



# Robotics in Horizon 2020 1<sup>st</sup> Call ICT23.a/2<sup>nd</sup> Call ICT24.a Research & Innovation Actions

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Unit A2 - Robotics

DG Communication Networks, Content and Technology

European Commission

# Introduction: Overall Objective

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

*"Substantial progress in robots capabilities"*

*"Research implementing the Strategic Research Agenda (SRA)"*

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



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

# 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>

# 2<sup>nd</sup> 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 **ICT23.a / ICT24.a**

Basic **and/or** applied research **AND**

Technology development and integration

to advance abilities and technologies  
**contributing to the prioritized 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

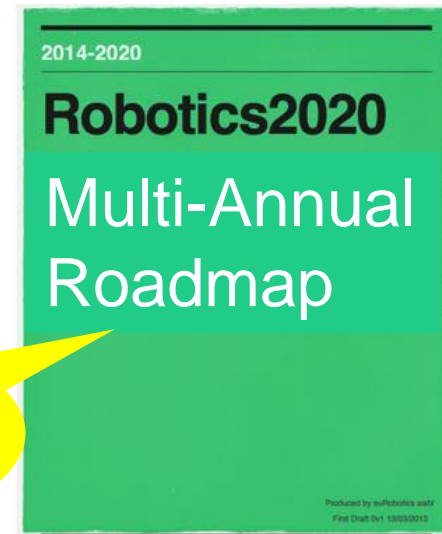


# "Research implementing the Strategic Research Agenda"



**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** 12

\*ICT23.a text:

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



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# MARKET DOMAINS

# Market domains: 1<sup>st</sup> 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: 2<sup>nd</sup> 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**

# Market domains: 2<sup>nd</sup> Call - ICT 24.a

Healthcare

CON

Tra

- *Enabling robotics technologies for disabled people*
  - upper, lower **limb disabilities** and/or **amputees**
  - **exoskeletons or prostheses** to gain functionalities

Surgical  
Therapy &  
Rehab  
Training  
Assistive  
Robotics  
...

Envi  
Education  
Monitoring and  
Security  
...

warehousing  
...



**MARKET DOMAINS  
VS  
ABILITIES  
VS  
TECHNOLOGIES**

# Market Domains

Set



**Requirements**

**Capability**



Provide

**Technologies**

# Market Domains

Set



**Requirements**

**Capability**

Provide



**Technologies**

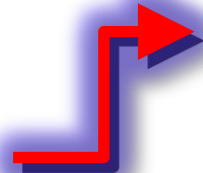
# Market Domains

Set



**Requirements**

STEP  
CHANGES



**Capability**

Provide



**Technologies**

# MAR: Structure

## For a given Market Domain

- **Ability Targets**
- **Technology Targets**

## Market Domains

Set



Requirements



Capability



Provide

**Technologies**

# MAR: Structure

## ABILITY: Manipulation

- **Current Ability Levels:**

Level 0: No Manipulation Ability

...

Level 8: Unknown Object Manipulation

- **Ability Targets:**

Raise levels,

Collaborative manipulation,  
Manipulation sequences,...

## Market Domains

Set



Requirements



Capability



Provide

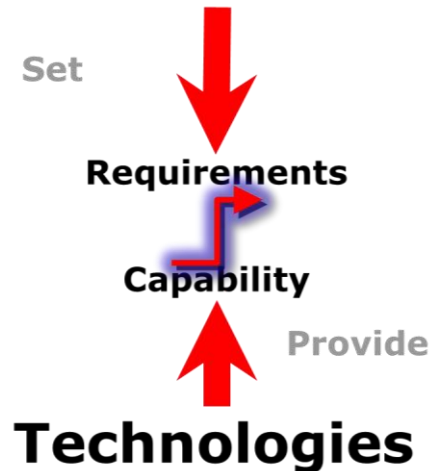
**Technologies**

# MAR: Structure

## Technology: Actuators

- **Expected Step Changes:**  
High power to volume ratio, fine scale high resolution actuation,...
- **Benchmarks and Metrics:**  
Force, weight, power consumption,...
- **Impact on Domains and Products/Visions:**  
Healthcare: Rehabilitation robotics (improved safety, compliance control), exoskeleton,...

## Market Domains



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

**TRL:** measure of the degree of maturity of a technology

- **H2020 Definition:**

[http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014\\_2015/annexes/h2020-wp1415-annex-g-trl\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf)

- **MAR:** clarifications for the robotics domain + examples



# Essential readings: SRA & MAR

## *What do I find?*

### **SRA**

- Framework/context
- Terminology

### **MAR**

- Market Domains ↔ Abilities ↔ Technologies
  - Step changes
  - TRLs
- Impact

# How SRA/MAR help in preparing proposals (1/2)?

**SRA/MAR PROVIDE FRAMEWORK/GUIDELINES**

## **My proposal vs. SRA**

- Show how the proposal addresses the SRA high level goals and strategic objectives.

## **My proposal vs. MAR:**

- Which "step change" in Ability/Technology
- Which impact on the Domains
- Which TRL increase

# How SRA/MAR help in preparing proposals (2/2)?

## SRA/MAR already identify high level impact of market domain

- No need to argue that the market domain X has high potential impact
- But proposals should describe their specific concrete plans in terms of dissemination, exploitation to make the case for the proposed project's contribution and impact

# Recipe for a good proposal

## **MARKET DOMAIN**

### **ABILITY**

- Step change: current vs. target

## **TECHNOLOGY/TECHNOLOGY COMBINATION**


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

## **VALIDATION**

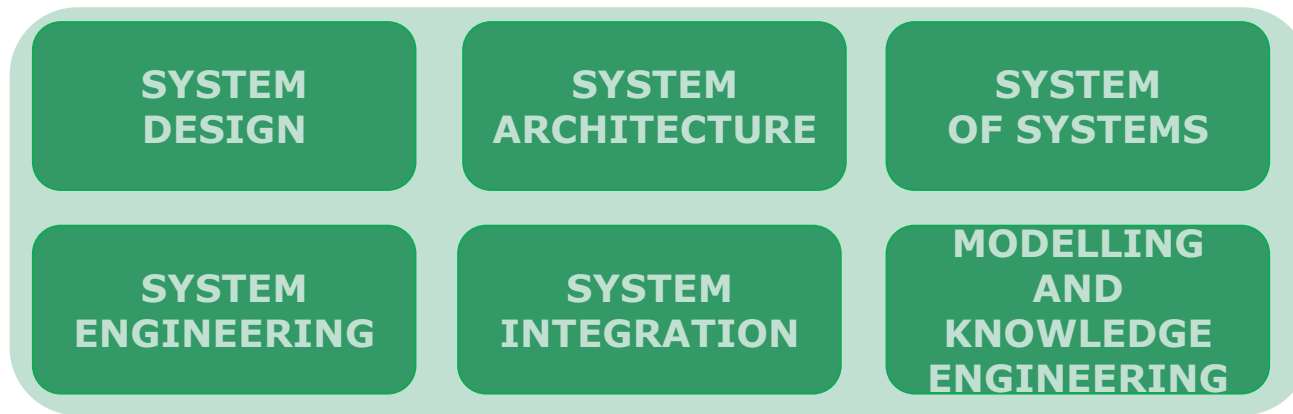
- Plans to demonstrate progress/step changes in abilities/ technologies RELEVANT to the selected market domain(s)
- Targeted improvements (TRLs), metrics, validation plans

## **IMPACT**

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

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# ICT 23.a – 1st Call: 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/>

## Project Size?

"Research & Innovation Actions

- A mix of proposals requesting Small and Large contributions are expected"
- No STREP/IP distinction
- **Adapt the size to the project needs**
- **Value for money**



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# Thank you