



Robotics in Horizon 2020

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Outline

- *Robotics in Europe*
- *What's new in H2020*
- *The Robotics Public-Private Partnership (PPP)*
- *Robotics in H2020*
 - LEIT
 - Excellence in Science
 - Societal challenges
- *Impact in H2020*

Key issues – research challenges

- *Millions of robots in the world today – many more tomorrow*
- *Not just on the factory floor, but also in services sectors*
- *Can we afford to have a lot of dumb machines running around?*





How do we address today's issues

- *A dedicated unit created nine years ago (FP5-FP6-FP7)*
- *More than 100 ongoing projects today*
 - *over 700 partners*
 - *approx. 500 M€ funding*
- *70-80 M€ funding of new projects per year*
- *Usually 1 Call/year with up to 200 proposals*
- *20 new projects launched every year*
- *Not the only robotics activity...*

Impact of the EU effort

- **Largest publically funded programme in the world** (civilian)
- Many different **topics**: manipulation, navigation, learning, control, cognition, HRI, etc.
- Uses envisaged in **many areas** e.g. search & rescue, surgery, logistics, etc.
- Substantial **addition to the body of knowledge** (hundreds if not thousands of publications, papers, presentations, etc.)
- **Technology transfer and innovation**
- Catching **public imagination** (e.g. London Science Museum, European robotics weeks)
- Progressing towards **socio-economic aspects**
- Dealing **with ethical, legal and societal issues**

What is new in Horizon 2020?

A single programme bringing together three separate programmes/initiatives*

Coupling research with innovation – from research to commercialisation, all forms of innovation

Simplified access, for all companies, universities, institutes in all EU countries and beyond



HORIZON 2020

*The 7th Research Framework Programme (FP7), innovation aspects of Competitiveness and Innovation Framework Programme (CIP), EU contribution to the European Institute of Innovation and Technology (EIT)

Excellent
science

Industrial
leadership

Societal
challenges



Horizon 2020: Three priorities

Excellent science

- *raising the level of excellence in Europe's science base and ensuring a steady stream of world-class research to secure Europe's long-term competitiveness*

Industrial leadership

- *making Europe a more attractive location for R&I by promoting activities where businesses set the agenda.*

Societal challenges

- *reflecting the policy priorities of the Europe 2020 strategy and addressing major concerns shared by European citizens*



New in Horizon 2020

Moving from several funding rates to just two

- ***Maximum of 100% of the total eligible costs for R&I***
- ***Maximum 70% for actions close to market - innovation (up to 100 % for non-profit organisations)***

Indirect costs: a **single flat rate, 25%** of eligible costs

New instruments to foster innovation, for example, Pre-Commercial Procurement (PCP) or the SME Instrument

Horizon 2020 – changes

Some points to note

- **Terminology**
- **Types of action**
- **Types of contribution**
- **Horizon 2020 grant agreement changes**
- **Submission**
- **Evaluation criteria**

Horizon 2020 – changes

Terminology

- **aligned with the terminology of the legal texts (the Financial Regulation)**
- **N.B. 'action' is the official term used for 'project' in the Model Grant Agreement**

Horizon 2020 – changes

Types of action (instruments)

- **Research and Innovation Actions**

- Actions primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution.

- **Innovation Actions**

- Actions primarily consisting of activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services.
- **Robotics use cases**

- **Coordination and Support Actions**

- Actions consisting primarily of accompanying measures

Horizon 2020 – changes

Types of action (instruments)

- **Programme Co-Fund**

- Pre-commercial Procurement (PcP)
 - 'Pre-commercial procurement' means procurement of research and development services involving risk-benefit sharing under market conditions and competitive development in phases
- Public Procurement of Innovation solutions (PPI, not in ICT23 & ICT24)
- ERA-NET (not in ICT23 & ICT24)

- **SME Instrument**

- not in ICT23 & ICT24

Horizon 2020 – changes

Types of projects in terms of contribution

- **Expressed in terms of indicative budget (requested funding)**
- **Cut-off point €4-5 million – *Large Contribution v. Small Contribution***
- **The distinction does not correspond to the old distinction IP v. STReP**
- **The Work Programme may varyingly call for either large or small projects or both – important to check**

Horizon 2020 – changes

Horizon 2020 funding rates

- **Research and Innovation Actions + Coordination and Support Actions**
 - up to 100%
- **Innovation Actions**
 - up to 70%
 - up to 100% (non-profit entities)
- **Indirect Costs – 25% of eligible direct costs less subcontracting**

Horizon 2020 – changes

Proposal submission – points to note

- much shorter time to grant – work in advance
- Part A of the proposal, administrative part – submission of legal data to the Research Executive Agency as soon as requested
- self-check of SME status – financial viability: do it carefully as might be very critical at a later stage
- **page limit** for technical content in Part B (excluding partner descriptions)
 - **70 pages** (50 pp for Coordination Actions)
 - pages exceeding the limit will not be evaluated

Horizon 2020 – changes

Proposal submission – points to note

- **demonstrate your operational capability – competence and availability of resources**
- **thoroughly describe ethical issues and how they are dealt with**
- **Impact section of primary importance**
- **check the proposal template on the Participant Portal for more information**

Horizon 2020 – changes

Proposal submission – points to note

- **a short contract preparation phase – a proposal has to be close to a final project work plan, not a sales brochure**
- **the maturity, specificity and completeness of the work plan will be taken into account at the evaluation stage and weaknesses will be penalised**
- **lay out specific, well-defined and challenging yet realistic objectives and how they will be reached**
- **great idea not enough – credible work plan essential**

Horizon 2020 – changes

Proposal submission – evaluation criteria

- **3 criteria: Excellence, Impact, Implementation**
- **innovation aspect more strongly incorporated**
- **0-5 points, threshold 3 pts for individual criteria**
- **overall threshold 10 points**
- **for Innovation Actions, weighting of Impact 1.5**

Horizon 2020 – changes

Proposal submission – points to note

- **Be ready if you are selected (time to grant significantly reduced)**
 - Availability of Coordinator and Consortium essential after evaluation results published
 - Consortium Agreement to be prepared sufficiently long in advance
 - Legal and financial documents ready to be submitted as soon as requested



Horizon 2020 - Robotics: PPP

What is a PPP?

"...a government service or private business venture which is funded and operated through a partnership of government and one or more private sector organisations."

PPP stands for **P**ublic-**P**rivate **P**artnership

- Public side = European Commission
- Private side = Companies, universities (which can be public bodies), research organisations, NGOs

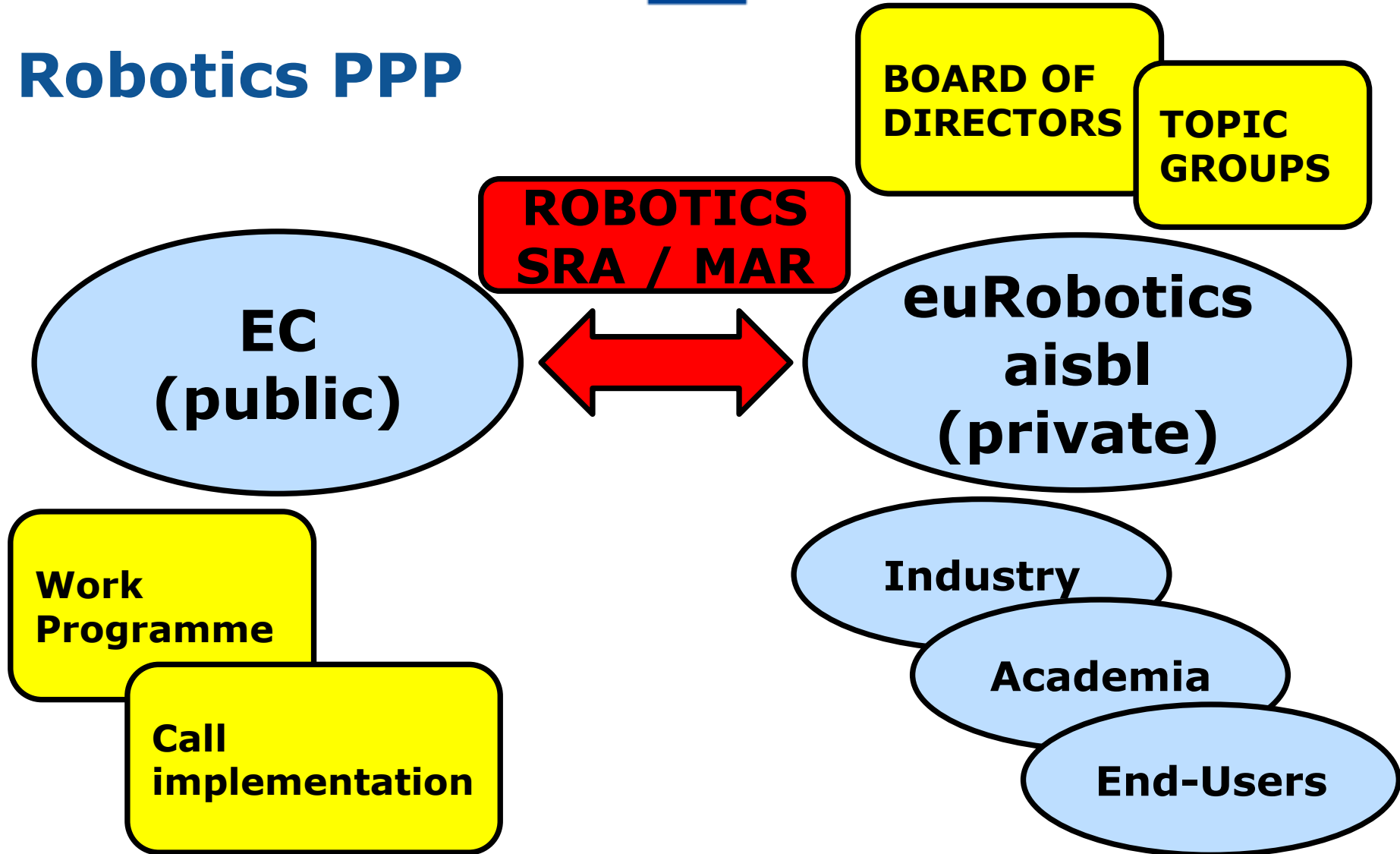
Goal: To strengthen the competitive position of Europe in a particular business sector

- Mutual development of research strategy & commitment to invest in a sector
- Not limited to research, also looking at other areas such as regulation, policy, trade, non-technical barriers, etc.

Specific goals of the PPP in Robotics

- *Develop strategic goals of European robotics and foster their implementation*
- *Improve industrial competitiveness of EU through innovative robotic technologies*
- *Position robotics as a key enabler for solving Europe's societal challenges*
- *Strengthen networking activities of the European robotics community*
- *Promote European robotics*
- *Reach out to new users and markets*
- *Contribute to policy development and addressing ethical, legal and societal issues*

Robotics PPP



PPP and you

Be part of it & play an active role to:

- Define the **Strategic Research Agenda for Robotics R&I** (SRA)
- Establish the **Multi-Annual Roadmap** (MAR)

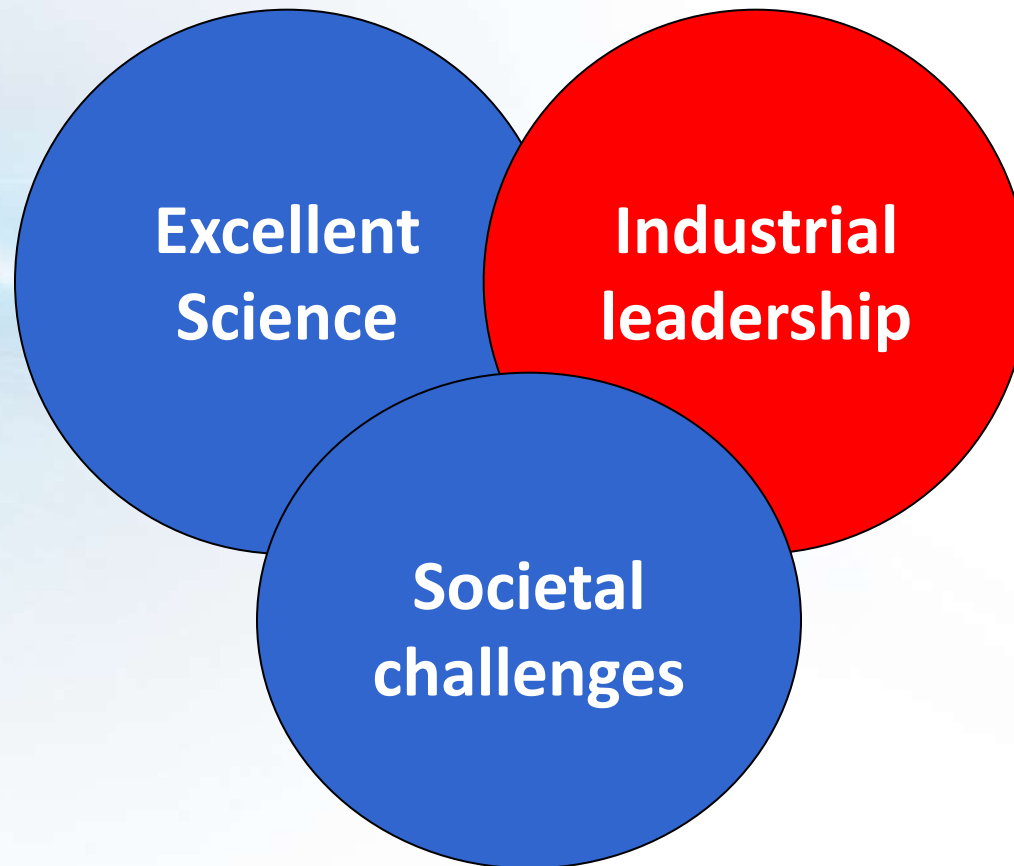
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Priorities in R&D&I Workprogramme

PPP and you

- The call organisation and operations are run by the Commission
- The evaluation and selection of proposals does not involve the private side of the PPP – done by the Commission with the help of independent experts
- Proposers need not be PPP members
- PPP membership gives **no advantage or preferential treatment** in evaluations

Horizon 2020





Robotics in H2020: ICT23 – 2014

LEIT CHALLENGE 5: ROBOTICS Roadmap-based R&D&I in Robotics Publication: 11 December 2013 Submission deadline: 23 April 2014	€74m
ICT23.a - Research and Innovation Action PRIORITY: Market domains: manufacturing, commercial, civil, agriculture RTD to advance key technologies relevant for industrial and service robotics, including shared resources and assessment	€57m
ICT23.b - Technology transfer - Robotics use cases Industrial and service sectors	€12m
ICT23.c - Pre-commercial procurement in robotics Public safety and monitoring of environment and infrastructure	€5m



Robotics in H2020: ICT24 – 2015

CHALLENGE 5: ROBOTICS Roadmap-based R&D&I in Robotics - second Call Publication: 15 October 2014 (TBC) Deadline: 21 April 2015 (TBC)	€83m
ICT24.a – PRIORITY: healthcare, consumer, transport RTD to advance key technologies relevant for industrial and service robotics	€50m
ICT24.b - Technology transfer - Industry-academia cross-fertilisation	€12m
ICT24.c - Technology transfer - Robotics use cases	€12m
ICT24.d - Pre-commercial procurement in robotics: healthcare	€5m
ICT24.e - Community building and Robotic competitions	€4m

How is it new/different from previous calls?

1/3

- **ICT 23.a & ICT 24.a:**

While the robotics technologies and abilities that still are to be advanced are not very different from the previous research efforts, they now have to be advanced in the **context of some market domains prioritised in the call** and progress has to be demonstrated in **real-life setup relevant for these market domains**

- **ICT 23.b & ICT 24.c:**

- use-cases – similar to FP7 ICT Call 10 Challenge 2
- relatively recent – proposers must understand the **focus on technology transfer** as opposed to R&D

How is it new/different from previous calls?

2/3

- **ICT 23.c:** PcP in Monitoring and safety / **ICT 24.d:** PcP in Healthcare
 - first time called in robotics
 - concept of PcP (PcP Pilot) exists in ECHORD++
 - relevant projects: SMART@FIRE <http://www.smartatfire.eu/> , SILVER <http://www.silverpcp.eu/>
- **ICT CT 24.b:** Technology transfer – Industry-academia cross-fertilisation
 - similar to **ECHORD** <http://www.echord.info/> and **ECHORD++**, however, with a **different administrative mechanism** – possibility to include third parties as opposed to add partners

How is it new/different from previous calls? Role of industries and end users

3/3

- **Industry** has a far **greater role** to play in Robotics R&I than before. Involvement of industry as manufacturers, system suppliers, integrators or users is welcome, as appropriate, depending on the needs of the project and on the technology readiness level addressed.
- The involvement of **end users** in R&I projects is **welcome**. In Robotics **Use Cases**, which target industrial and service sectors, and **Pre-commercial Procurement** it is a **must**.

ICT 23.a and ICT 24.a

Research implementing the Strategic Research Agenda



**VISION
/GOALS**

**GUIDANCE
"HOW TO"**



SRA = High level document

- sets terminology

MAR = Technical details

- updated each year
- tracks trends

WHERE TO FIND THEM?

<http://www.eu-robotics.net/ppp/downloads/> &
<http://robotics2020.wikispaces.com/>

ICT 23.a – R&I actions

Market domains:

- manufacturing
- commercial
- civil
- agriculture

Key robotics technologies:

- cognition
- HRI
- mechatronics
- navigation
- perception
- + combination of those

Systems development processes

Shared resources and assessment

ICT 24.a – R&I actions

Market domains:

- healthcare
- consumer
- transport

Key robotics technologies:

- cognition
- HRI
- mechatronics
- navigation
- perception
- + combination of those

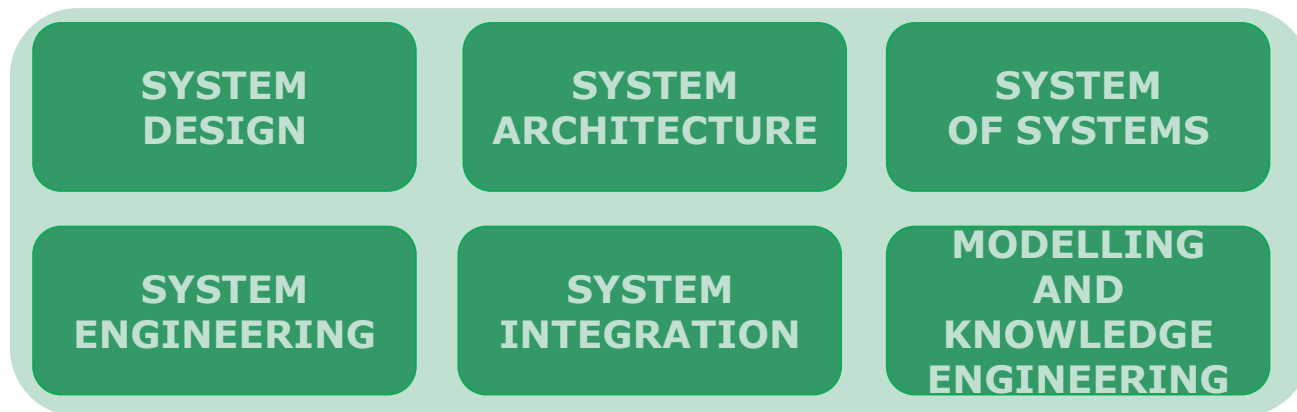
What to find in the Strategic Research Agenda (SRA) and the Multi-Annual Roadmap (MAR)?

- ✓ Detailed definition of Market domains, Technologies and Technology Combinations
- ✓ Mapping: application domains vs. abilities vs. technologies
- ✓ → Technology/ability gaps for specific application domains
- ✓ → Prioritised necessary step changes in technologies/abilities

Use SRA/MAR information to situate your project contribution

Use SRA/MAR information to justify impact

ICT 23.a - Systems Development



- To be addressed by individual projects, as appropriate
- Best practices in systems development which can benefit the whole robotics community
 - > 1 R&I Project – "horizontal support"
 - > reduce systems development time and effort
 - > previous project along similar line: BRICS*

*<http://www.best-of-robotics.org/>



ICT 23.a – shared resources and assessment

SUPPORT AND DEMONSTRATE EUROPEAN EXCELLENCE IN ROBOTICS

- *To develop hardware test bed facilities, plus software resources, available to all*
- *To provide engineering support for testing demonstrators, their performance and robustness*
- *To develop, gather and validate robotics metrics and benchmarks*
- *One large project is encouraged, showing added value and interest for the research community and building synergies with current EU-funded efforts (FP7 projects, ECHORD, EuRoC, RockIn, Eurathlon, etc.)*



ICT 23.b Technology Transfer – **Robotics use cases**

INTRODUCING, TESTING AND VALIDATING PROMISING INNOVATIVE ROBOTICS SOLUTIONS IN REAL-WORLD ENVIRONMENTS

- State of the art robotic technology
- Real-world use cases
- Validation/demonstration supported by metrics such as performance, cost, quality, cycle times...
- Clear exploitation plans with economic potential beyond the end of the project
- Balanced consortium including:
 - research/technology providers
 - end users
 - robotics industry and/or system integrators

ICT 23.c INNOVATION ACTIONS:

Pre-Commercial procurement in robotics Call 1 and 2

- Application areas in **Call 1 (ICT23.c): Public safety, environment and infrastructure monitoring**
- Application areas in **Call 2 (ICT24.d): Healthcare**
- Gathering public procurers with common needs
- One large project (up to 5m€) including 2 major components
 - Refining requirements; organizing the selection of suppliers and evaluation of progress
 - RTD work to be procured
- End-user integration absolutely essential
- concept of PcP Pilot exists in ECHORD++





Robotics elsewhere in LEIT (list not exhaustive)

ICT 30 2015: Internet of Things and Platforms for Connected Smart Objects – covers multiple devices including robots

ICT 34 2015: ICT contribution to pilot for co-investments by business angels in innovative ICT firms – including robotics

ICT 37 2014-2015: Open Disruptive Innovation Scheme (SME instrument)

Advanced Manufacturing & Processing

FoF 6 – 2014: Symbiotic human-robot collaborations for safe and dynamic multimodal manufacturing systems

FoF 9 – 2015: ICT Innovation for Manufacturing SMEs (I4MS), including "Highly flexible and near-autonomous robotics systems (application experiments)".

FoF 11 – 2015: Flexible production systems based on integrated tools for rapid reconfiguration of machinery and robots

Space

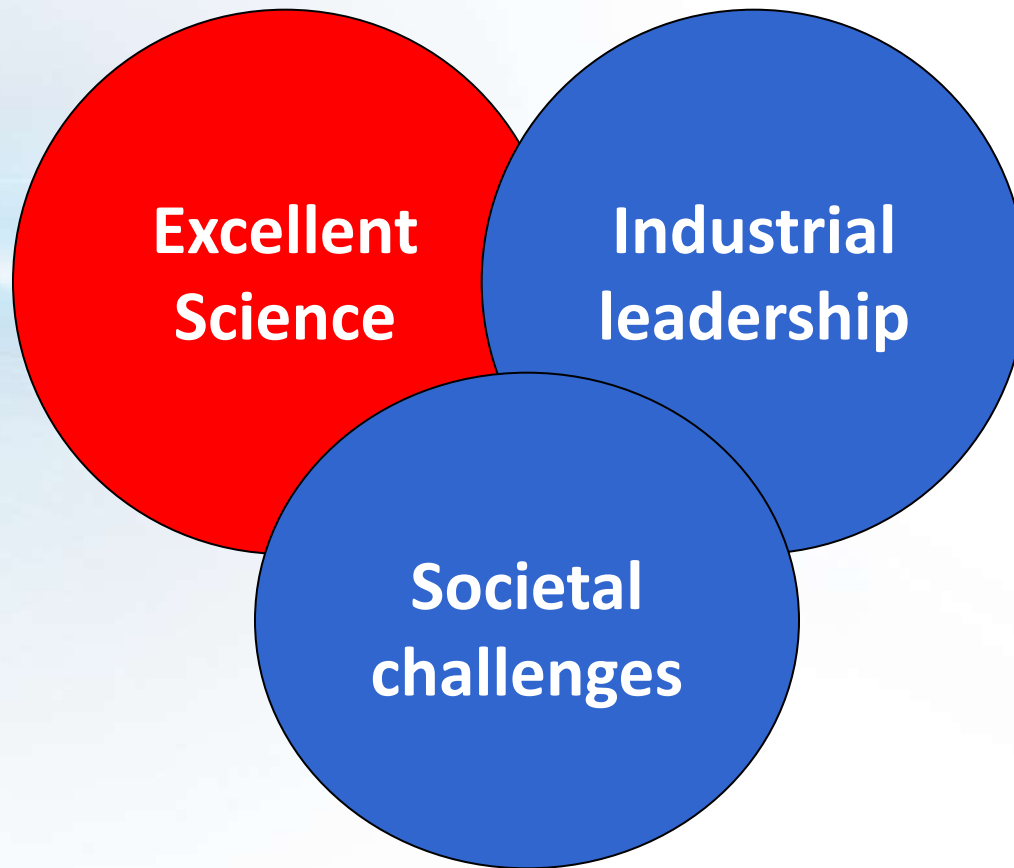
COMPET 4 – 2014: Space Robotics Technologies (incl. robotics)

COMPET 6 – 2014: Bottom up space technologies at low Technology Readiness Level (incl. robotics)

COMPET – 9 2014 Technology Demonstrator projects for exploration (incl. robotics)

COMPET 3 – 2015: Bottom up space technologies at low TRL

H2020

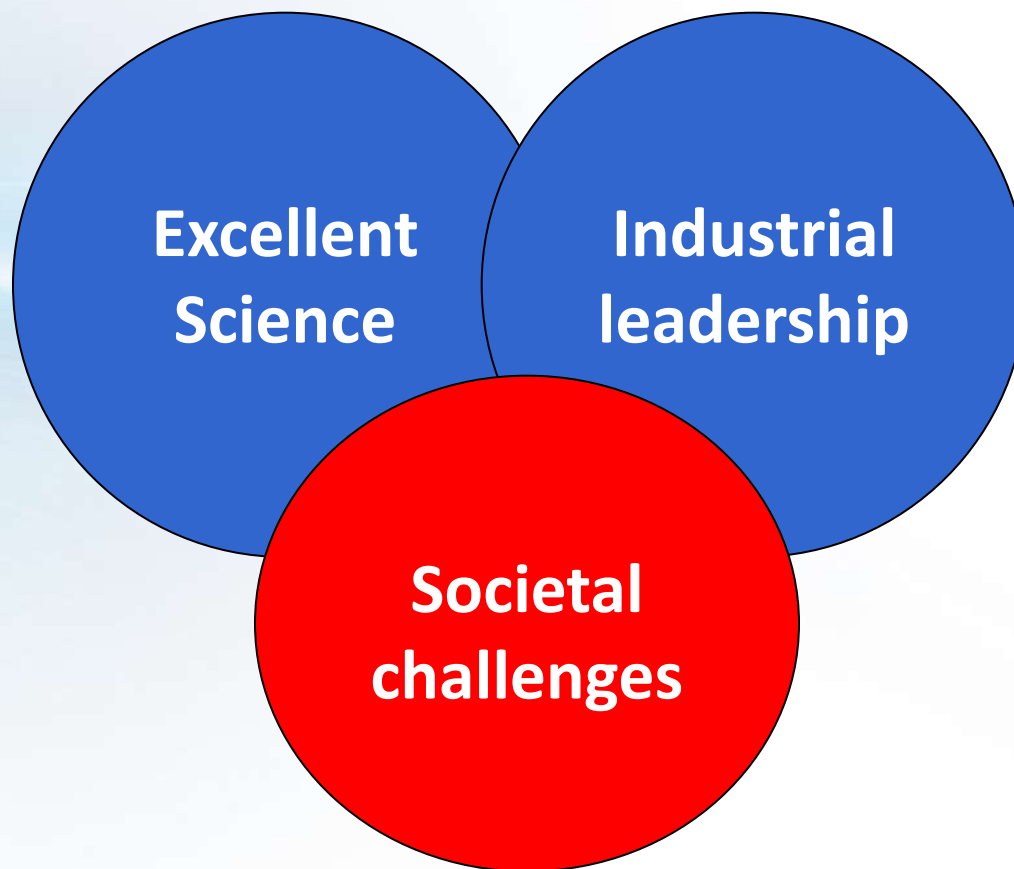


Cognitive Systems and Robotics in the Excellent Science pillar

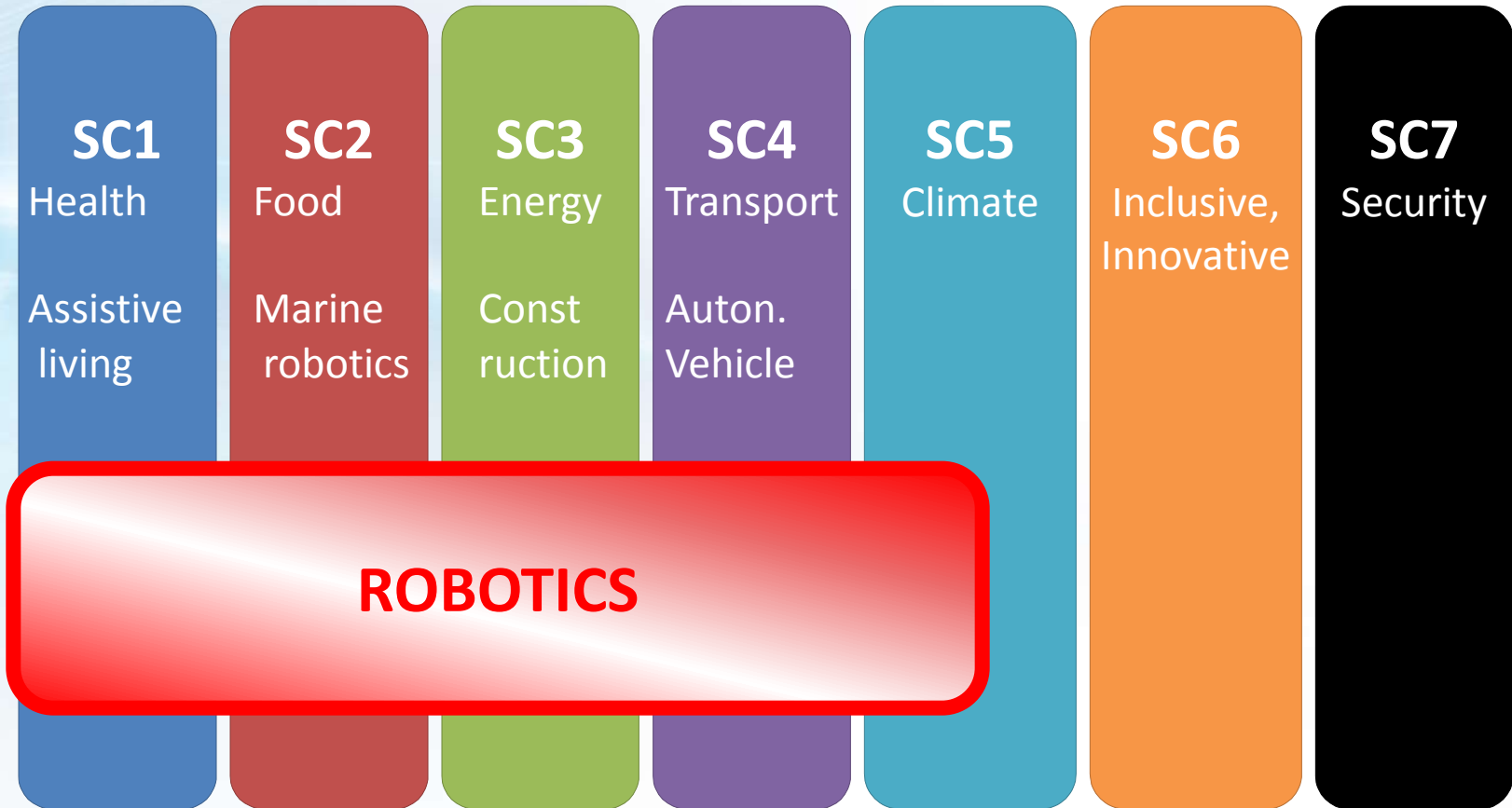
FETPROACT 2: Knowing, doing and being, cognition beyond problem solving

- **Foundational research on future artificial cognitive systems and robots**
- **Multidisciplinary: knowledge, cognition and related issues (incl. embodiment, learning, motivation, autonomy, knowledge)**
- **Takes artificial cognitive systems beyond the level of dull task execution**
- **Demonstrate robust performance for future robotics systems**
- **Budget: €15 million – N.B. different call timetable**

H2020



Robotics in H2020 Societal Challenges





Robotics in the Societal Challenges pillar

SC 1 Health, demographic change and wellbeing

- **PHC 19 – 2014: Advancing active and healthy ageing with ICT: Service robotics within assisted living environments**

SC 2 Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bio economy

- **Blue Growth 5 - 2014: Preparing for the future innovative offshore economy – including robotics / ROVs**
- **Blue Growth 6 - 2014: Delivering sub-sea technologies for new services at sea - including robotics / ROVs / AUVs**
- **Blue Growth 7 - 2015: Response capacities to oil spills and marine pollutions - including the use of specialised vessels and underwater (autonomous) vehicles**

SC 3 Energy Challenge

- **EE 1 – 2014/15: Manufacturing of prefabricated modules for renovation of building - including automated/robotised tools for construction**

SC 4 Smart, green and integrated transport

- **MG.3.6-2015 Safe and connected automation in road transport - including autonomous driving applications**

SC 5 Climate action, environment, resource efficiency and raw materials

- **SC5-11-2014/2015: New solutions for sustainable production of raw materials**
 - c) **Deep mining on continent and in sea-bed [2015] - new highly-automated technological sustainable solutions**

IMPACT in H2020

- By coupling **research** and **innovation** (R&I), H2020 aims to drive economic growth and create jobs.
- H2020 gives **more weight to IMPACT**
For Innovation actions (Robotics Use cases):
 - impact criterion weighted by factor of 1.5
 - impact considered first when scores equal
- Robotics contributes more directly and more explicitly to impact than in previous framework programmes.
- List of expected impact in the WP



IMPACT - tips

- Any individual proposal is not expected to address the whole list!
- Be concrete and specific about what the project results would achieve in the areas described in the Workprogramme, during the project lifetime and beyond
- Stress your (competitive) positioning / technical advantage in possible future markets or applications
- Assess the need for industry participation and provide evidence of their commitment

Dissemination

- Provide concrete dissemination plan, scientific and non-scientific, with a coherent vision, not just a 'shopping list'
- Prepare for all types of media channels (including e.g. YouTube)
- Involve the right kind of person with communications and media skills
- Note: specific rules apply to PcP dissemination (e.g. in the tender launch phase) with respect to Treaty and State Aid principles

A good exploitation plan

- Should be well thought-out and properly resourced
- Directly supports the expected impact
- Includes, where relevant, a credible business case
- Involves people with the right expertise (for technology transfer, patents etc.).
- Projects with a more scientific approach should still make clear what the eventual exploitation outcomes and impact will be.

Technology Readiness Levels

- TRLs are a measure of maturity of a technology for its intended market, typically used by e.g. space agencies, US DoD, the oil and gas industries
- The basic TRL scheme has progressive levels going from e.g. TRL 1 (less mature) to TRL 9 (more mature – ready for market)
- LEIT – ICT- Robotics aims to "improve the Technology Readiness Levels (TRL) of robotics R&D"



H2020 general TRL scheme

- *TRL 1 – Basic principles observed*
- *TRL 2 – Technology concept formulated*
- *TRL 3 – Experimental proof of concept*
- *TRL 4 – Technology validated in lab*
- *TRL 5 – Technology validated in relevant environment*
- *TRL 6 – Technology demonstrated in relevant environment*
- *TRL 7 – System prototype demonstration in operational environment*
- *TRL 8 – System complete and qualified*
- *TRL 9 – Actual system proven in operational environment*

TRLs applied to robotics

- Improved TRLs are not the only method of portraying expected impact in robotics.
- TRL interpretations are not set in concrete, and can depend on the context of different H2020 sections e.g., space, manufacturing, micro/nano – and of course robots.
- TRLs for robotics can be seen as milestones, marking significant concrete changes in the process of robotics technology development from concept to market

TRL – tips

- A proposal **does not** have to address **all** TRLs
- We **do not** target any specific TRLs. It is up to the proposer. Other parts of the H2020 Workprogramme **do** address specific TRLs
- State the TRL you are **starting** from and the TRL you are **aiming** at
- TRL 1 and 2 are **not** excluded from LEIT-ICT-Robotics
- For robotics use cases, higher TRLs are targeted.



For further reference

Robotics PPP (SRA and MAR)

<http://www.eu-robotics.net/ppp/>

H2020 Workprogramme General Annexes

http://ec.europa.eu/research/participants/portal/desktop/en/funding/reference_docs.html

Current project portfolio:

<http://cordis.europa.eu/fp7/ict/robotics>

Background document with Q&A

http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3660

Robotics in H2020 INFO DAY

<http://ec.europa.eu/digital-agenda/en/news/information-day-horizon-2020-call-1-and-2-objective-ict-23-and-ict-24-robotics>



THANK YOU!