



Robotics in Horizon 2020 Research and Innovation

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Unit A2 - Robotics

DG Communication Networks, Content and Technology

European Commission

ERF – 2014

Autonomous Vehicles for Long-Term Operation in Industrial Environments

Autonomous Vehicles for Long-Term Operation in Industrial ENvironments

- Strong industrial interest and clear use-cases (intra-logistics/autonomous transport vehicles on the shop floor)
- Some major components (needed for long term operation: life-long learning, self-inspection,...) still need basic research
- PROBLEM: R&I vs Innovation project?

Overall Objective of Robotics in H2020 (LEIT)

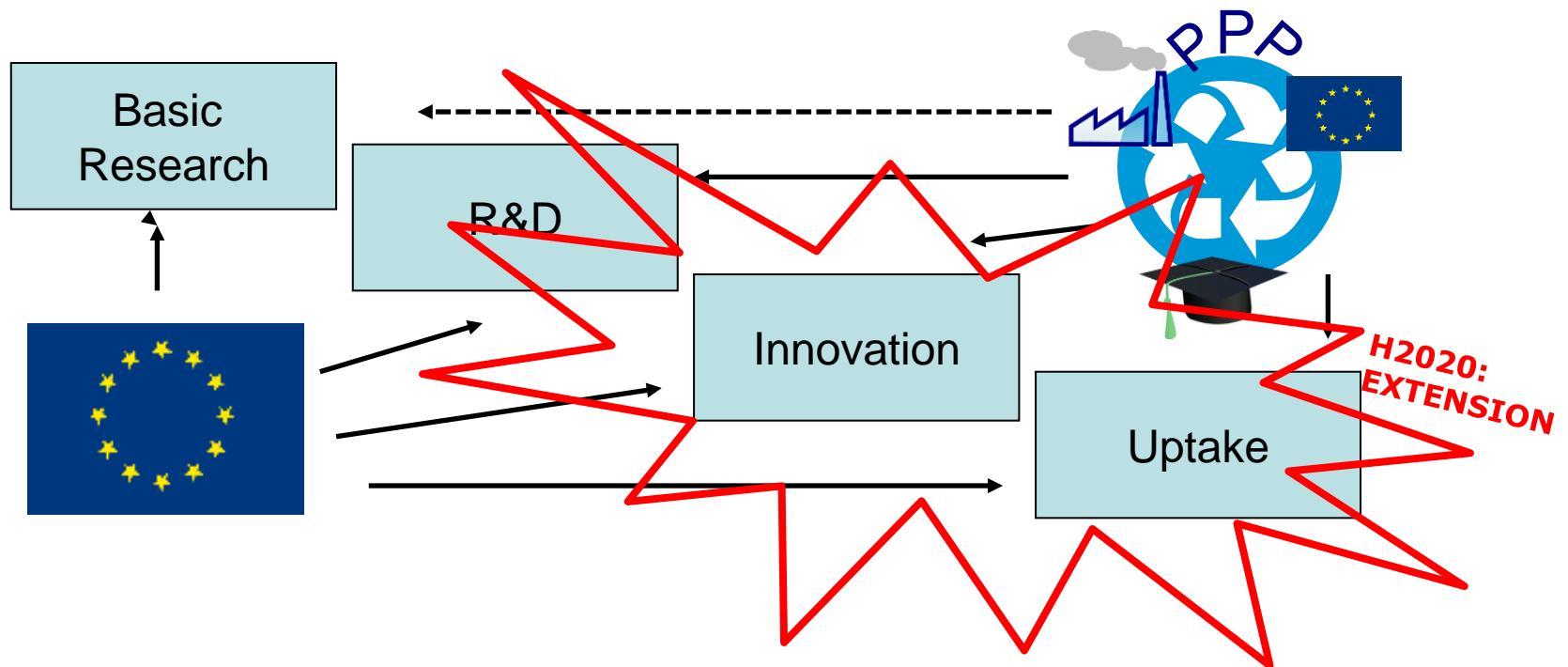
"New generation of industrial and service robots and underpinning technologies"

"Substantial progress in robots capabilities [...] autonomy, adaptability and interacting in safe ways with humans."

" Operate in dynamic real-world environments",

"Research implementing the Strategic Research Agenda (SRA)"

Horizon 2020: Extension towards Innovation and Uptake



RESEARCH AND INNOVATION ACTIONS (R&I)

VS

INNOVATION ACTIONS

Horizon 2020 – Definitions

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**

RESEARCH AND INNOVATION ACTIONS (R&I)

VS

INNOVATION ACTIONS

CHALLENGE 5: ROBOTICS - 1st Call Roadmap-based R&I in Robotics Deadline: 23 April 2014	<ul style="list-style-type: none"> • TYPE of ACTIVITY • % fund. • Size 	74M€
ICT23.a - Research & Innovation Actions PRIORITY Market domains: manufacturing, commercial, civil, agriculture Advance key technologies for the priority domains + system development + shared resources and assessment	R&I 100% Small/Large	57M€
ICT23.b Technology transfer - Robotics use cases	INNO. - 70% Small/Large	12M€
ICT23.c Pre-commercial procurement in robotics	INNO. - 70% Large	5M€

CHALLENGE 5: ROBOTICS - 2nd Call Roadmap-based R&I in Robotics Deadline: 21 April 2015 (TBC)	<ul style="list-style-type: none"> • TYPE of ACTIVITY • % fund. • Size 	83M€
ICT24.a – Research & Innovation Actions PRIORITY Market domains: healthcare, consumer, transport Advance key technologies for priority domains	R&I 100% Small/Large	50M€
ICT24.b - Technology transfer Industry-academia cross-fertilisation	INNO. 70% Large	12M€
ICT24.c - Technology transfer Robotics use cases	INNO. 70% Small/Large	12M€
ICT24.d - Pre-commercial procurement in robotics: healthcare	INNO. 70% Large	5M€
ICT24.e - Community building and competitions	Coord. Action	4M€

1st Call – ICT23.a – 2014: ROBOTICS*

ICT 23.a Research and Innovation Action:

- Advance robotics abilities + key technologies and their combination

Not in isolation but in the context of

- Market domains:

manufacturing, commercial, civil, agriculture

- Demonstrate increased TRL (Technology Readiness Level) relevant for the market domains

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/92-ict-23-2014.html>

2nd Call – ICT24.a – 2015: ROBOTICS

ICT 24.a Research and Innovation Action:

- Advance robotics abilities + key technologies and their combination

Not in isolation but in the context of

- Market domains:
healthcare, consumer, transport
- Demonstrate increased TRL (Technology Readiness Level) relevant for the market domains

Research and innovation actions in **ICT-23.a / ICT-24.a**

- Testing and validation on a small-scale prototype in a laboratory or simulated environment
- Limited demonstration or pilot activities to show technical feasibility in a near to operational environment
- Laboratory test and simulation possible but only as an intermediary step / no heavy investment in simulations
- "Simulated environment" -> **sufficiently realistic/challenging**

↪ **Necessary activities** validating results in realistic or real-world environments to demonstrate progress in abilities/technologies **RELEVANT** to these market domains

"Research implementing the Strategic Research Agenda"



**VISION
/GOALS**

**GUIDANCE
"HOW TO"**



SRA = High level document

- sets terminology

MAR = Technical detail

- updated each year
- tracks trends

WHERE TO FIND THEM?

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

What do I 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

ROBOTICS ABILITIES KEY TECHNOLOGIES AND THEIR COMBINATION

Robotics abilities*

- **adaptability, cognitive ability, configurability, decisional autonomy, dependability, flexibility, interaction capability, manipulation ability, motion capability, perception ability**

Key robotics technologies*

- **cognition, human-robot interaction, mechatronics, navigation, perception**

Technology combinations* - **NOT EXHAUSTIVE**

- **such as grasping and dexterous manipulation, physical HRI, mobile manipulation, reactive planning and other combinations (more examples in the SRA)**

FOR MORE DETAILS

SRA/MAR 17

*ICT23.a text:

<http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/92-ict-23-2014.html>

MARKET DOMAINS

Market domains: 1st Call - ICT 23.a

Civil (B2G)

Commercial
(B2B)

Manufacturing

Agriculture

Civil
Infrastructure
Environment
Search & Rescue
Law Enforcement
Emergency
Services
Science Support
...

Mining and Minerals
Utilities and Service
Construction and
Demolition
Inspection and
Monitoring
Marketing
...

Production
Food
SME Manufacture
...

Agriculture
Forestry
Fisheries
...

FOR MORE DETAILS

SRA/MAR

Market domains: 2nd Call - ICT 24.a

Healthcare

Surgical
Therapy &
Rehab
Training
Assistive
Robotics
...

Consumer
(B2C)

Domestic Appliances
Assistive Living
Entertainment
Education
Monitoring and
Security
...

Transport

Goods Transport
People Transport
Logistics
Warehousing
...

FOR MORE DETAILS

SRA/MAR 20

MARKET DOMAINS VS ABILITIES VS TECHNOLOGIES

Market Domains

Set



Requirements

STEP
CHANGES



Capability

Provide



Technologies

Recipe for a good **R&I** proposal

MARKET DOMAIN

ABILITY

- Step change: current vs. target

TECHNOLOGY/TECHNOLOGY COMBINATION

- Step change: current vs. target
- How? Methodology

VALIDATION

- Plans to demonstrate progress/step changes in abilities/technologies **RELEVANT** to the selected market domain(s)
- Targeted improvements (TRLs), metrics, validation plans

IMPACT

- Specific Objective(s)
- Concrete plans to reach the objective(s)

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Excerpt from the Work-Programme

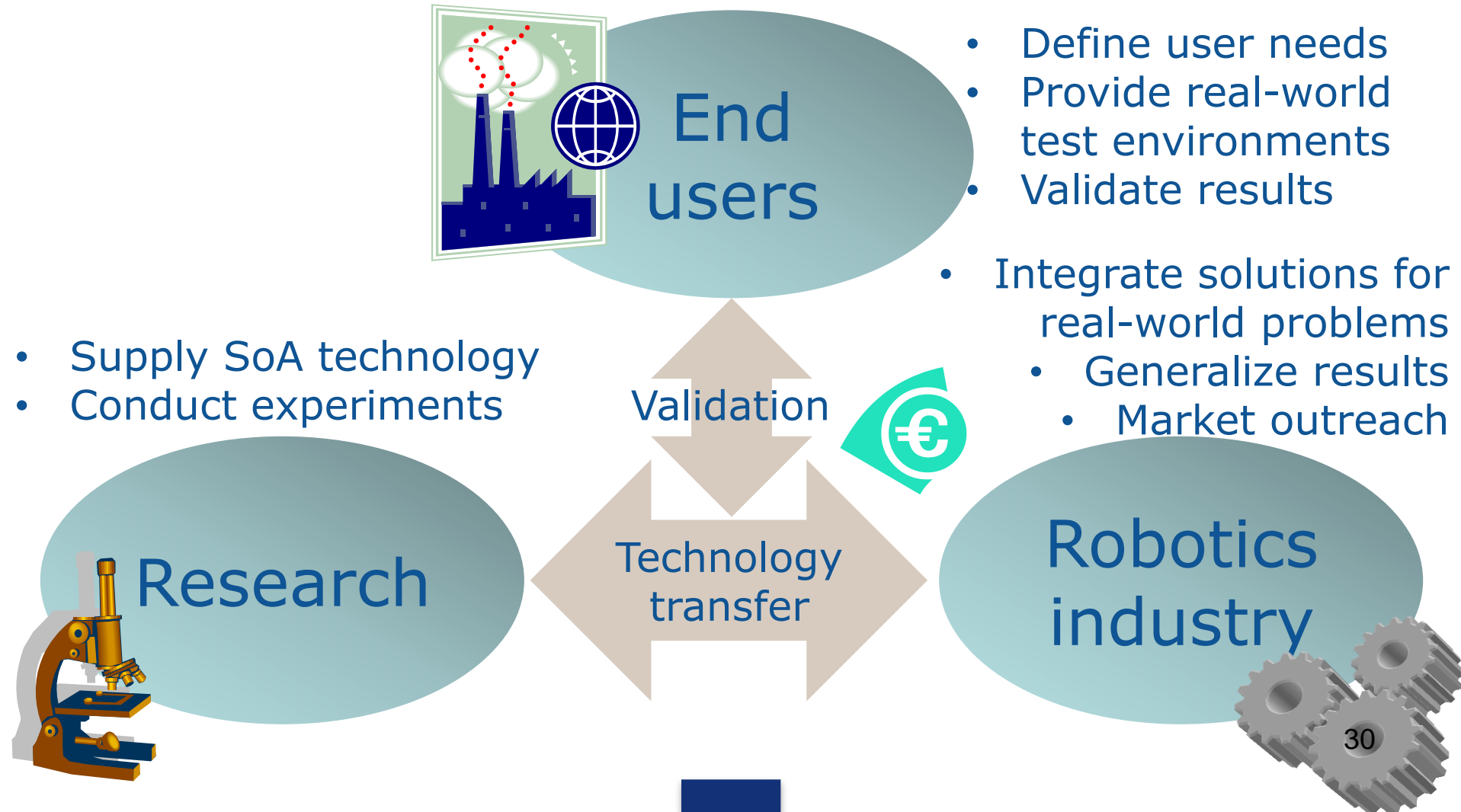
"**Using leading edge science and technology**, including results from EU-funded projects, a targeted effort will aim at **introducing, testing and validating** promising and innovative robotics solutions **in real-world conditions**.

The focus will be on the **robust operational deployment** of these robotic solutions, based on performance objectives, metrics, and **user needs**. The **strong involvement** of stakeholders such as **robotics industry, system integrators** and **end-users** is **essential**."

Recipe for a good use-case proposal

- Real-world use cases
- State of the art robotic technology
- 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

Typical consortium



Technology Readiness Levels

TRL	H2020 description
1	Basic principles observed
2	Technology concept formulated
3	Experimental proof of concept
4	Technology validated in lab
5	Technology validated in relevant environment
6	Technology demonstrated in relevant environment
7	System prototype demonstration in operational environment
8	System complete and qualified
9	Actual system proven in operational environment



Application domains

There are **no limitations**, provided that the applications are taken from the **real-world**:

- industry (all kinds),
- utilities,
- **transport and logistics**,
- farming and fishing,
- civil engineering and building,
- mining and quarrying,
- private and public services (including health and education),
- emergency and rescue,
- ...



Exploitation

The **economic potential** of the intended results should be demonstrated by means of:

- market screening,
- competitive position,
- marketing goals,
- business plans,
- ...



Can **Use Cases** proposals include **some research?**

Yes but ...

... keep in mind that the **main focus** is **technology transfer.**

SRA - Scenario "Logistics and Transport"

Description

Warehouses are well organised and **increasingly robots are deployed** on a large scale to pick and organise items for delivery. While there are still **efficiency gains to be made** from optimising the automation of large warehouses the entry and exit of goods from the warehouse is still a **potential bottleneck**.

Automating the unpacking of containers and pallets and the automatic stacking of lorries are the **next steps** in reducing costs in the delivery process. These tasks will involve significant interaction with people as they collaborate to pack and unpack goods.

Time Scale

Incremental milestones in niche areas of warehouse management may be realised **within a few years**.

It will take **10 to 15 years for highly reliable, cooperative** systems to be deployed.

I

R&I

Autonomous Vehicles for Long-Term Operation in Industrial ENvironments

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- R&I vs Innovation project?
Depending on maturity & focus of your project

Thank you