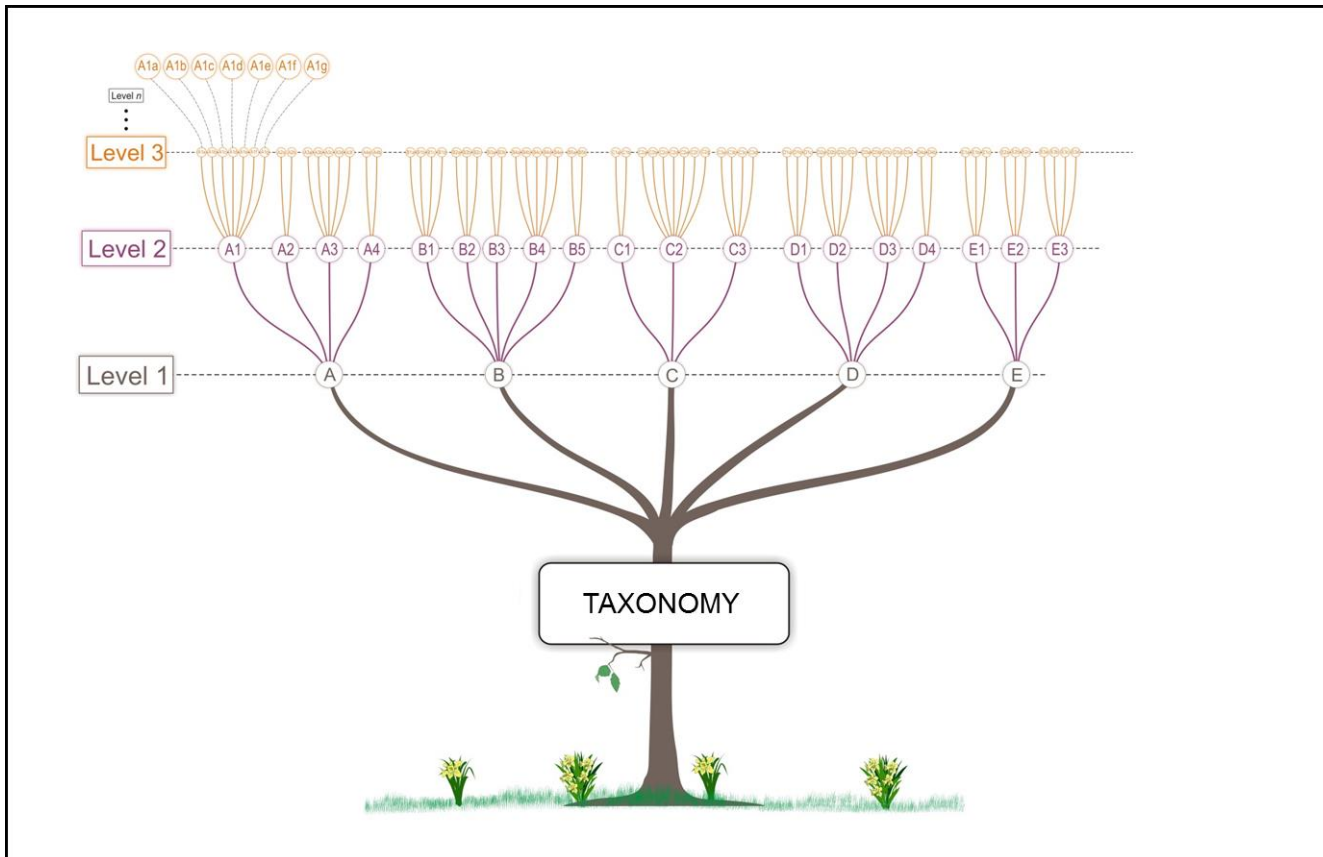
=



Y en un sector de 'altos vuelos'



Es necesario un mismo lenguaje, un marco de referencia común

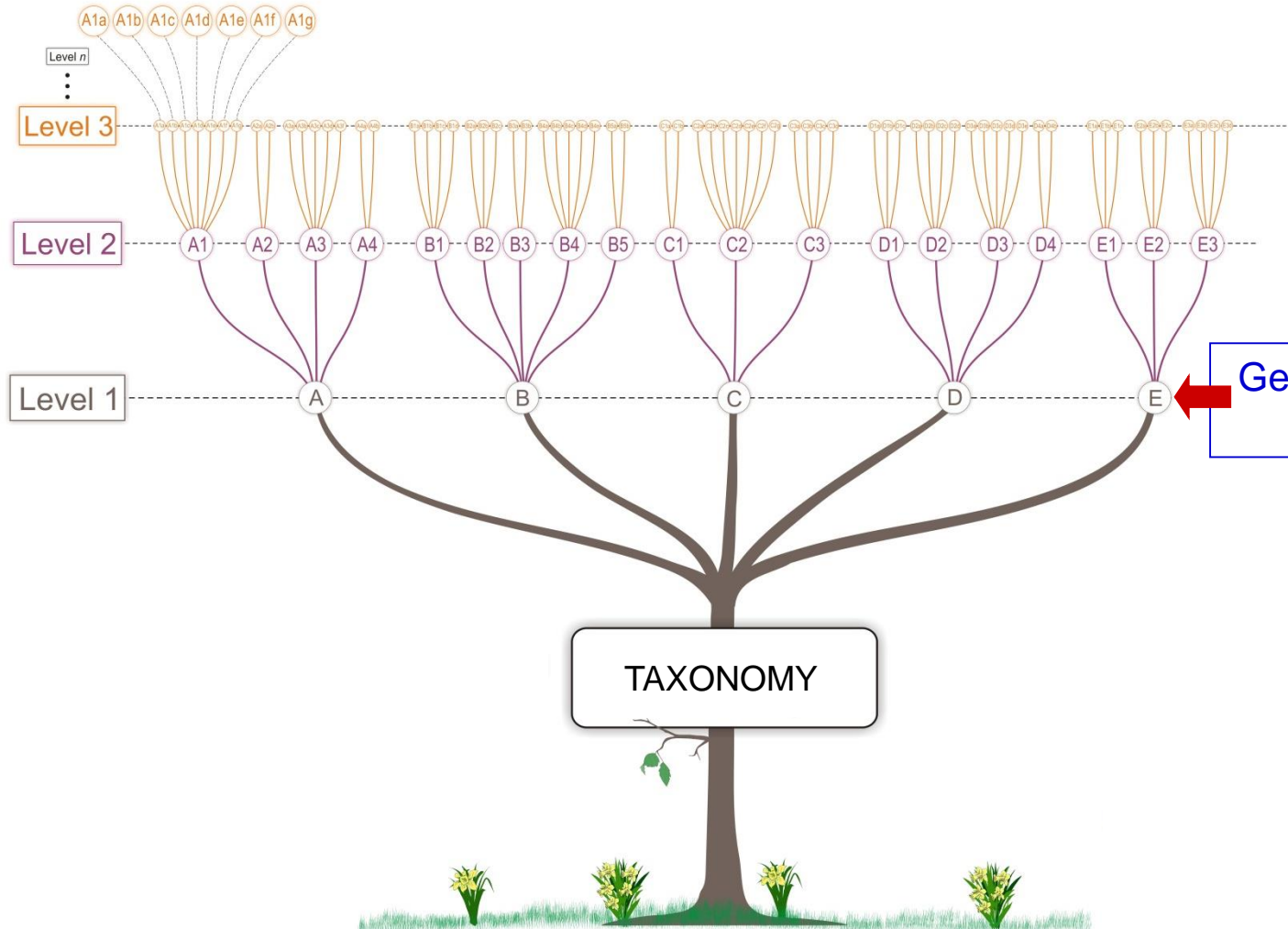


Taxonomía = Términos y definiciones en un contexto jerárquico

# Hay que crear una taxonomía

## 1. MOTIVACIÓN

Levels of  
understanding



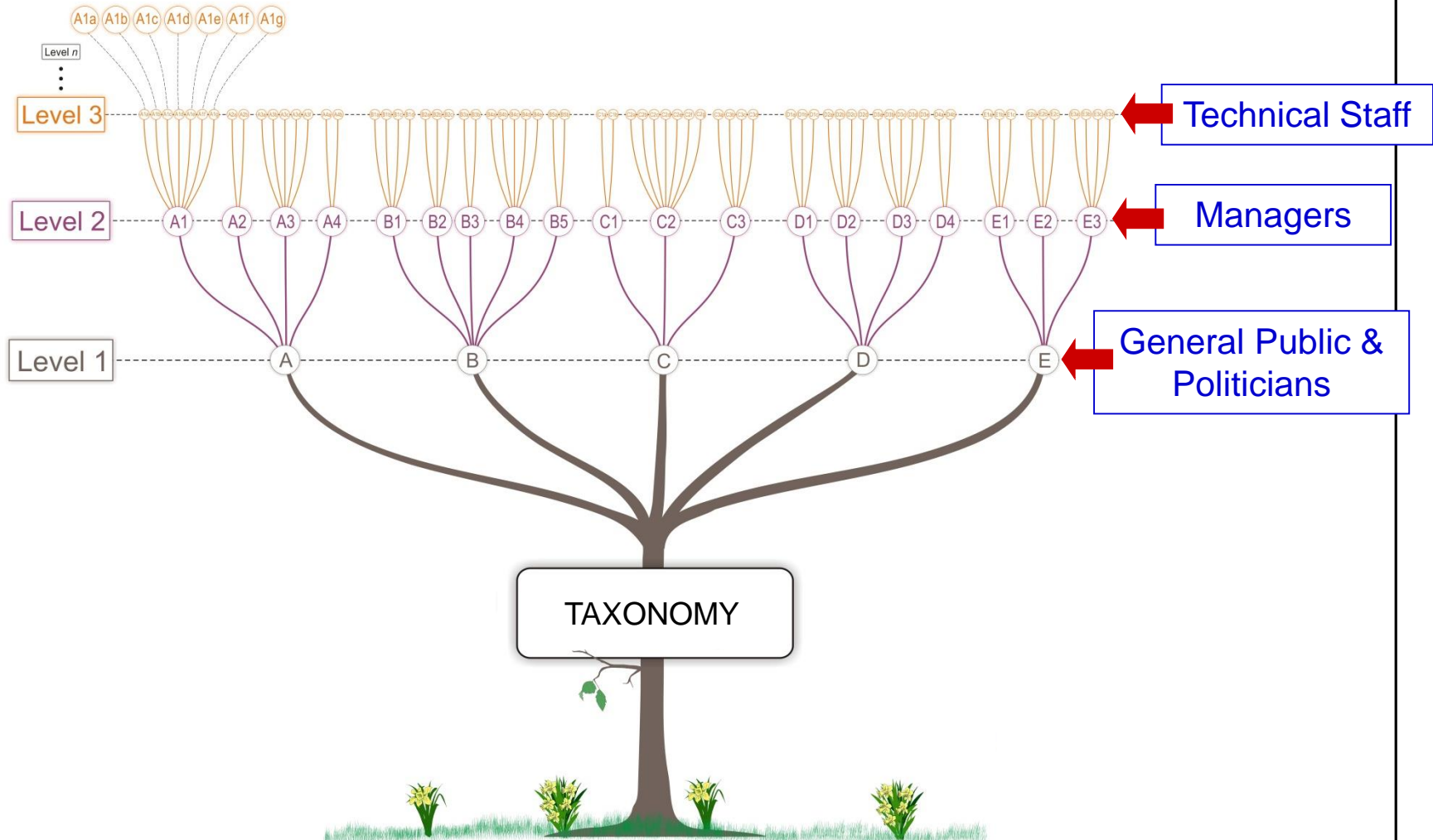
General Public & Politicians



# Hay que crear una taxonomía

## 1. MOTIVACIÓN

Levels of  
understanding

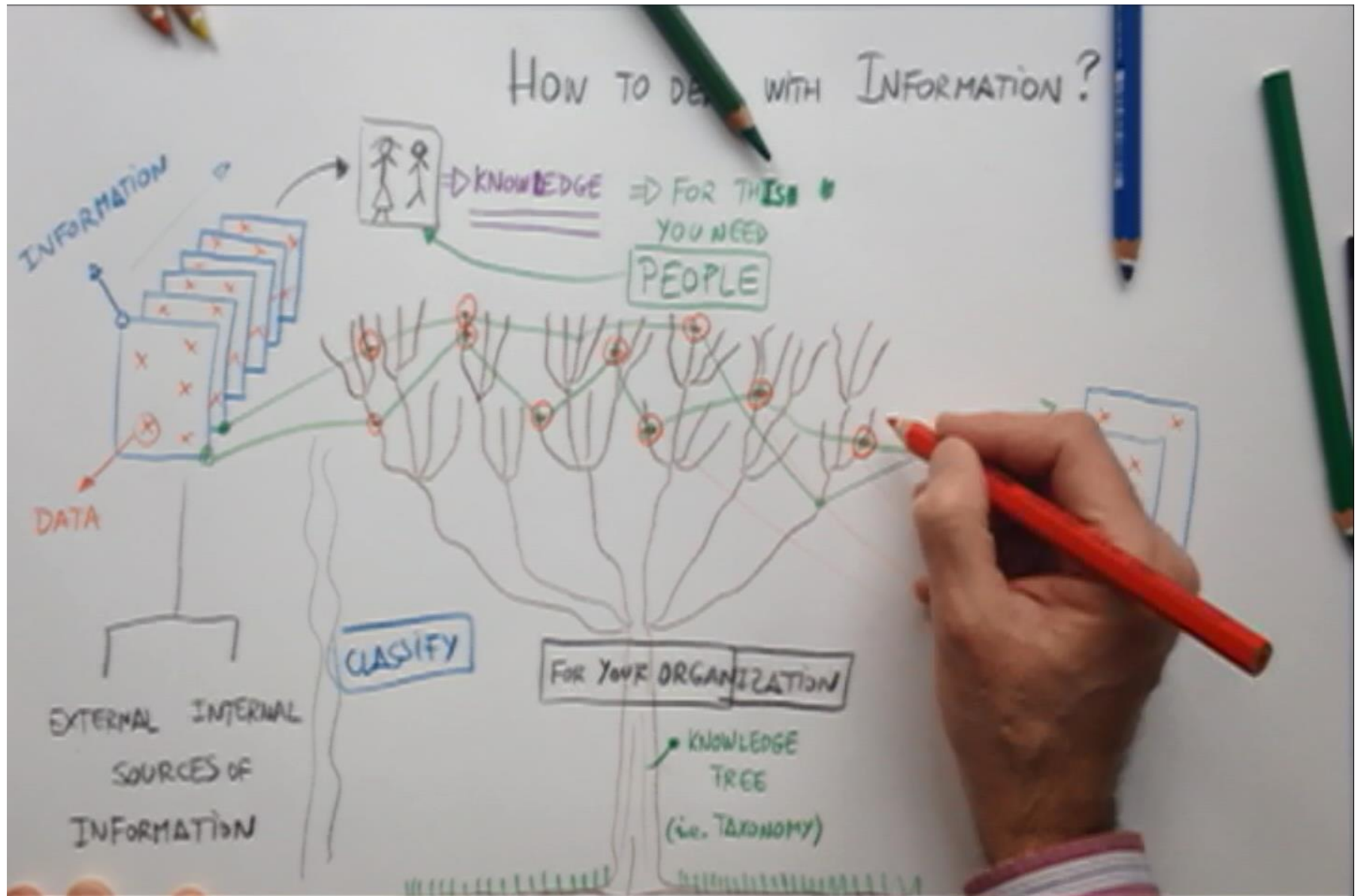


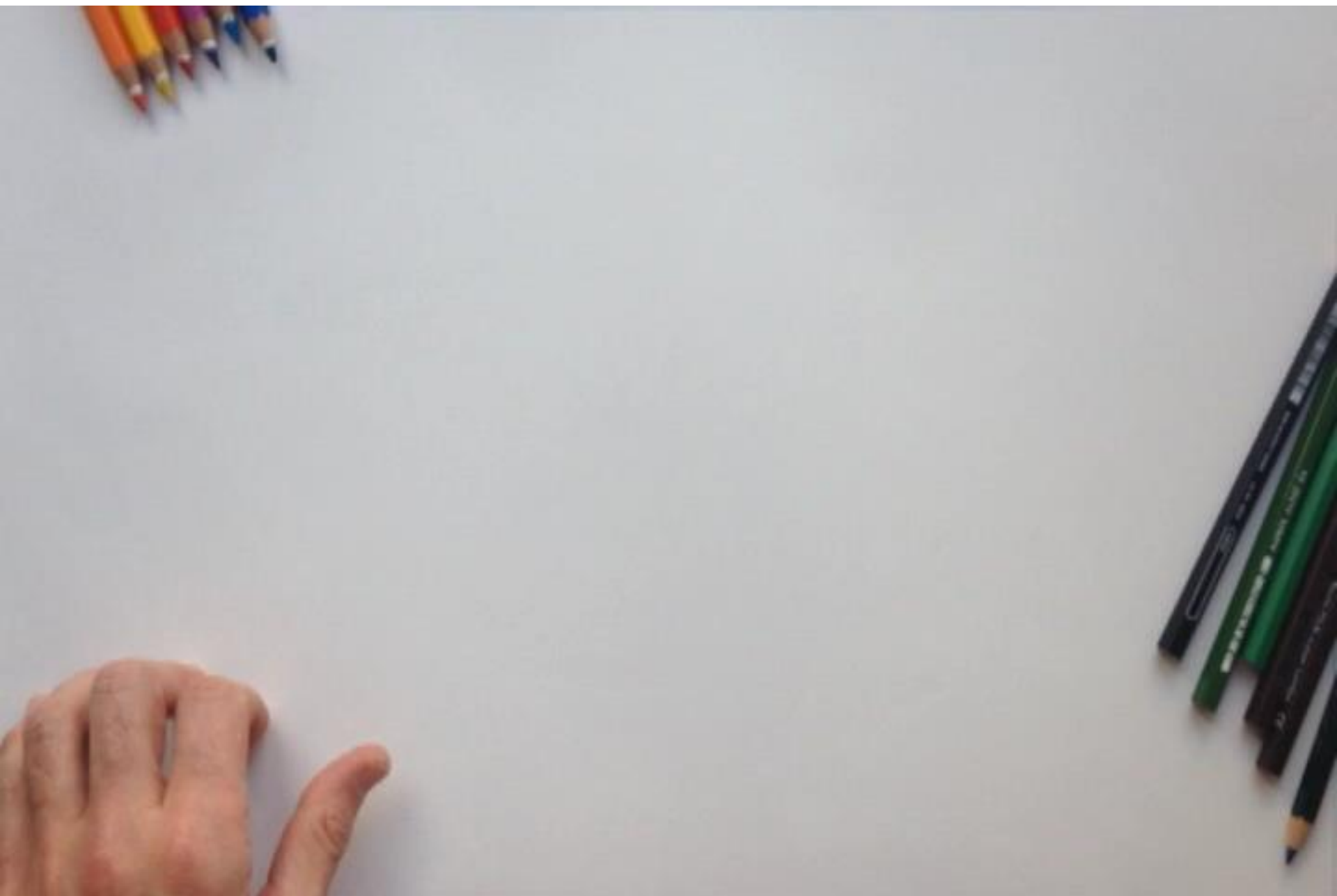
# ¿Para qué queremos una taxonomía?





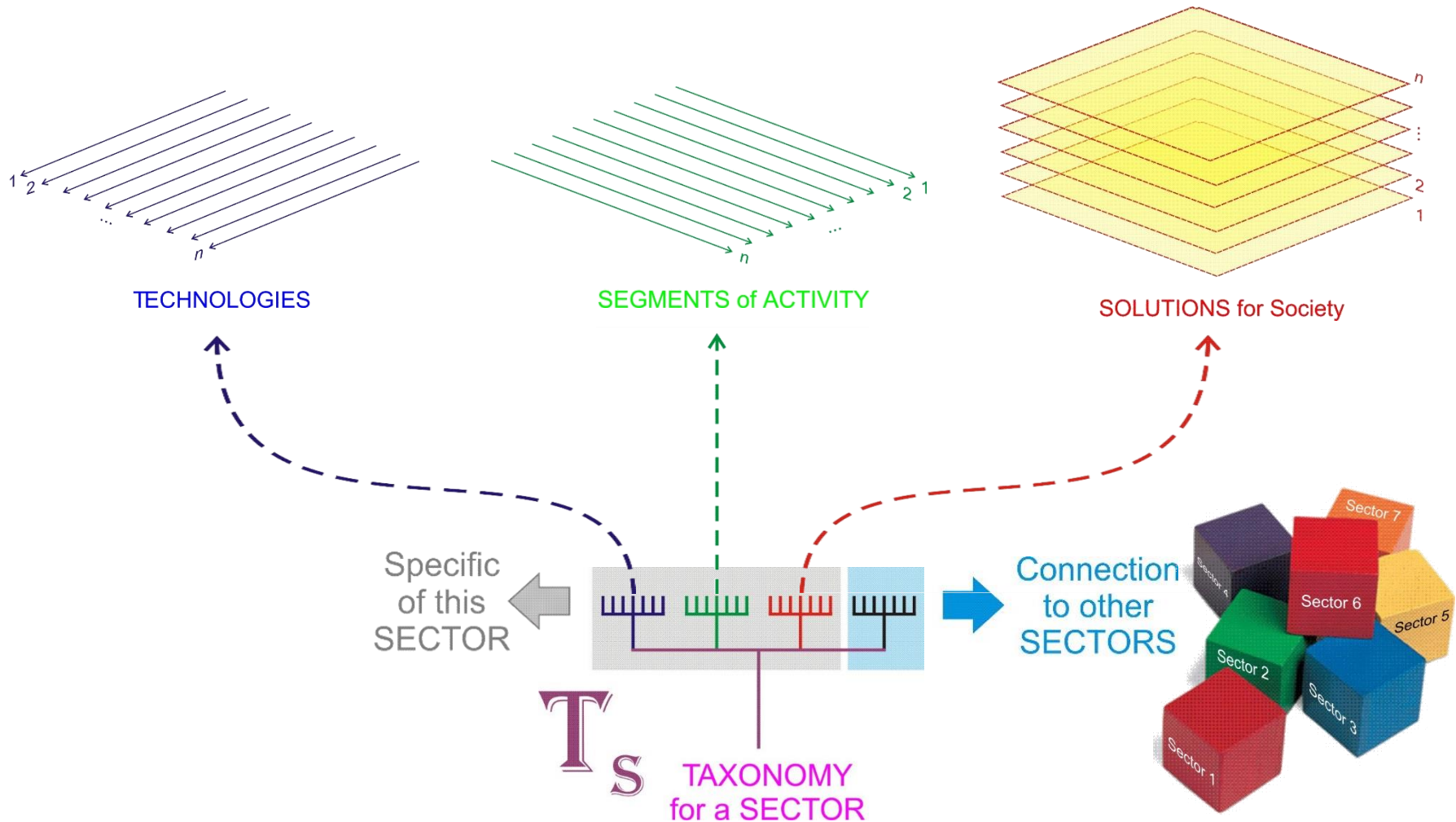
# La utilización de la taxonomía





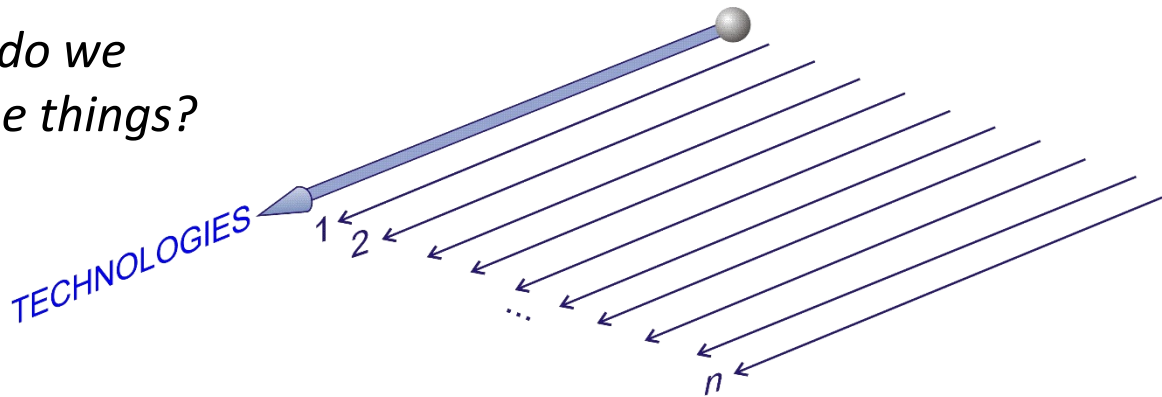
## 2. Las Taxonomías de la PAE

**Basic idea:** a taxonomy for a sector is defined with 4 branches



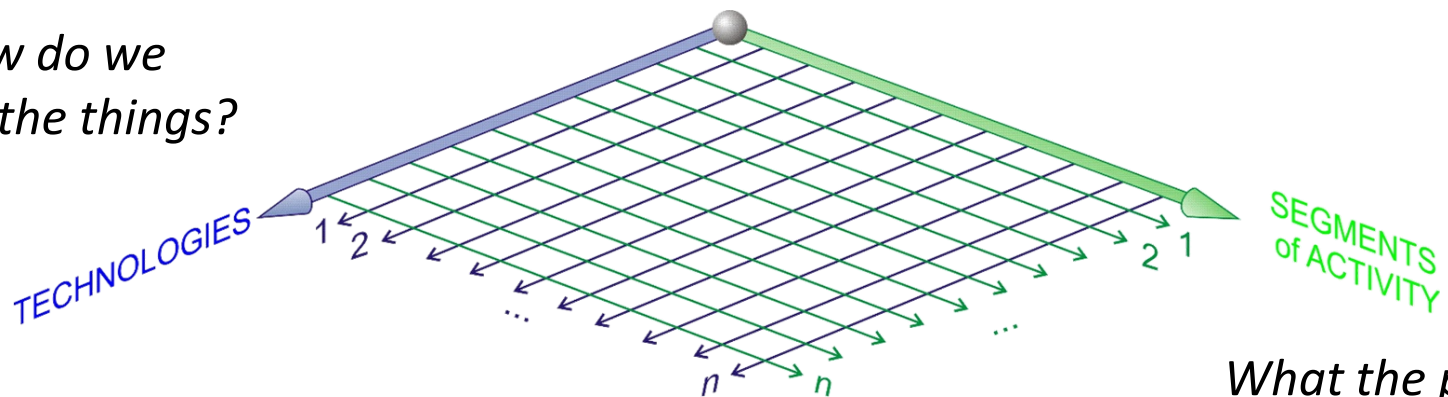
- 3 branches specific of the sector under study
- 1 branch that links this sector to other sectors

*How do we  
make the things?*



The TECHNOLOGIES and SEGMENTS of ACTIVITY are 'orthogonal' views of the sector

*How do we  
make the things?*



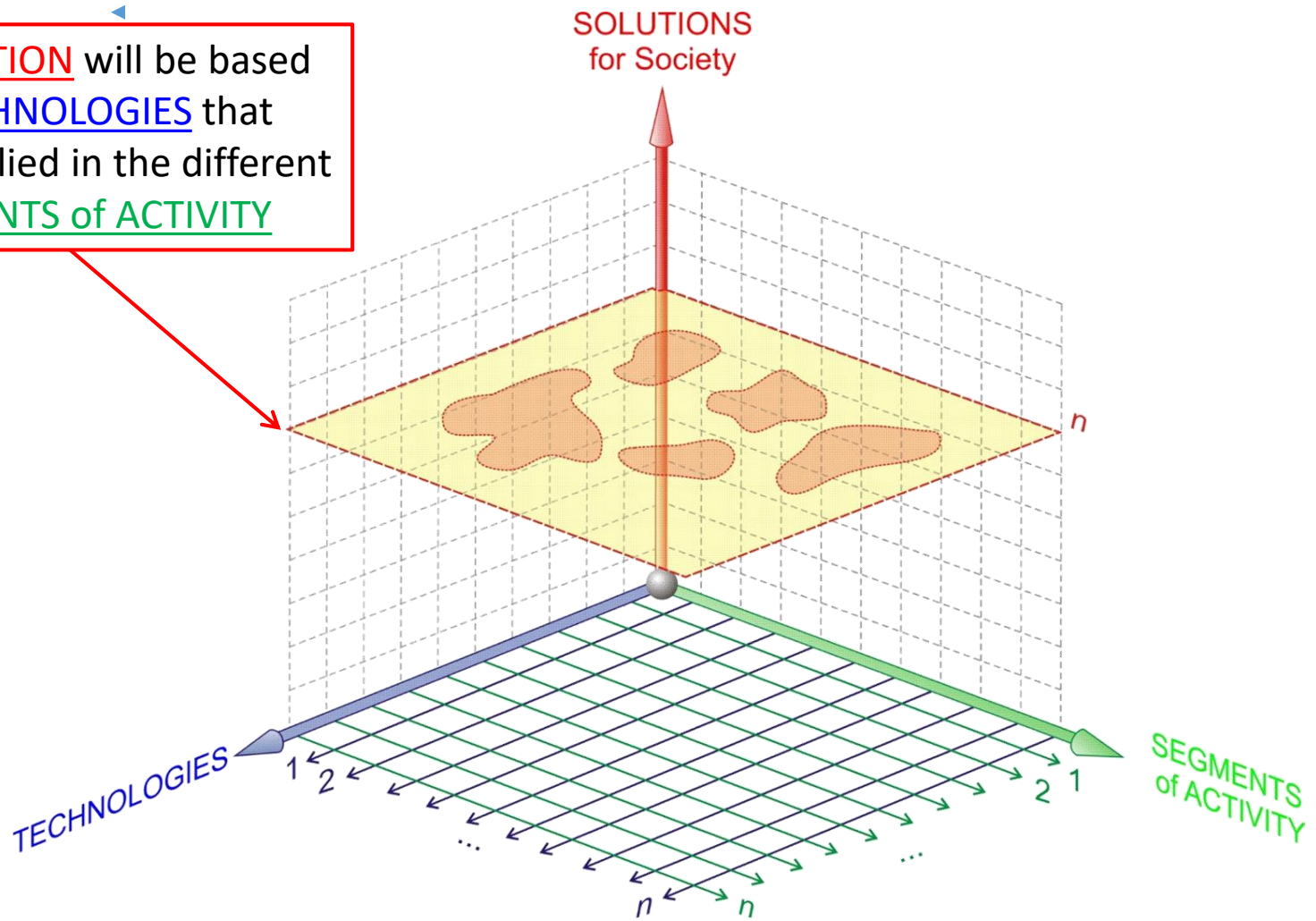
*What the people is  
working for?*

The TECHNOLOGIES and SEGMENTS of ACTIVITY are 'orthogonal' views of the sector

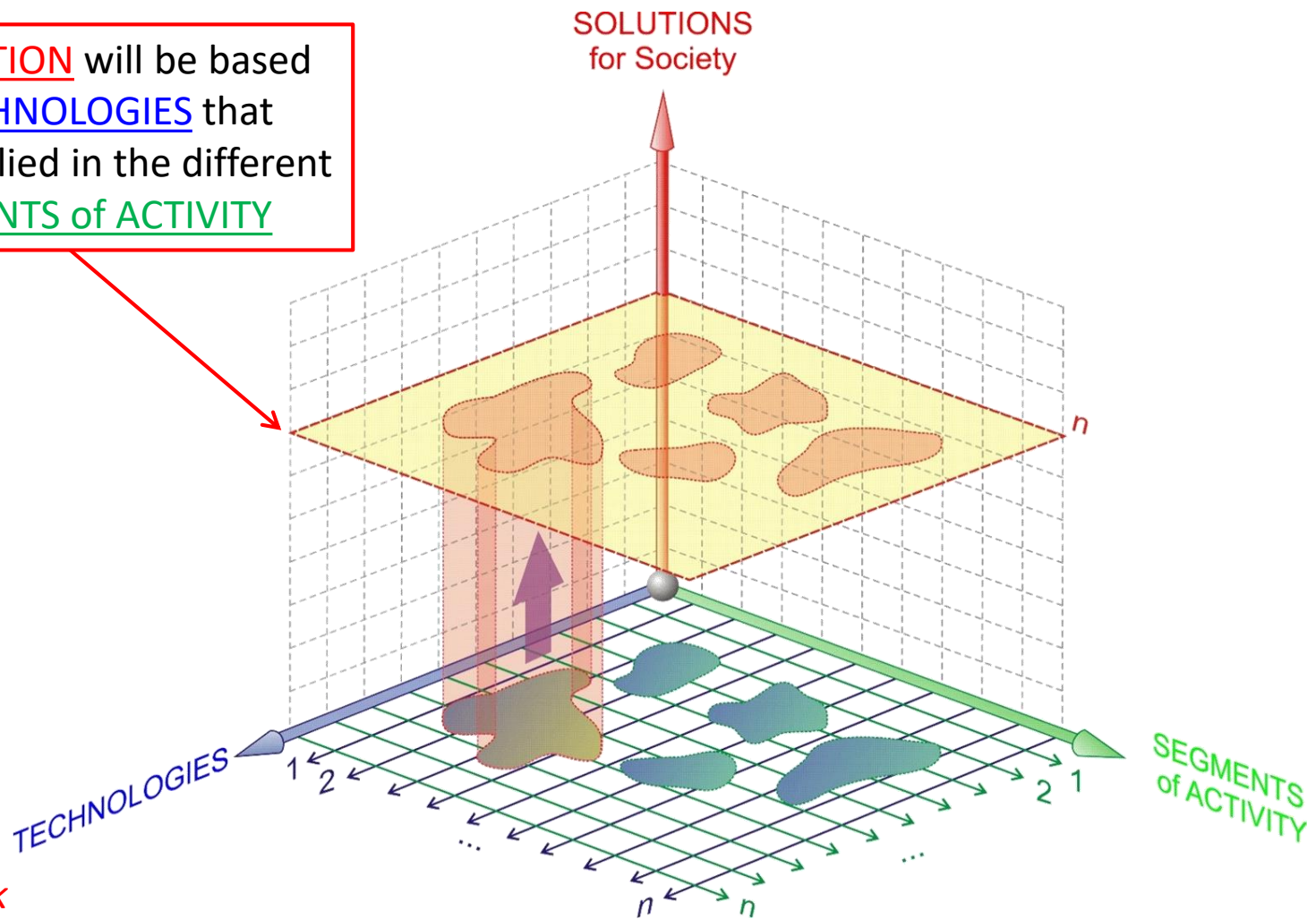




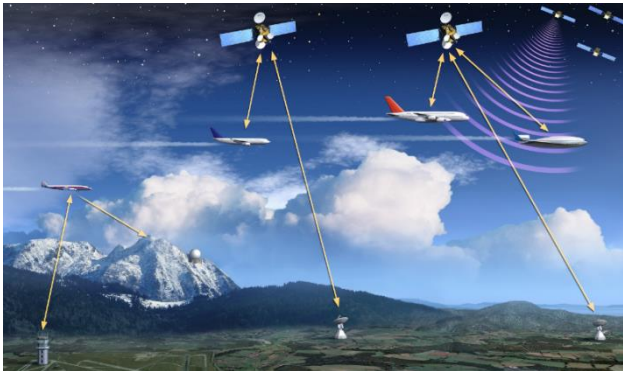
Any SOLUTION will be based  
on TECHNOLOGIES that  
will be applied in the different  
SEGMENTS of ACTIVITY



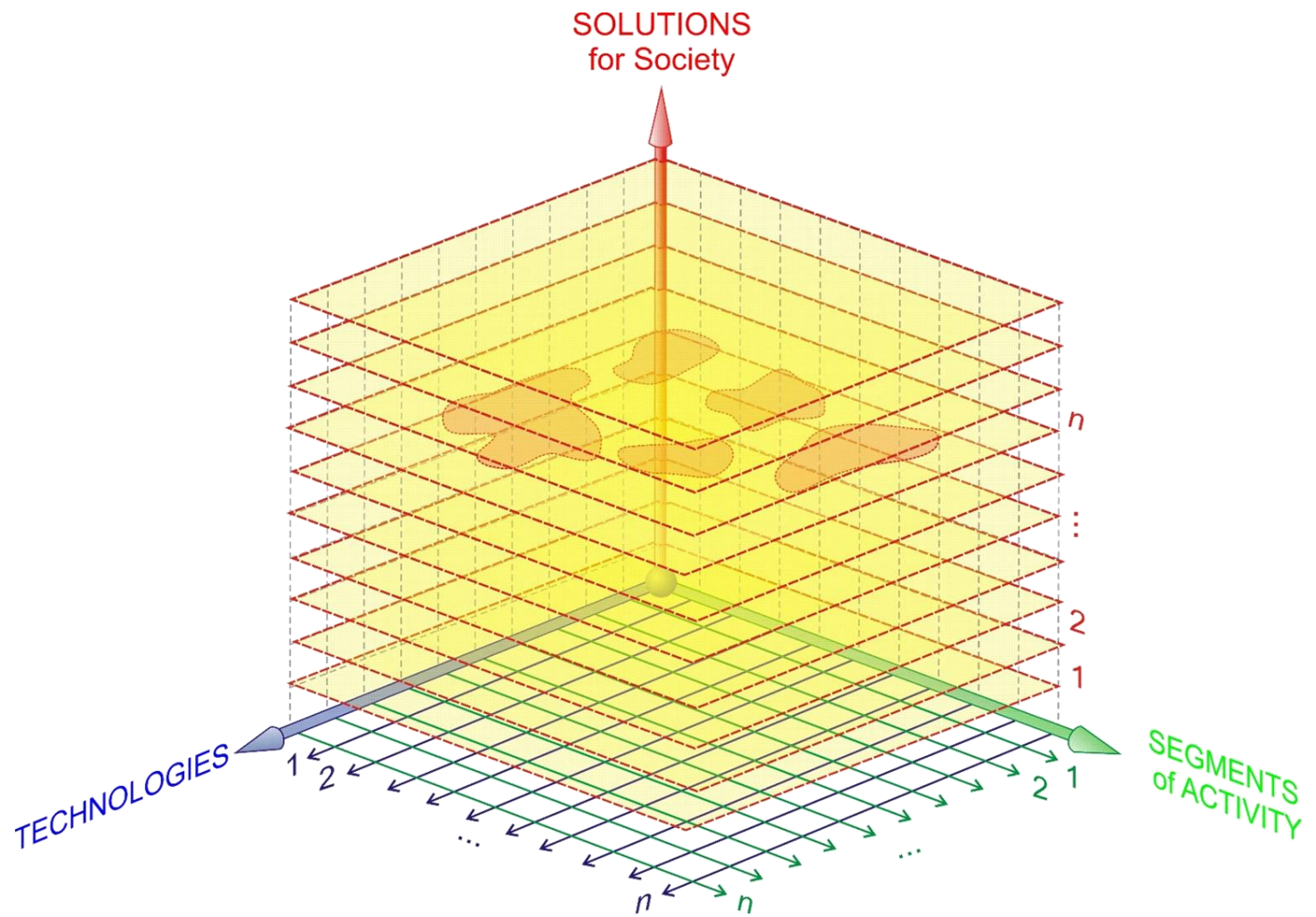
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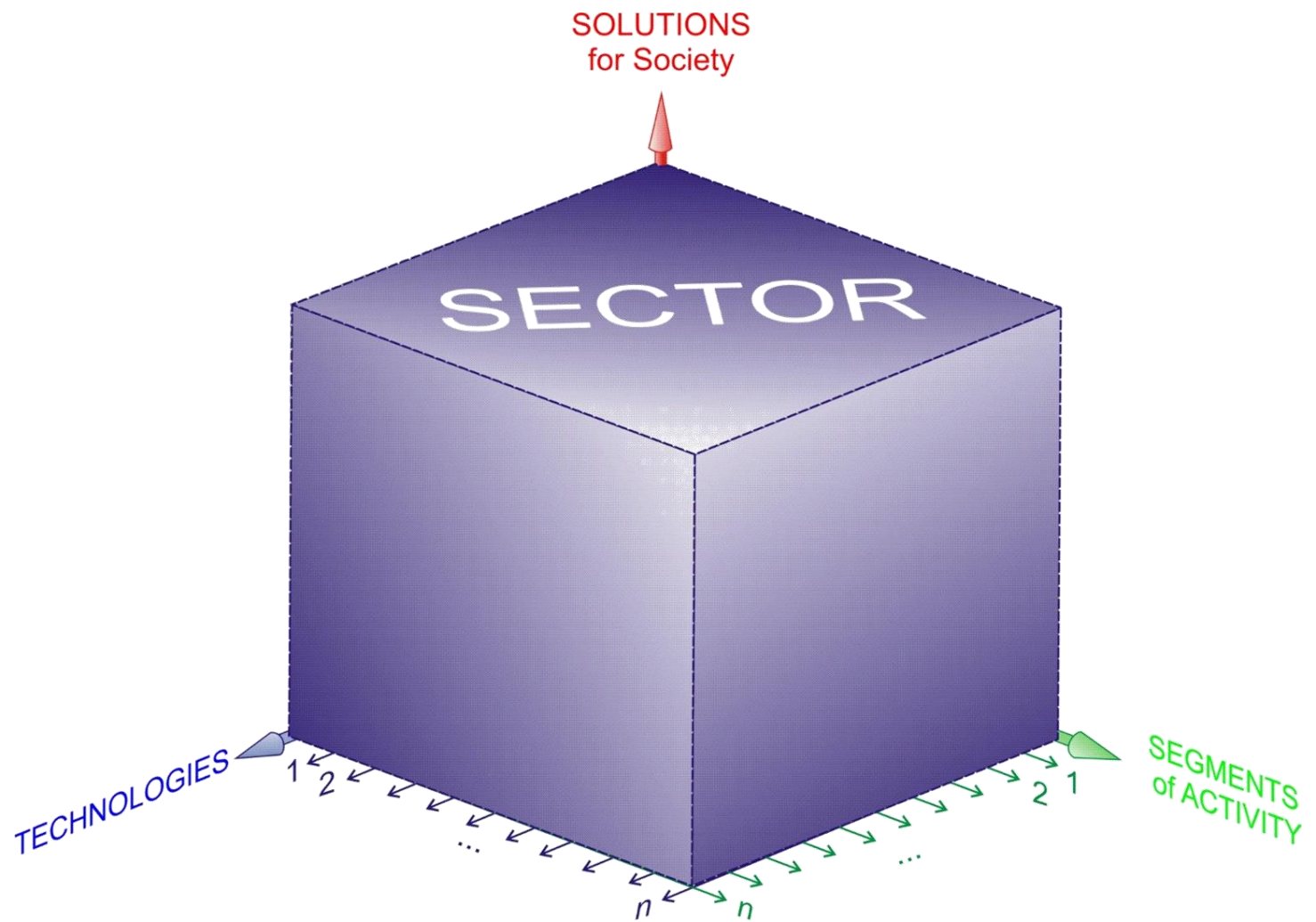


SOLUTION  $k$

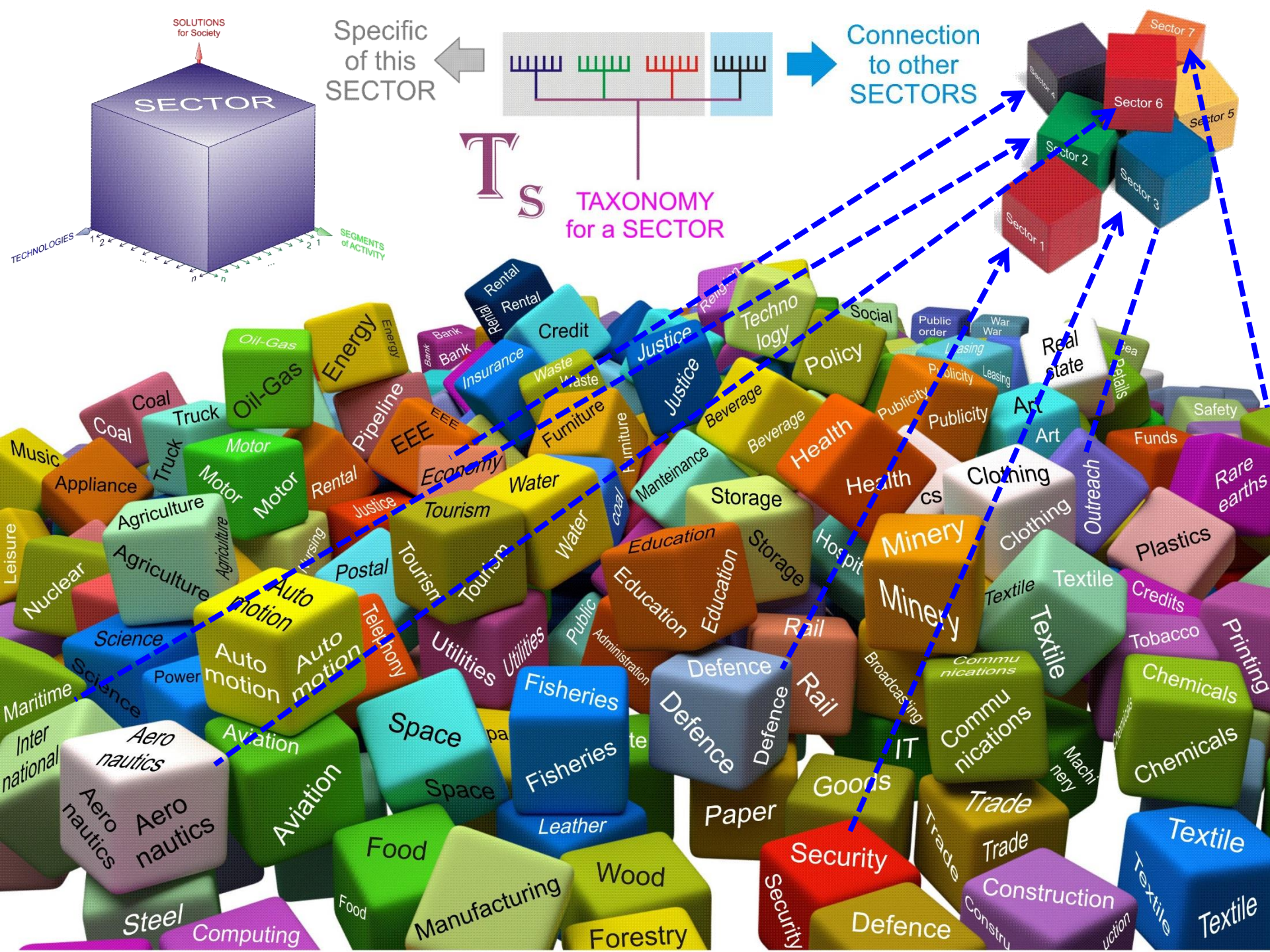


$$\begin{array}{l} \text{Technology 1} \\ \text{Technology 2} \\ \dots \\ \text{Technology } i \end{array} = \begin{array}{l} \text{Segment 1} \\ \text{Segment 2} \\ \dots \\ \text{Segment } j \end{array}$$











# Las Taxonomías de la PAE

<https://plataforma-aeroespacial.es/descargas/#2017-taxonomias>

Correo INTA  WordReference

INICIO

LA PAE ▾

ACTUALIDAD

FORO

DESCARGAS ▾

## PAE 2010-2016 documentos

## Taxonomías de la PAE 2017



### Aeronautical Taxonomy Report

PAE-ATX-REP-01/03  
July 2017



Proyecto financiado por PER 2016-0743

JULY 2017

PAE-ATX-REP-01/03



### Aeronautical Taxonomy Annex

PAE-ATX-ANX-01/03  
July 2017



Proyecto financiado por PER 2016-0743

JULY 2017

PAE-ATX-ANX-01/03



### Space Taxonomy Report

PAE-STX-REP-01/03  
July 2017



Proyecto financiado por PER 2016-0743

JULY 2017

PAE-STX-REP-01/03



### Space Taxonomy Annex

PAE-ATX-ANX-01/03  
July 2017



Proyecto financiado por PER 2016-0743

JULY 2017

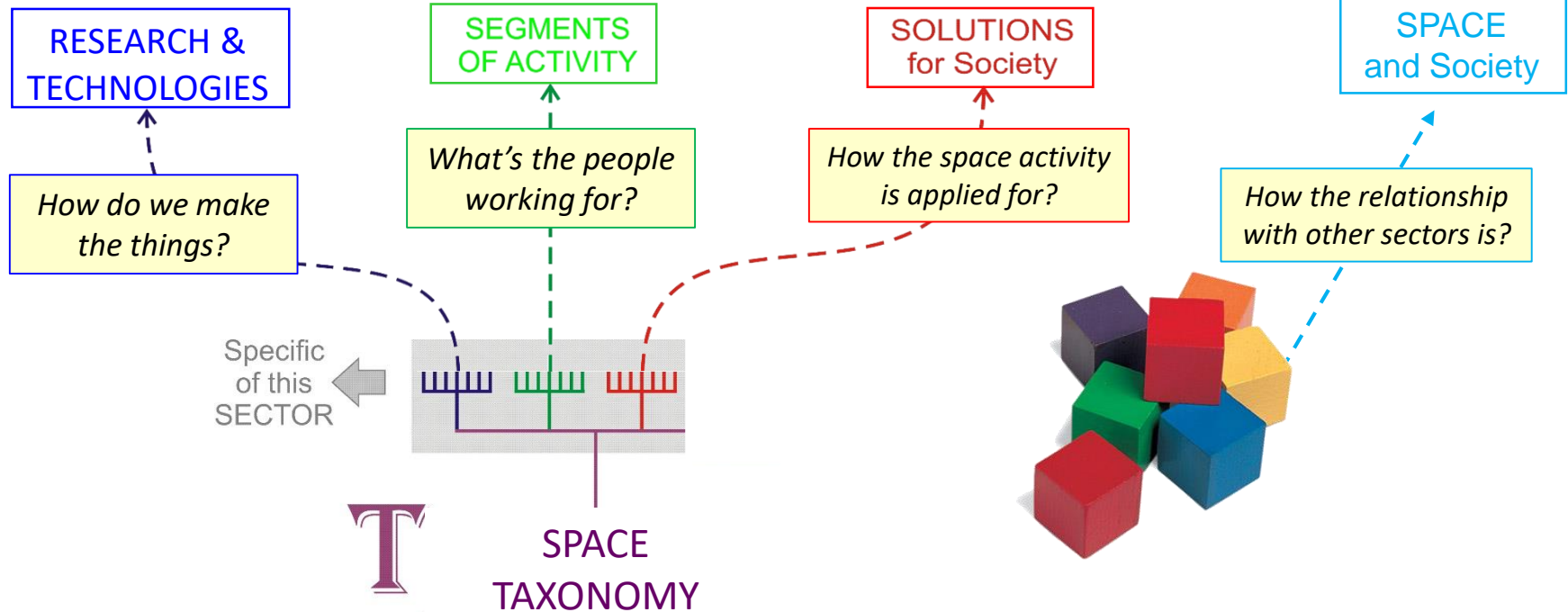
PAE-STX-ANX-01/03

1. Systems Design & Validat.
2. Struct. & Mechanisms
3. Power
4. Avionics
5. Thermal
6. Propulsion
7. GNC & EDL Avionics
8. Communications (RF/Opt.Tech)
9. Sci. Instr. & Sensors
10. Autom., Telepr., Robotics
11. Manned Space Flight
12. Mission Operations
13. SSA / SST
14. Data technologies
15. New Space Paradigms

1. Space Science
2. RTD
3. Commercial & Programmes
4. Design
5. Manufacturing
6. Quality
7. AIV & Tests
8. Access to Space
9. Mission operations
10. Services & Applications
11. In Space Transport & OOS
12. SSA
13. Human factors
14. General Manag. & Admin.

1. Earth Observation
2. Navigation
3. Communications
4. Security
5. Defence
6. Science
7. Robotics Exploration
8. Manned Space Flight
9. Future Domains

1. Other Industries
2. Economy
3. Policy
4. Law
5. International co-operation
6. Education
7. Outreach
8. Humanities



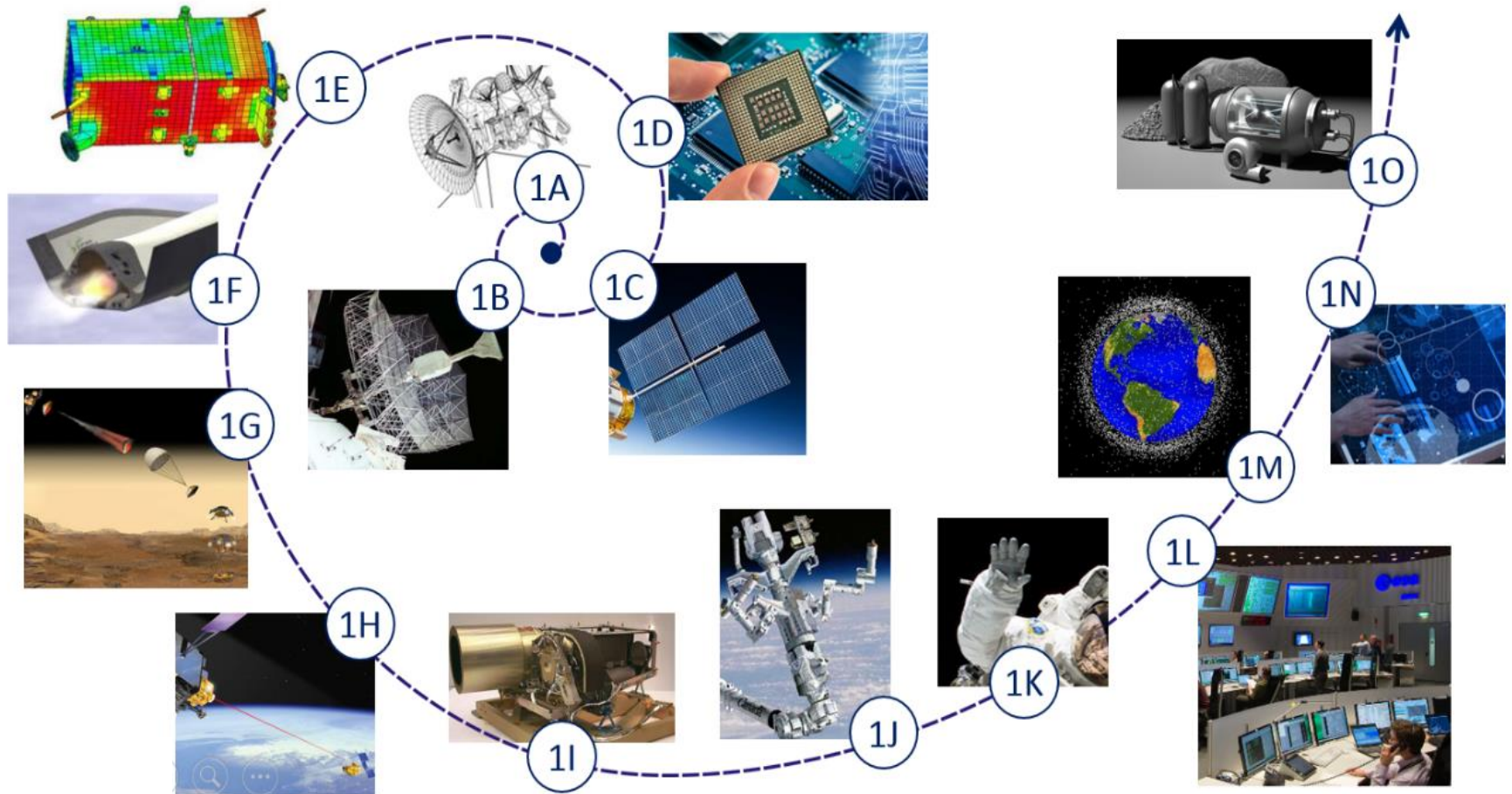


# Space Taxonomy

## 1 - Research & Technology Domain

- 1-A System Design & Verification
- 1-B Structures, Materials & Mechanisms
- 1-C Power
- 1-D Avionics (OBDH, S/W, components)
- 1-E Thermal
- 1-F Propulsion
- 1-G Guidance, Navigation & Control and Entry, Descent & Landing

- 1-H Communications (RF & Optical)
- 1-I Science Instruments, Observatories & Sensors
- 1-J Automation, Telepresence & Robotics
- 1-K Manned Spaceflight Technologies
- 1-L Mission Operations & Ground Systems
- 1-M SSA & Clean Space
- 1-N Data Technologies
- 1-O New Space Paradigms

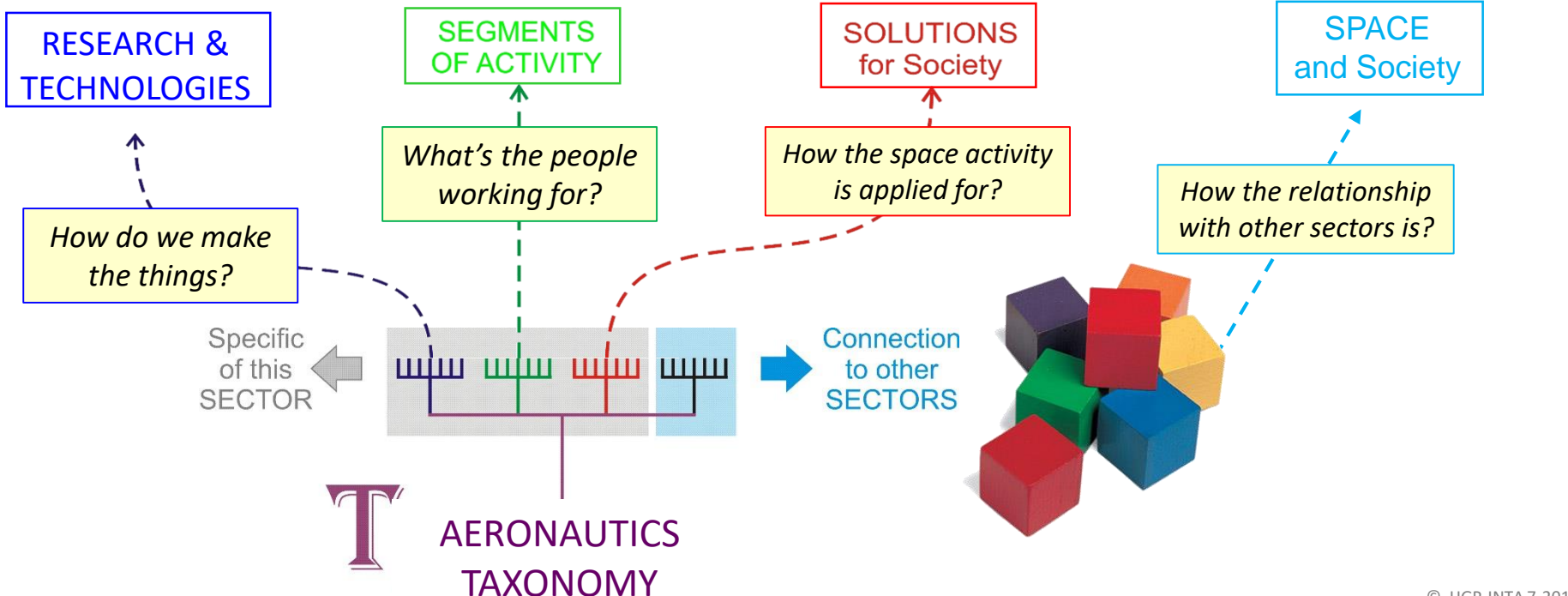


1. Flight Physics
2. Aerostructures
3. Propulsion & Power
4. Avionics Systems & Equipm.
5. Flight Mechanics
6. Integrated Design & Validation
7. Air Traffic Management
8. Airports
9. Human Factors
10. Innovative Concepts & Scenarios
11. Unmanned Aerial Syst. Technol.
12. Digital Industry – Industry 4.0

1. RTD
2. Commercial & Programmes
3. Design
4. Manufacturing
5. Quality
6. Systems Integr. & Verification
7. Flight Testing
8. Certification & Airworthiness
9. Maintenance, Repair & Overh.
10. Air Traffic Management
11. Airport Management
12. Air Transport
13. General Manag. & Admin.

1. Scheduled Air Passenger Transport
2. General Aviation
3. Air Freight
4. Defence
5. Security
6. Civil Surveillance
7. Environmental
8. Future Applications

1. Other Industries
2. Economy
3. Policy & Regulations
4. International co-operation
5. Education
6. Outreach
7. Humanities



# Aeronautics Taxonomy

## 1 - Research & Technology Domain

1A - Flight Physics

1B - Aerostructures

1C - Propulsion & Power

1D - Aircraft Avionics, Systems & Equipments

1E - Flight Mechanics

1F - Integrated Design & Validation (methods & tools)

1G - Air Traffic Management

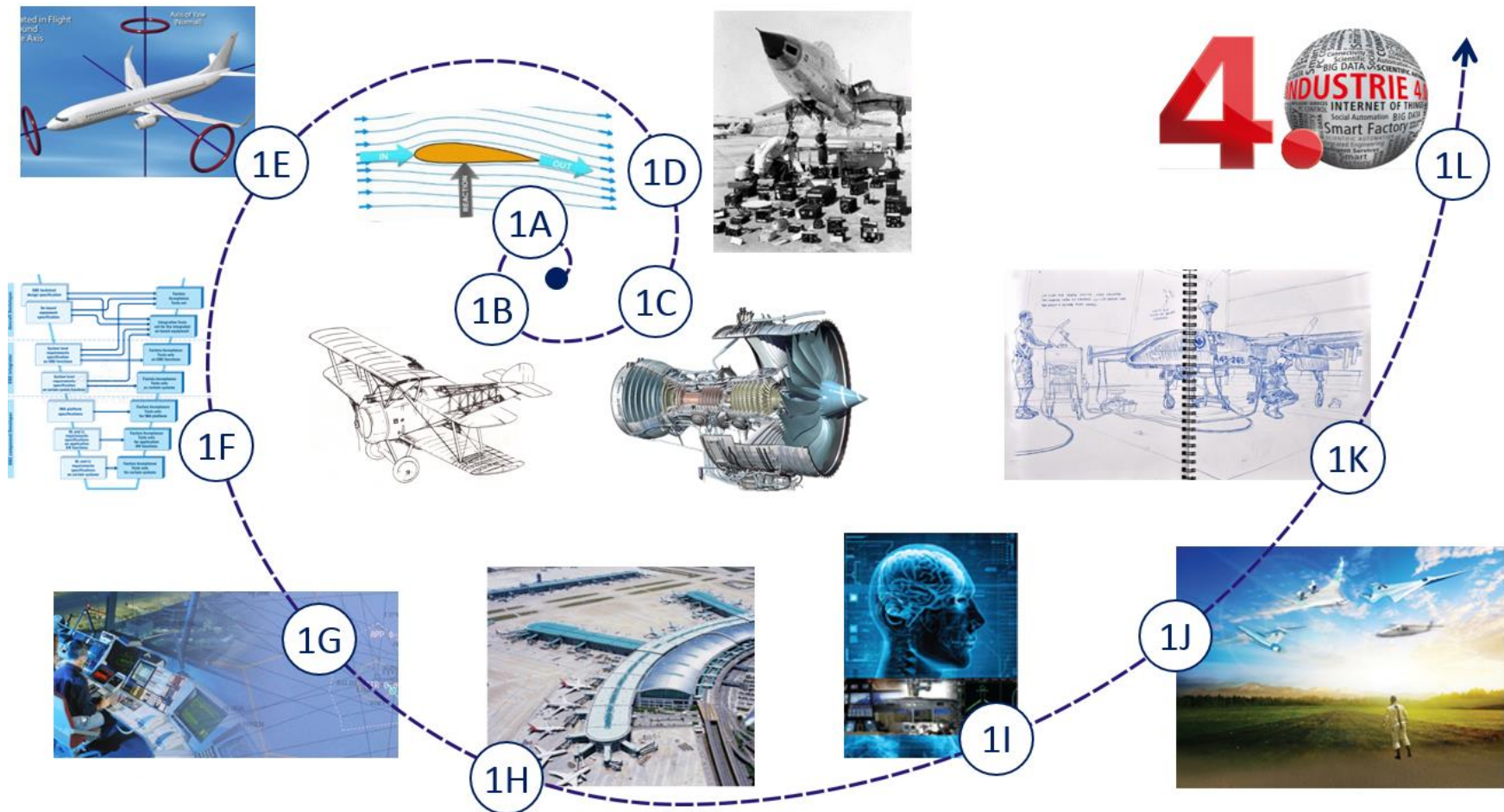
1H - Airports

1I - Human Factors

1J - Innovative Concepts & Scenarios

1K - Unmanned Aerial Systems Technologies

1L - Digital Industry - Industry 4.0







Taxonomía	Número de nodos (cuentan con una definición asociada)		
	Primer nivel	Segundo nivel	Tercer nivel
<b>Aeronáutica - AERO</b>	4	12 + 13 + 8 + 7	139 + 9 + 0 + 19
<b>Espacial - SPACE</b>	4	15 + 14 + 9 + 8	112 + 0 + 0 + 19

## Computational Fluid Dynamics (1-A-1)

### DEFINITION:

Computational Fluid Dynamics (CFD) consists in the development, validation, and use of software tools for the numerical simulation of fluid flows past aerodynamic vehicles. CFD is a discipline necessitating the knowledge of applied mathematics, fluid dynamics and computer sciences. Different levels of modelling are used for solving the governing partial differential equations of fluid flows (incompressible or compressible, inviscid or viscous...). Physical models have to be validated and calibrated by comparison with experimental data. Geometry of flow domain and boundary and initial conditions must be taken into account properly. Discretised equations are solved through numerical schemes and algorithms aiming at accuracy, efficiency and robustness. The computer codes are run on scalar or parallel computers along the following steps: After the grid generation (or adaptation), the CFD solver is run before post-processing and visualisation of the results. CFD is used for understanding physics by flow analysis, for performance prediction of complex aerodynamic configurations and for flow control or optimum design studies.

(Source: ACARE Domain 101)

### SUBDOMAINS:

1. Physical modelling (turbulent, reactive flows...)
2. Development of numerical schemes and algorithms
3. Development and production of CFD software
4. Validation of CFD software
5. Grid generation and adaptation
6. High Performance computing (vector and parallel processing)
7. Complex CFD applications

### 3. Aplicación a las entidades de la PAE

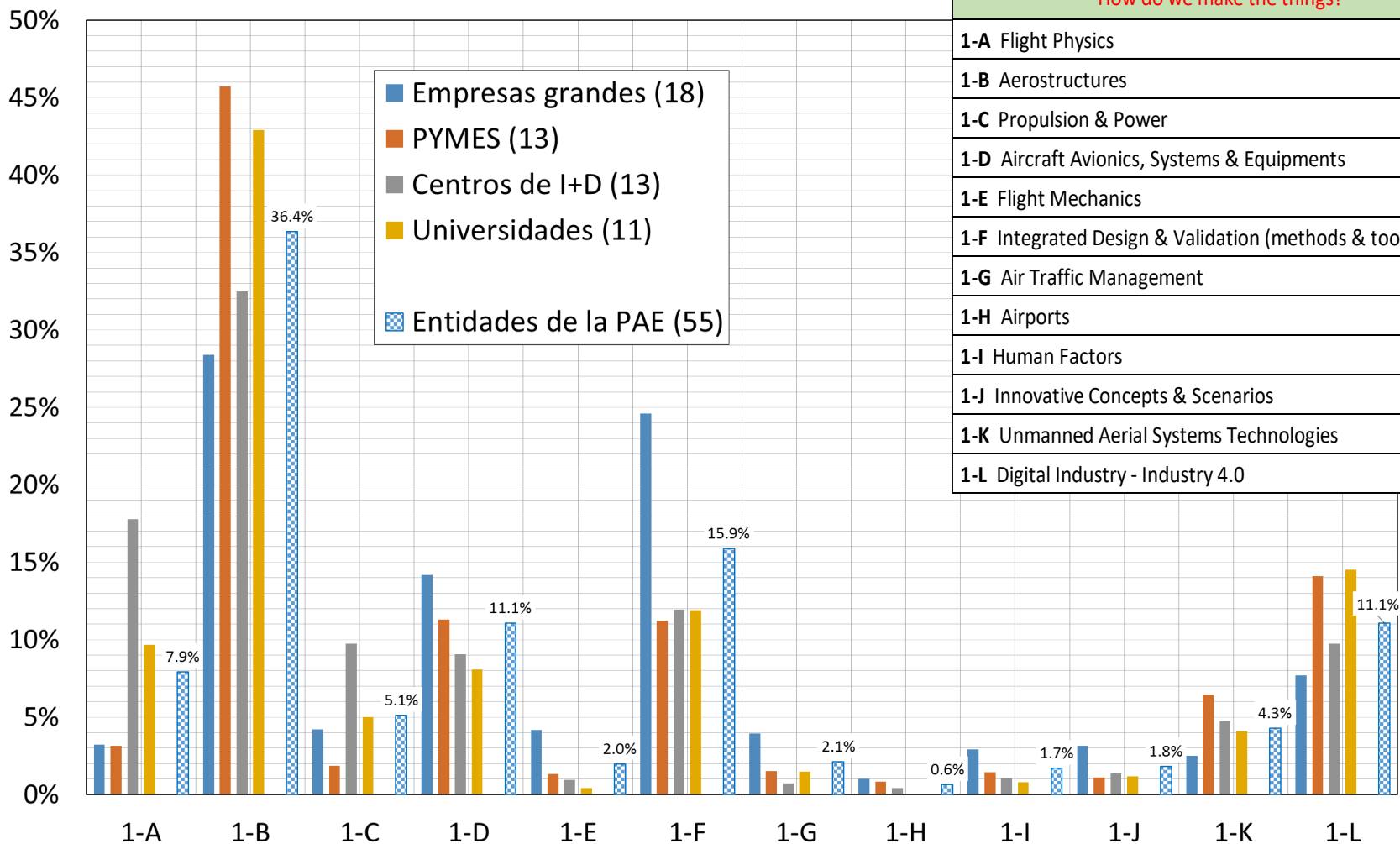
## Las entidades de la PAE se auto-clasificaron con las taxonomías

AERO Taxonomy 19-12-2017	GRANDES	PYMES	CENTROS I+D	Universidades		
Total	24	25	18	16	83	
Contribuciones	18	12	13	11	54	65%
Declinan	5	7	5	4	21	25%
NS/NC	1	6	0	1	8	10%
Participación	23	19	18	15		
	96%	76%	100%	94%		

SPACE Taxonomy 19-12-2017	GRANDES	PYMES	CENTROS I+D	Universidades		
Total	24	25	18	16	83	
Contribuciones	15	11	17	12	55	66%
Declinan	7	8	1	2	18	22%
NS/NC	2	6	0	2	10	12%
Participación	22	19	18	14		
	92%	76%	100%	88%		

- En la rama de las tecnologías, en cada subclase (más de 140 en aeronáutica y más de 100 en espacio), se debía clasificar: NA si no se tenía experiencia, 1 si se tenía algo de experiencia – menor de 5 años -, 2 si se tenían más de 5 años pero no se mantenía actualmente y 3 si se consideraban expertos en ese tema.
- En la rama de la ocupación de las personas se pedía poner: NA si no tiene personal dedicado a esa tarea, 1 si menos de 5% de la plantilla se dedica a esa tarea y 2 si es más del 5%.
- En la rama de los beneficios para la sociedad, el NA indicaba que en esa aplicación no se trabajaba, 1 que en algunos casos sí se trabajaba y 2 que era uno de sus principales campos de aplicación.

## Actividad aeronáutica de las entidades de la PAE



### 1 - Research & Technology Domain

How do we make the things?

1-A Flight Physics

1-B Aerostructures

1-C Propulsion & Power

1-D Aircraft Avionics, Systems & Equipments

1-E Flight Mechanics

1-F Integrated Design & Validation (methods & tools)

1-G Air Traffic Management

1-H Airports

1-I Human Factors

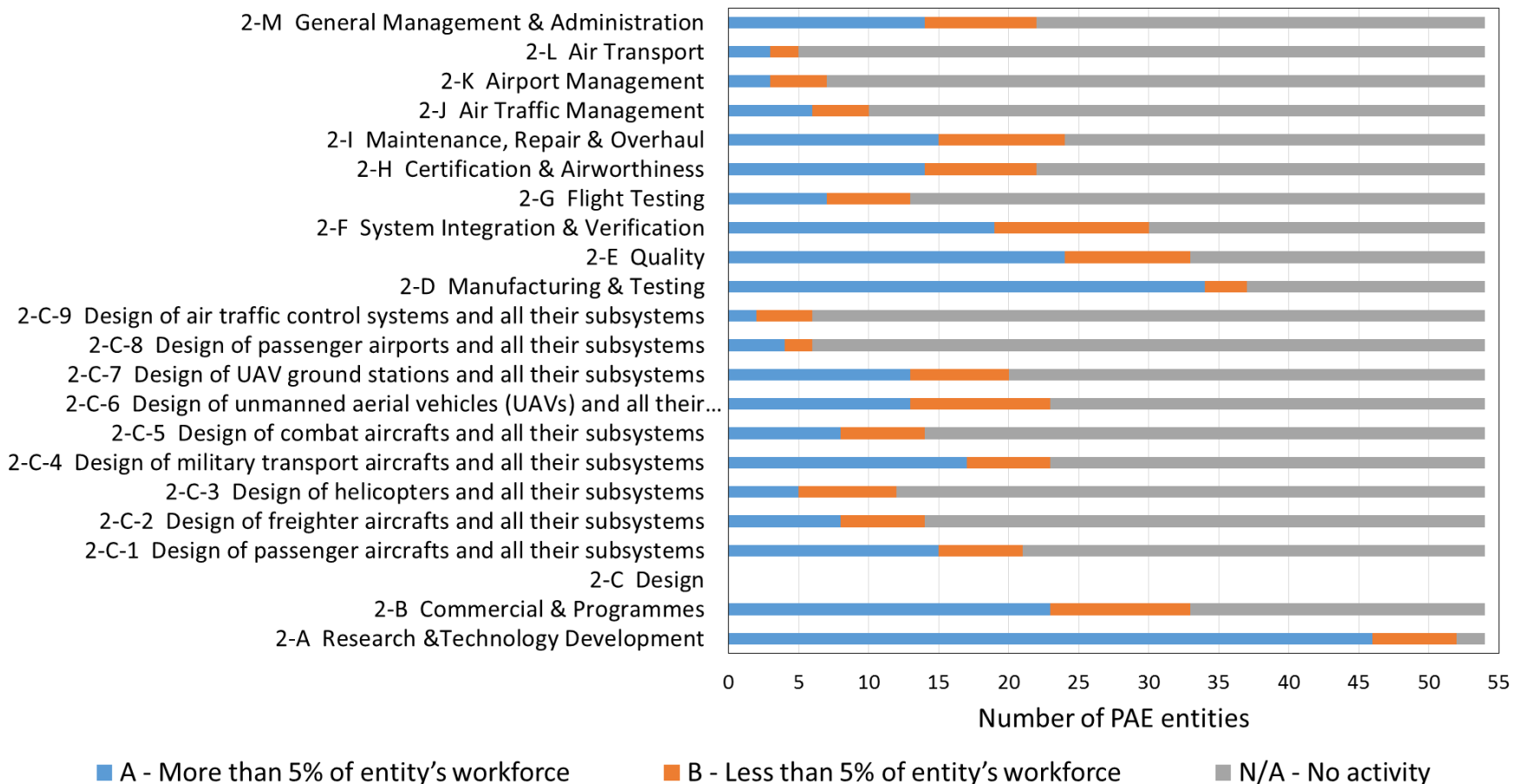
1-J Innovative Concepts & Scenarios

1-K Unmanned Aerial Systems Technologies

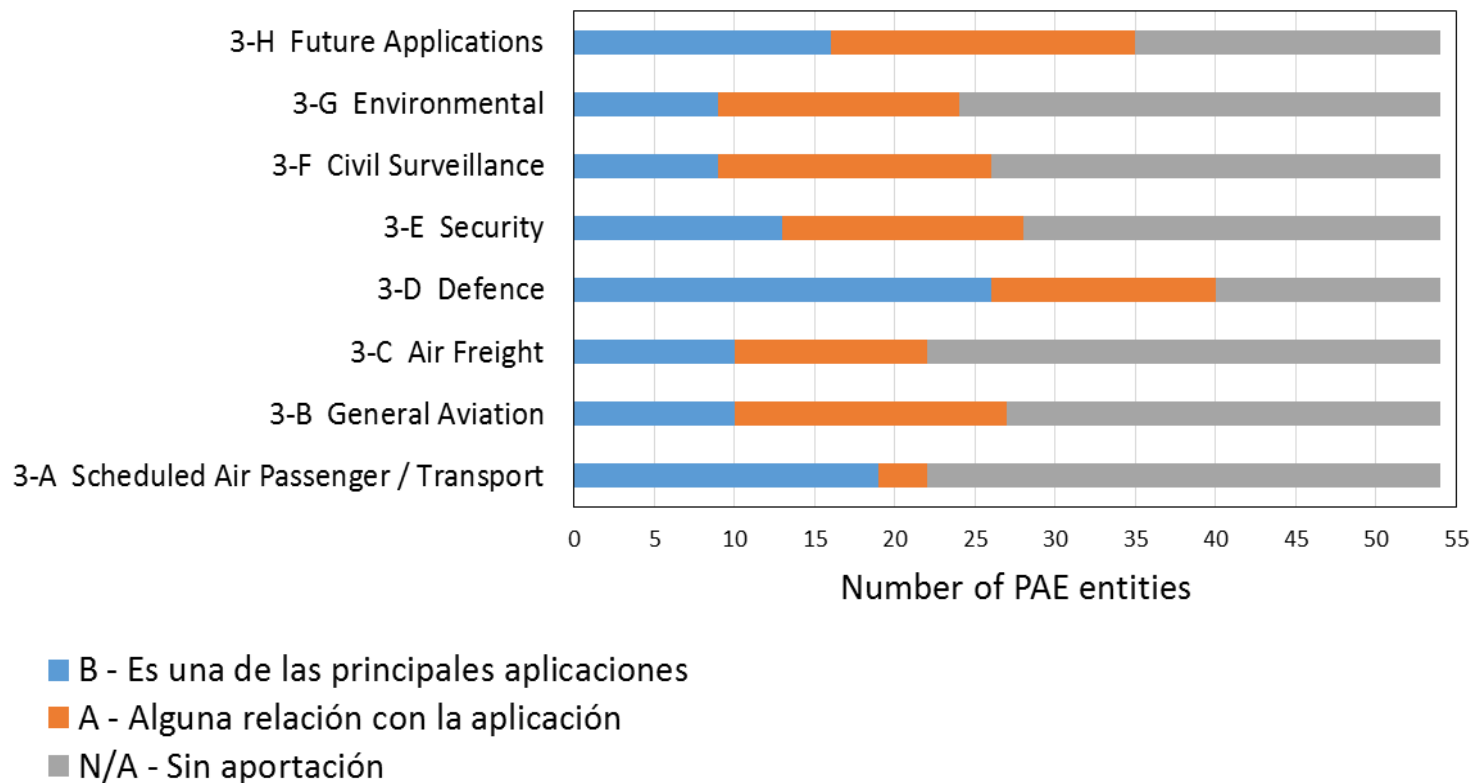
1-L Digital Industry - Industry 4.0



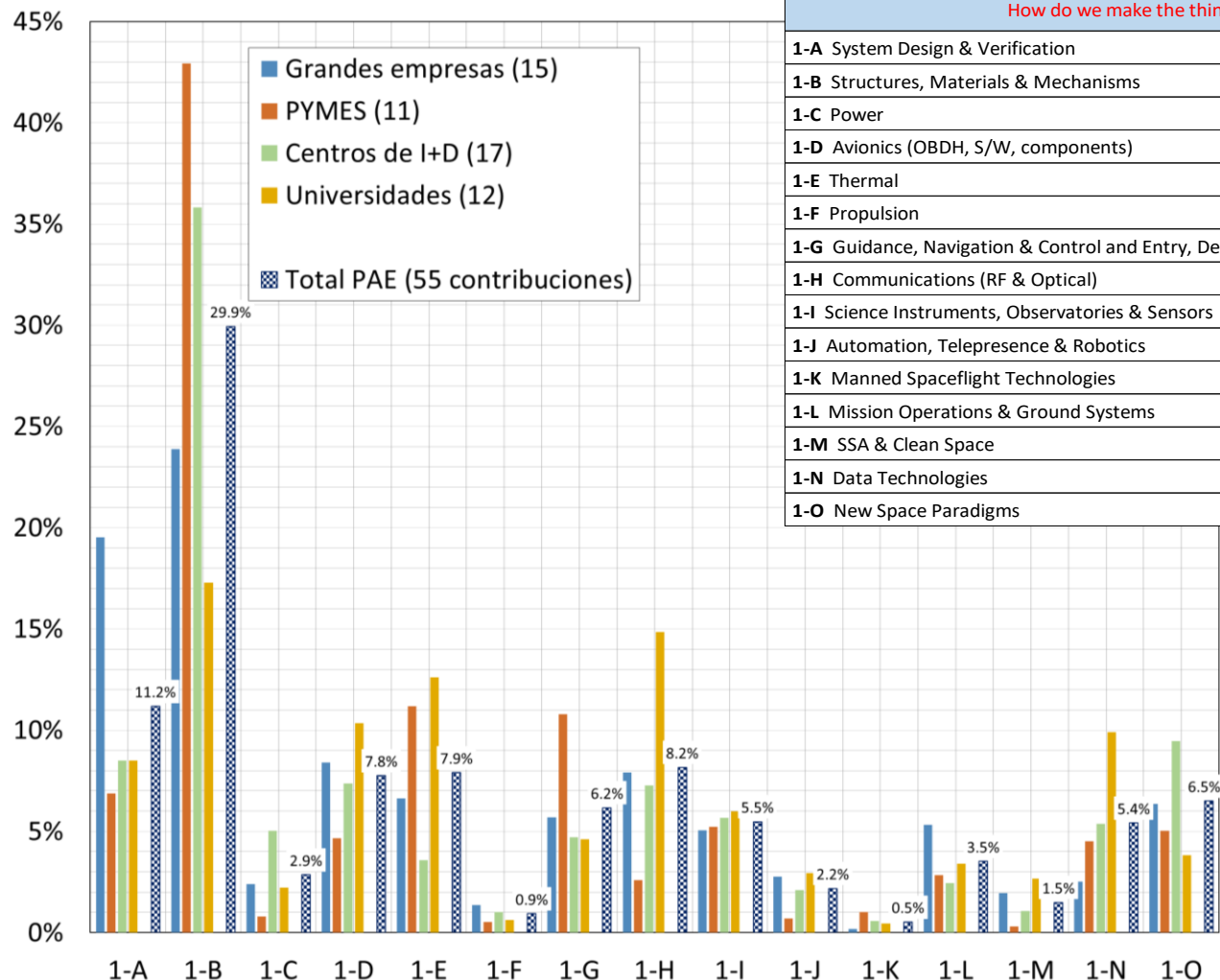
## Segments of aeronautics activity



## Aeronautics Solutions for the benefit of the Society



## Actividad espacial de las entidades de la PAE

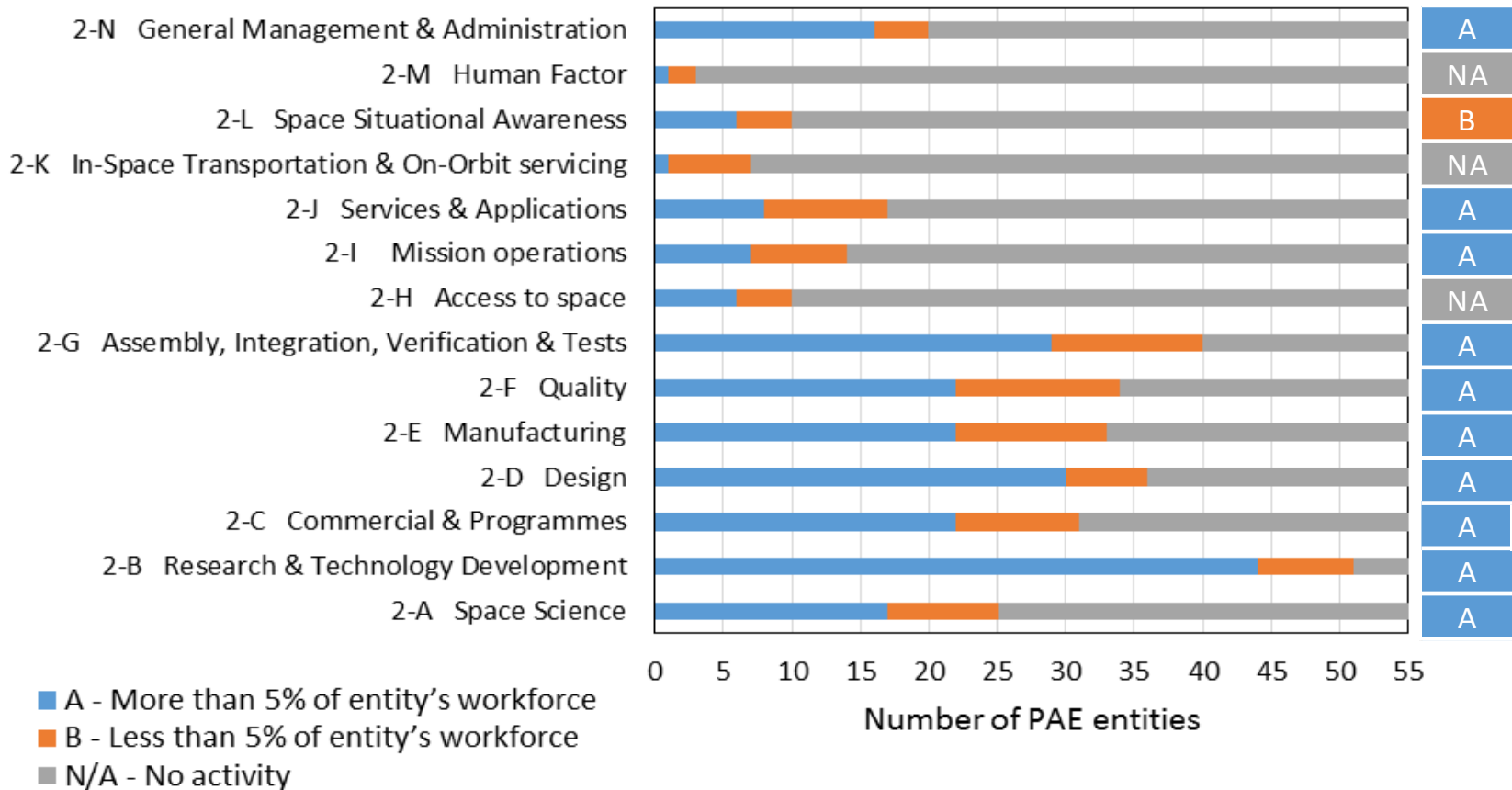


### 1 - Research & Technology Domain

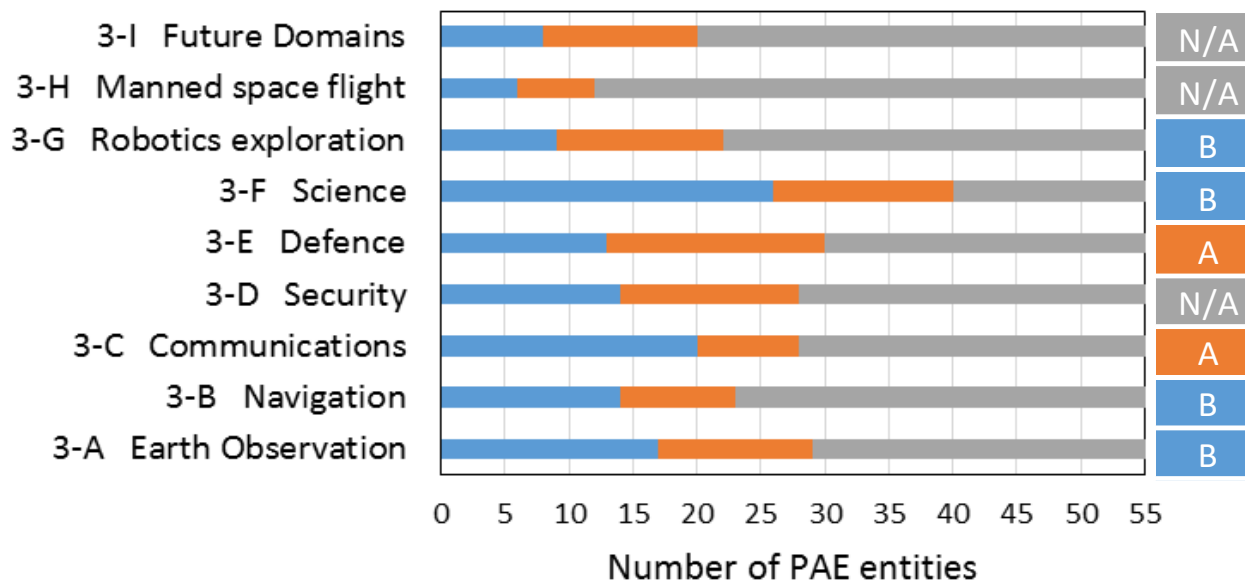
How do we make the things?

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- 1-N Data Technologies
- 1-O New Space Paradigms

## Segments of space activity

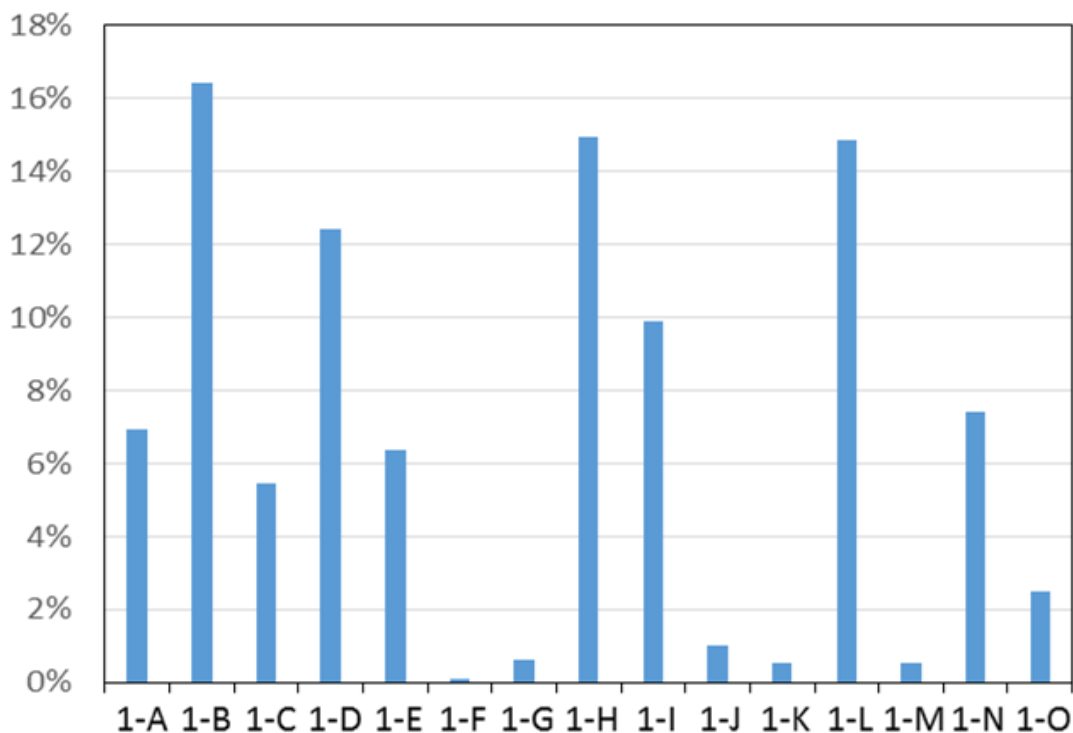


## Space Solutions for the benefit of the Society



- B - Es una de las principales aplicaciones
- A - Alguna relación con la aplicación
- N/A - Sin aportación

Actividad espacial de una entidad de la PAE



## 1 - Research & Technology Domain

How do we make the things?

**1-A** System Design & Verification

**1-B** Structures, Materials & Mechanisms

**1-C** Power

**1-D** Avionics (OBDH, S/W, components)

**1-E** Thermal

**1-F** Propulsion

**1-G** Guidance, Navigation & Control and Entry, Descent & Landing

**1-H** Communications (RF & Optical)

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**1-J** Automation, Telepresence & Robotics

**1-K** Manned Spaceflight Technologies

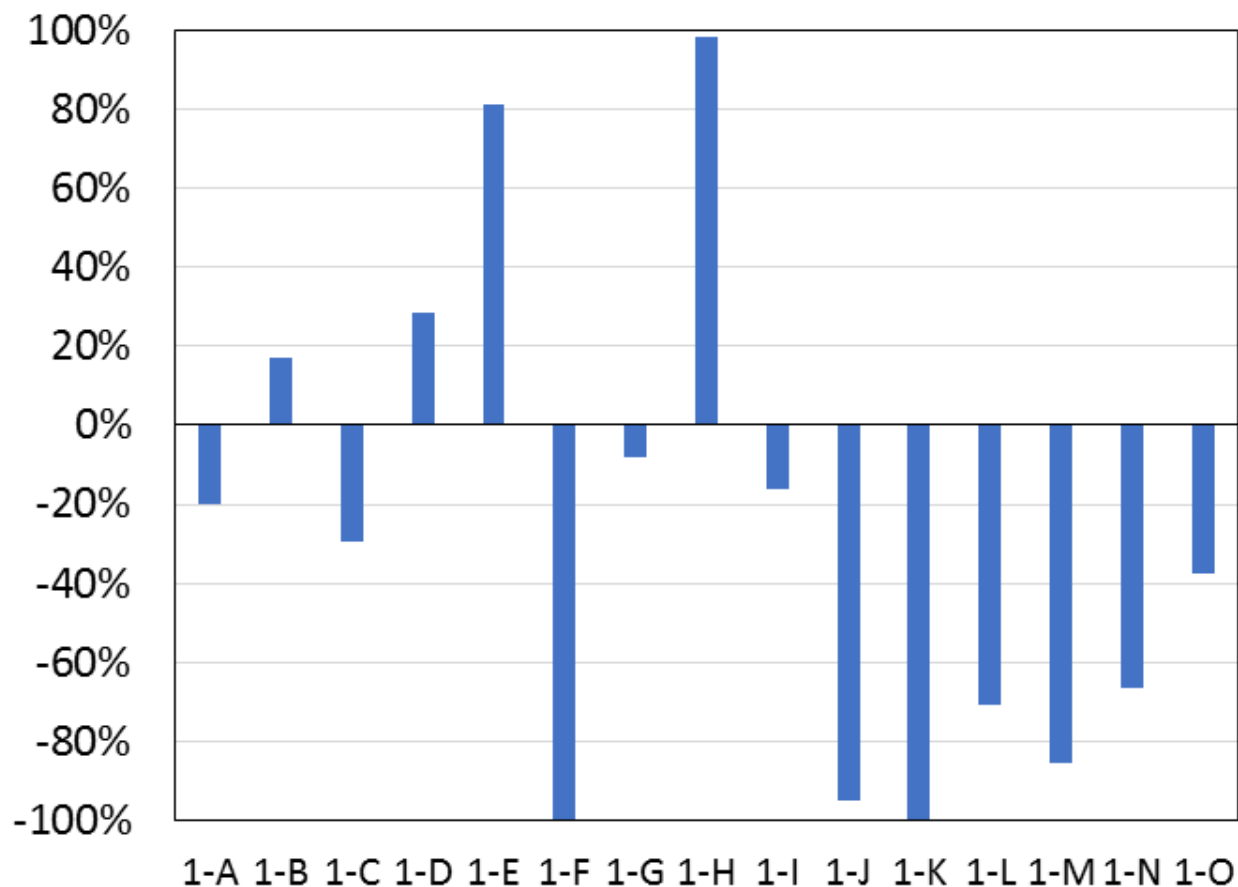
**1-L** Mission Operations & Ground Systems

**1-M** SSA & Clean Space

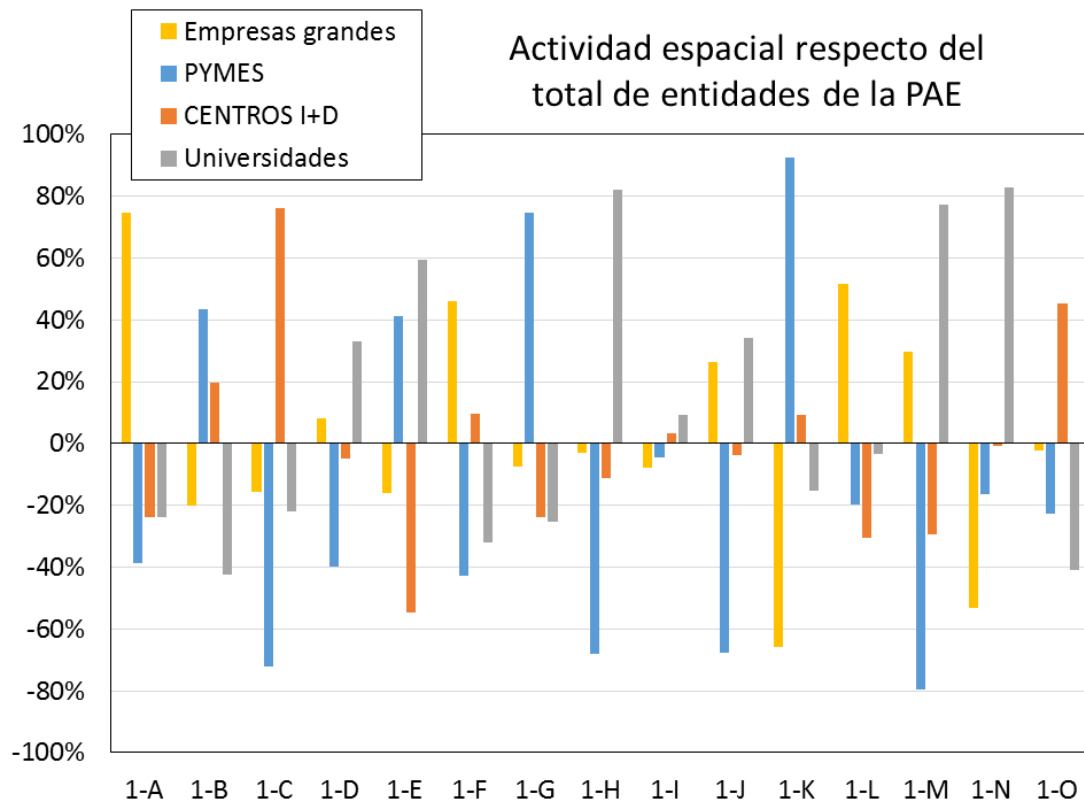
**1-N** Data Technologies

**1-O** New Space Paradigms

## Actividad espacial de una empresa respecto del total de entidades de la PAE







## 1 - Research & Technology Domain

How do we make the things?

1-A System Design & Verification
1-B Structures, Materials & Mechanisms
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1-N Data Technologies
1-O New Space Paradigms

## 4. Conclusiones y próximos pasos

- Participación
- Refinado de datos
- Una misma visión para avanzar
- Desarrolla una capacidad conjunta
- Nuevos indicadores
- El marco de referencia europeo
- A disposición de los asociados