AI & Robotics for Healthcare

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European Commission
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- Project / Program Officer
- 11 years in the "Robotics & AI" Unit / DG CNECT
- 42 projects / 12 in healthcare
- 170M€

- *Some generalities on Robotics & Healthcare*
- *H2020 & some H2020 Projects*
- *Some outlook to the future, end of H2020, Horizon Europe & Digital Europe*

- **Some generalities on Robotics & Healthcare**
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Trends in AI and Robotics

AI can be:

- Purely in software systems, like automated trading systems or recommendation systems on shopping website
- Embodied in robots with perception and locomotion capabilities

- Affordable robots
- Adaptive robots

Constraints in Healthcare

- Population Aging
- Social security systems under stress
- Lack of qualified employable people: *"We don't have enough labour to manage everyone's health all the time with a doctor and a nurse."*

Trends in Healthcare

- Diagnosis and treatment from the **analysis of large health datasets (Big Data)**.
- **European health data space**: Standardisation and exchange of patient data across institutions and countries.
- **Citizen empowerment** and **person-centred healthcare**.
- Willingness to age in a healthy way (European Innovation Partnership on Active and Healthy Aging).

AI & Robotics as part of the solution?

- "**Iron triangle**" with three interlocking factors - **access**, **affordability**, and **effectiveness** - require inevitable and often negative trade-offs.
  - Potential of AI & Robotics to **cut costs**, **improve treatment**, and **bolster accessibility** without degrading the other factors "a path to unlocking the iron triangle".
  - Transferring time-consuming human tasks to machines.
  - Enabling patients to self-service their care needs when possible.

- *Some generalities on Robotics & Healthcare*
- **H2020 & some H2020 Projects**
- *Some outlook to the future, end of H2020, Horizon Europe & Digital Europe*

Excellent Science (24.4 B €)

- European Research Council (13.1 B €)
- Future and Emerging Technologies (2.7 B €)
- Marie Skłodowska-Curie Actions (6.1 B €)
- Research Infrastructures (2.5 B €)

Industrial Leadership (17 B €)

- LEIT = Leadership in enabling and industrial technologies
  - ICT
  - Nano, new materials
  - Biotechnology
  - Space
  (13.5 B €)
- Access to Risk Finance (2.9 B €)
- Innovation in SMEs (0.6 B €)

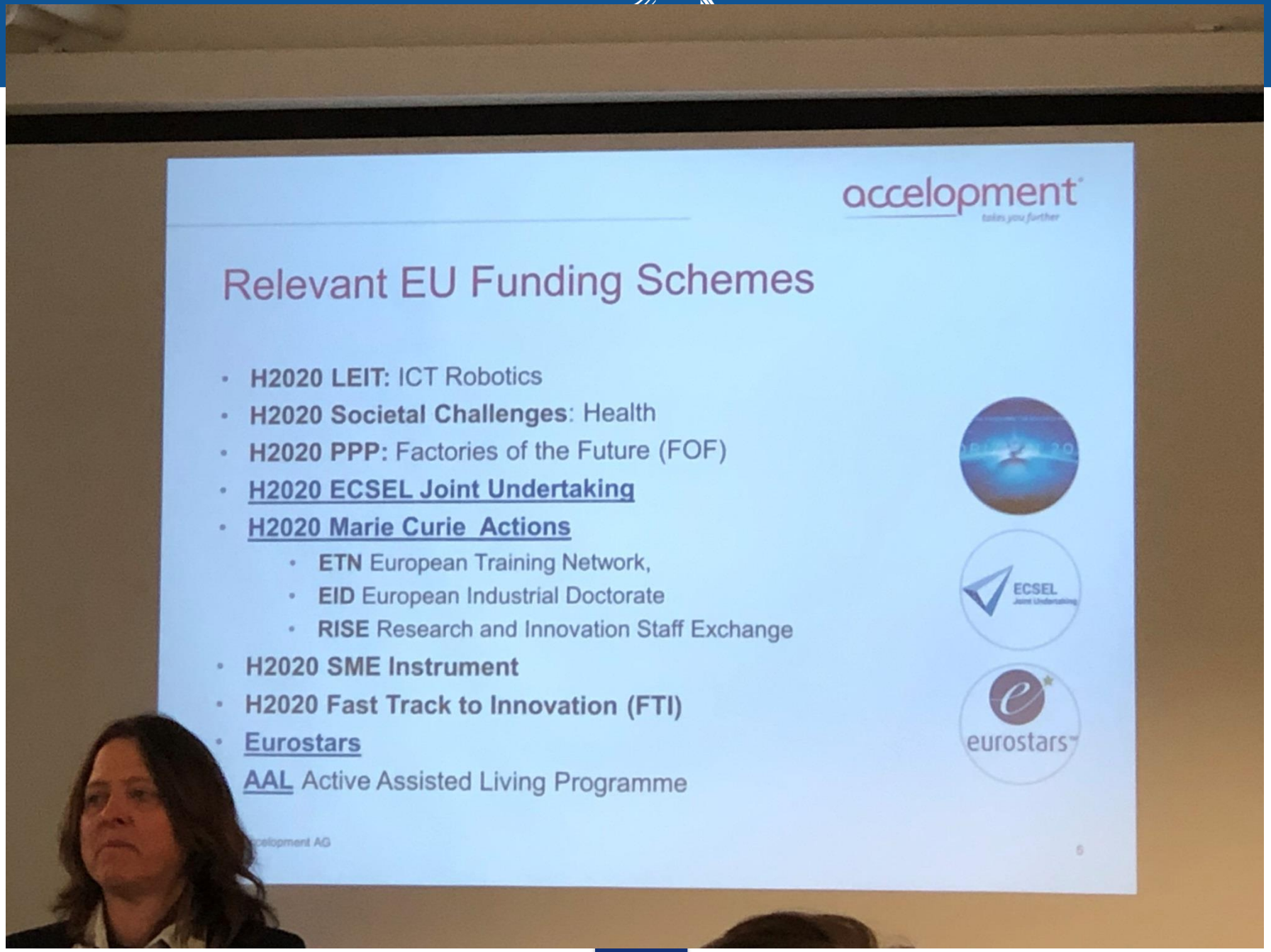
Societal Challenges (29.7 B €)

- Health (7.5 B €)
- Food (3.9 B €)
- Energy (6 B €)
- Transport (6.3 B €)
- Climate (3 B €)
- Inclusive Societies (1.3 B €)
- Security (1.7 B €)

Spreading Excellence (0.8 B €)

Science for Society (0.5 B €)

EIT (2.7 B €) | **JRC (1.9 B €)** | **Euratom (1.6 B €)**


accelopment
takes you further
Relevant EU Funding Schemes
H2020 LEIT: ICT Robotics
H2020 Societal Challenges: Health
H2020 PPP: Factories of the Future (FOF)
H2020 ECSEL Joint Undertaking
H2020 Marie Curie Actions
ETN European Training Network,
EID European Industrial Doctorate
RISE Research and Innovation Staff Exchange
H2020 SME Instrument
H2020 Fast Track to Innovation (FTI)
Eurostars
AAL Active Assisted Living Programme
ECSEL
eurostars

AI POLICY:

1. Communication on Artificial Intelligence for Europe.

2. Coordinated Plan on Artificial Intelligence (COM(2018) 795 final)

A STRATEGY FOR EUROPE TO LEAD THE WAY

Boost technological and industrial capacity & AI uptake

Prepare for socio-economic changes

Ensure an appropriate ethical & legal framework

AI FOR GOOD AND FOR ALL

European Commission

2018-2020: €1.5 billion in = 70%+ of annual investment

R&D and excellence centers

AI-on-demand platform

Digital Innovation Hubs

Industrial data platforms

Goal beyond 2020: Increasing investments from €4-5 billion / year today to €20 billion / year

European Commission

Maximising benefits from AI

European Commission

Economic impact

+

Contribution to societal challenges

Healthcare

Energy efficiency

Road safety

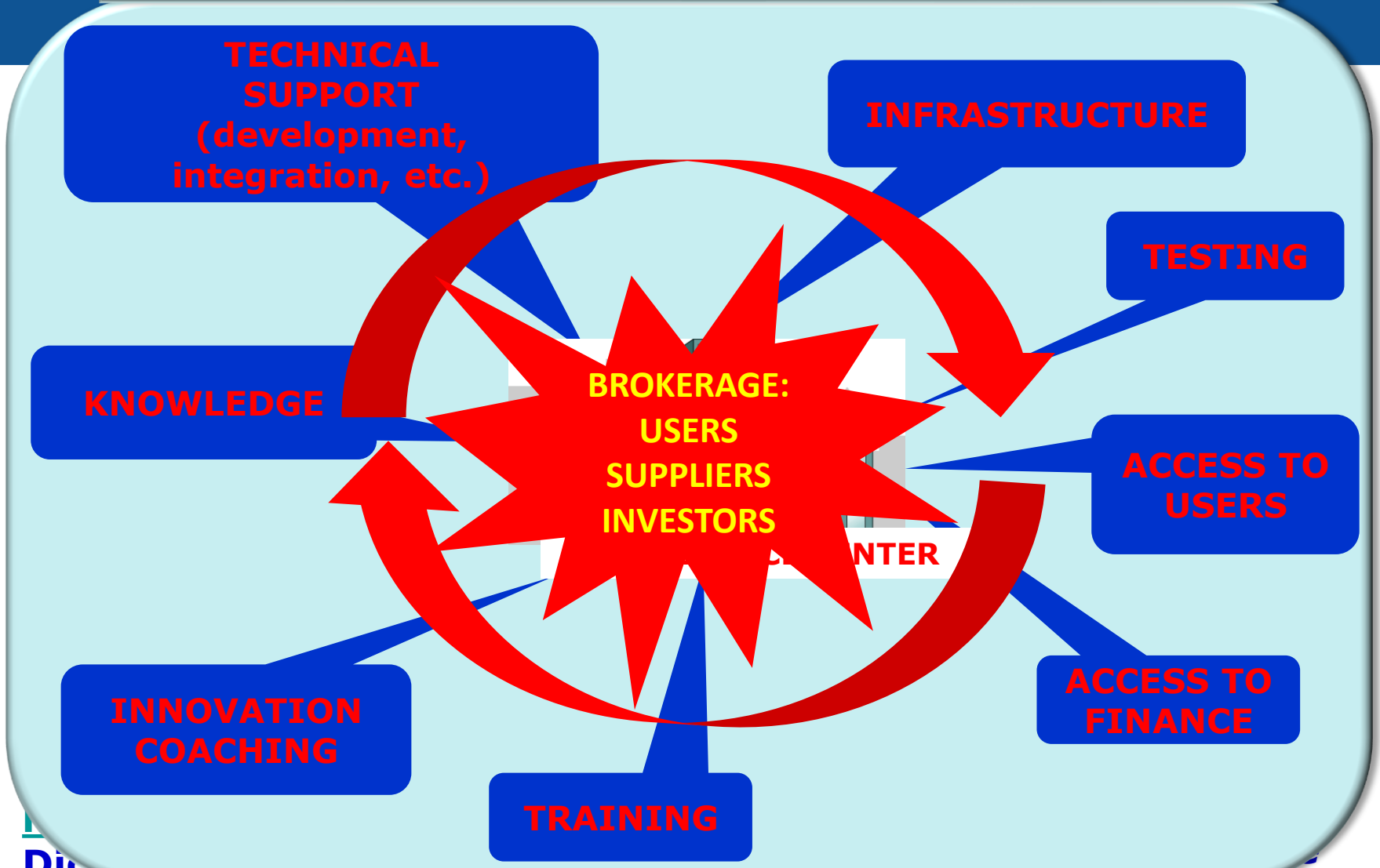
Cybersecurity

...

The AI-on-demand-platform AI4EU - http://ai4eu.org/

- Provide central access point to AI ressources in Europe
- Will have a Pilot Experiment in Healthcare to provide examples of how to use this platform for innovations with AI.

DIGITAL INNOVATION HUB: INGREDIENTS



Dig
in Healthcare Robotics

of digital innovations and competences

DIGITAL INNOVATION HUB: ACTORS

Entrepreneurs

Incubators

Academia

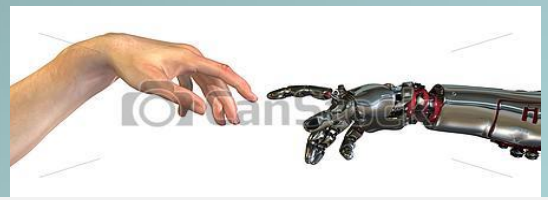
Government

Industry

COMPETENCE CENTER

SHARED PHYSICAL INFRASTRUCTURE & SUPPORT

- Techno centric: rto, excellence centre…
- User centric: testing facility in specific area (factory, hospital, farm, urban area, test-house …)



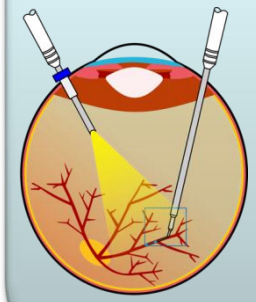
Users Community: SMEs, citizens, local economic actors…

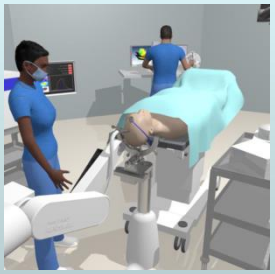
Investors

EC-Funded Projects in AI & Robotics for Healthcare – H2020 / LEIT / ICT

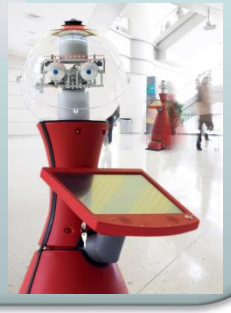
European Commission

Operating room (~26M€)



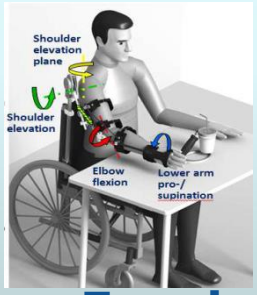


Support in Hospitals (~4M€)



Robotics

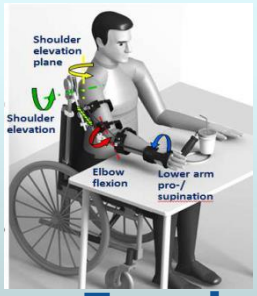
Exoskeleton & Rehabilitation (~40M€)



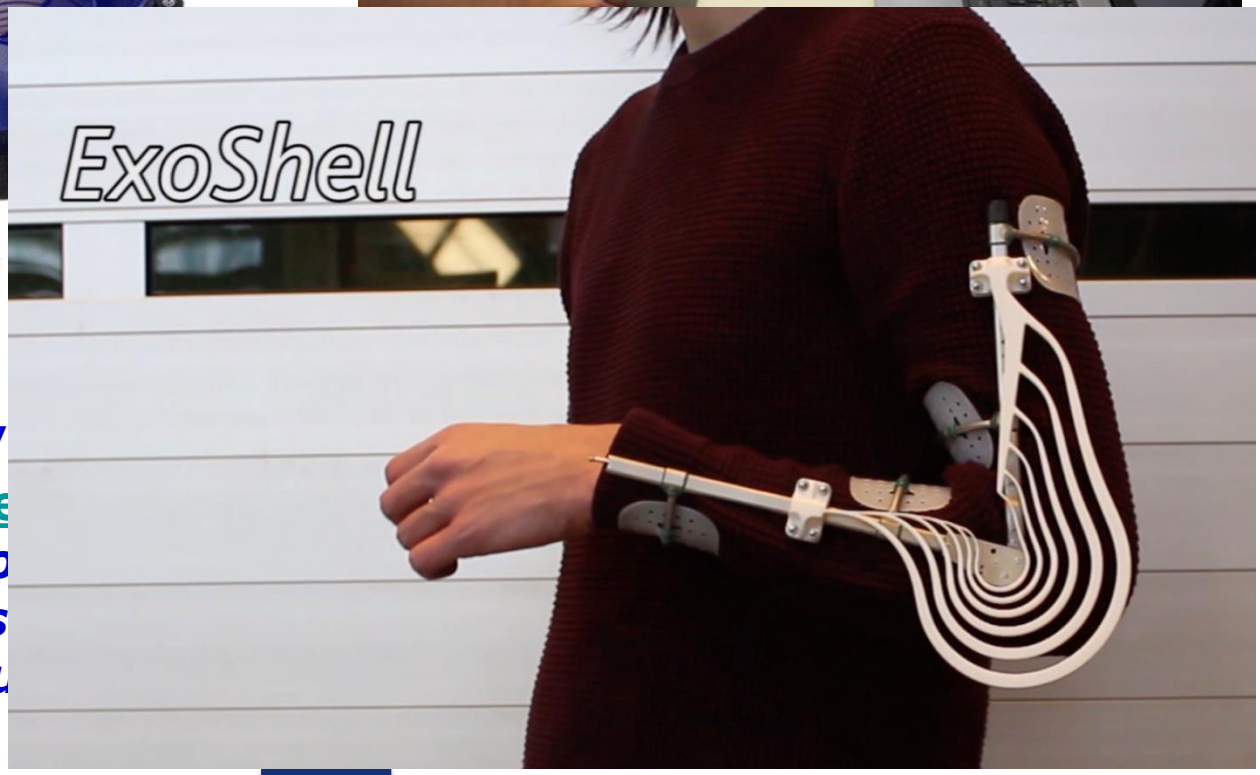
Support at Home *(Assistive living)* (~10M€)

European Commission

Robotics



Exoskeleton & Rehabilitation (~40M€)



SoftPro

H2020 call-2 (2015)

7.4 M€ (12 partners /

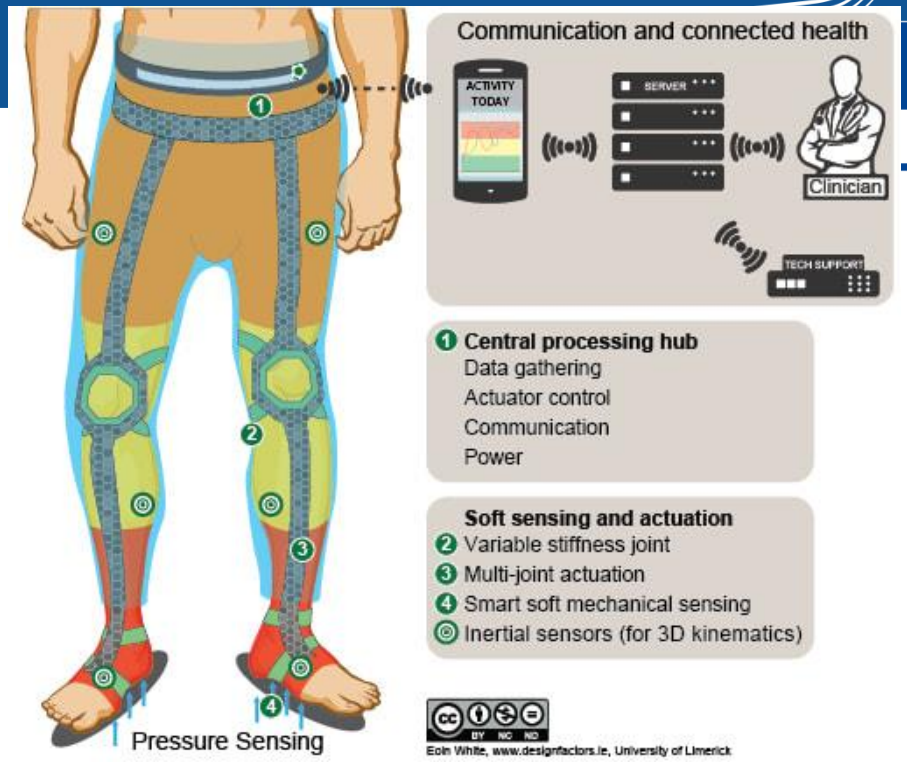
http://www.softpro.e

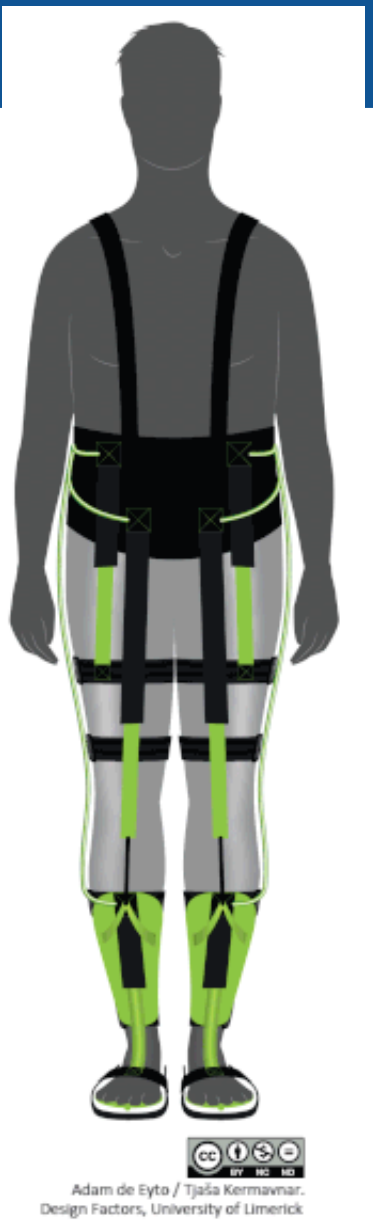
Soft robotics technolo

new prostheses, exos

assistive devices for u

rehabilitation





XoSoft

H2020 call-2 (2015)

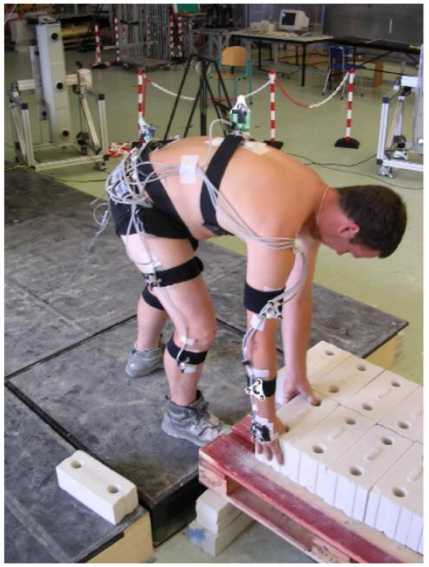
3.7 M€

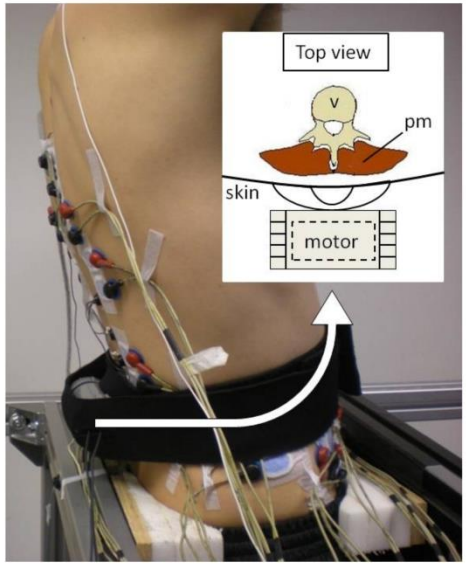
https://www.xosoft.eu/

Soft modular biomimetic exoskeleton to assist people with mobility impairments

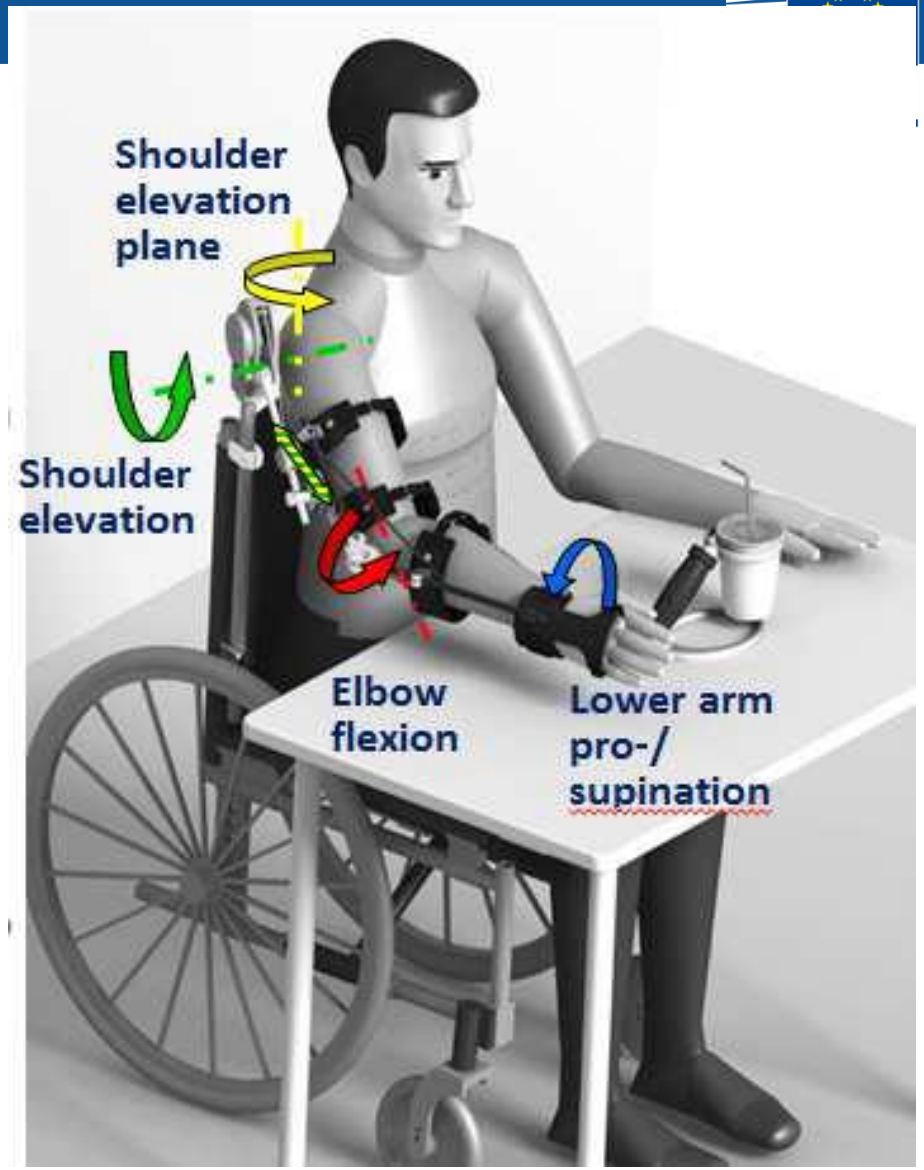
SPEXOR

H2020 call-2 (2015)
4.0 M€
http://www.spexor.eu/
Spinal exoskeletal robot for low back pain prevention and vocational reintegration





Low-back pain is the leading cause of worker absenteeism after the common cold, accounting for 15% of sick leaves and hundreds of millions of lost work days annually.



RETRAINER

H2020 call-1 (2014)

2.8 M€

http://www.retrainer.eu/

Wide clinical validation of robotics technologies for upper-limb rehabilitation

CYBERLEGs ++

CYBERLEGs Plus Plus

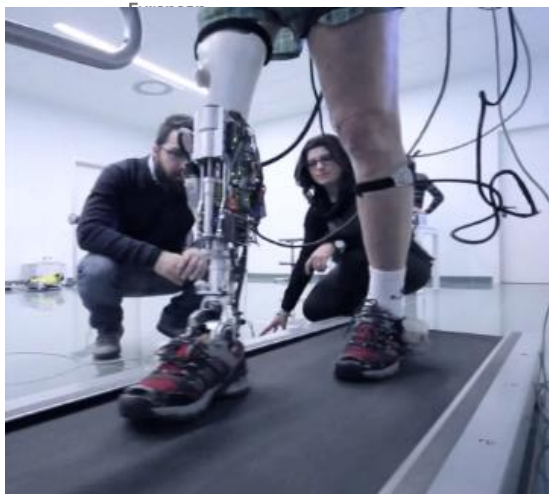
H2020 call-3 (2016)

4.3 M€

http://www.cyberlegs.eu/

CYBERnetic LowEr-Limb CoGnitive Ortho-prosthesis

Validate the technical and economic viability of the powered robotic ortho-prosthesis developed within the framework of the FP7-ICT-CYBERLEGs



MY LEG

SMART AND INTUITIVE OSSEOINTEGRATED TRANSFERMORAL PROSTHESIS EMBODYING ADVANCED DYNAMIC BEHAVIORS

MyLeg

H2020 call-7 (2017)

4.0 M€

Osseointegrated Implant

to enhance human-prosthesis interaction, perception, and motion capabilities

Implantable Myoelectric Sensors on Targeted Reinnervated Muscles

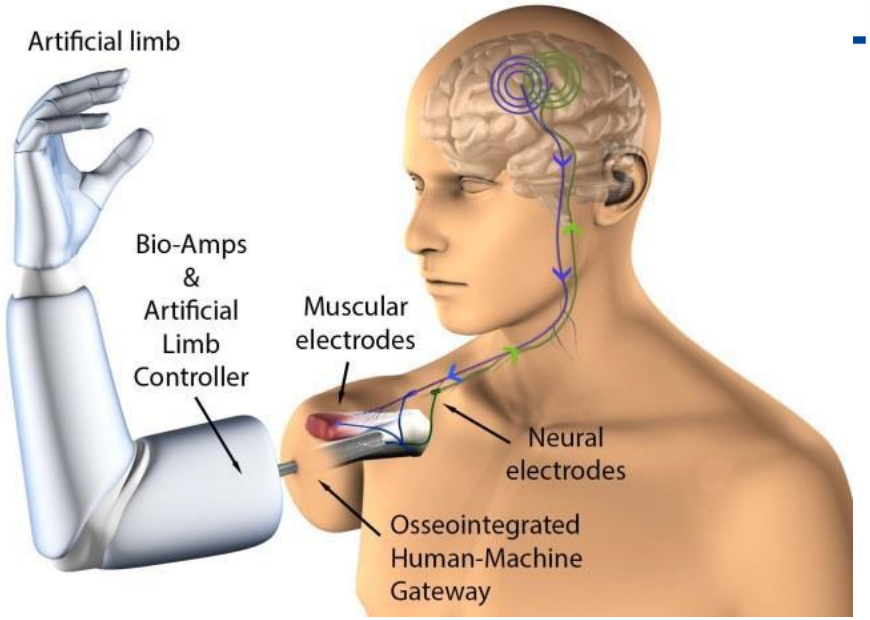
to provide an intuitive control and to extend the user's cognitive capabilities

Variable Stiffness Actuators & Novel Composite Materials

to achieve energy efficiency, dependability, and adaptability to different tasks

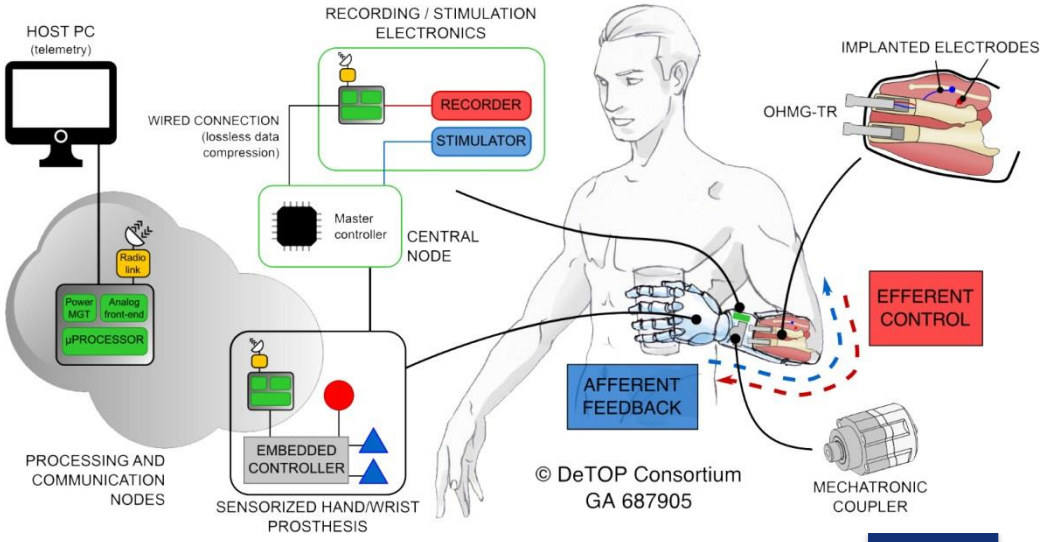
www.myleg.eu

Collaborative project supported by the the European Union in the Horizon 2020 Framework Programme under Grant Agreement no. 780871.

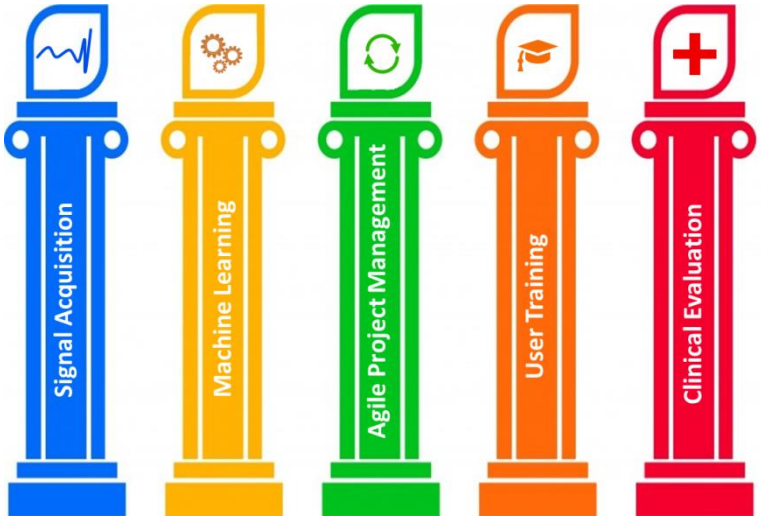


DeTOP

H2020 call-2 (2015)
4.3 M€
http://www.detop-project.eu/
Dexterous Transradial Osseointegrated Prosthesis with neural control and sensory feedback



Recovery of hand function after amputation beyond the myoelectric prostheses controlled via superficial electrodes which do not provide sensory feedback and have poor functionality and controllability

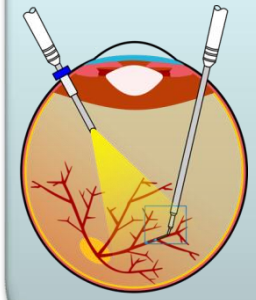


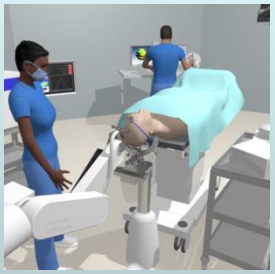
INPUT

H2020 call-2 (2015)
2.7 M€
http://www.input-h2020.eu/
Intuitive Natural Prosthesis Utilization

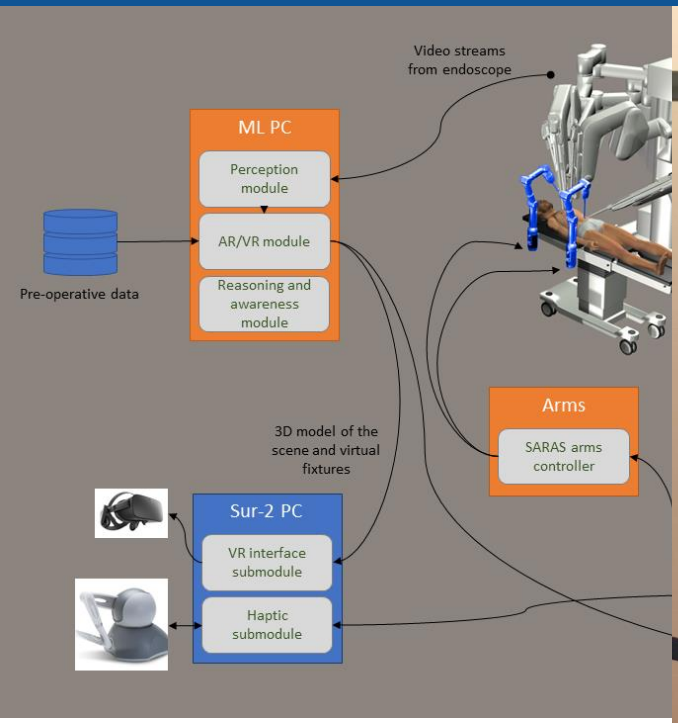
Make the control of complex upper limb prostheses simple, natural and to be used on a daily basis by amputees effortlessly after donning -"don and play".

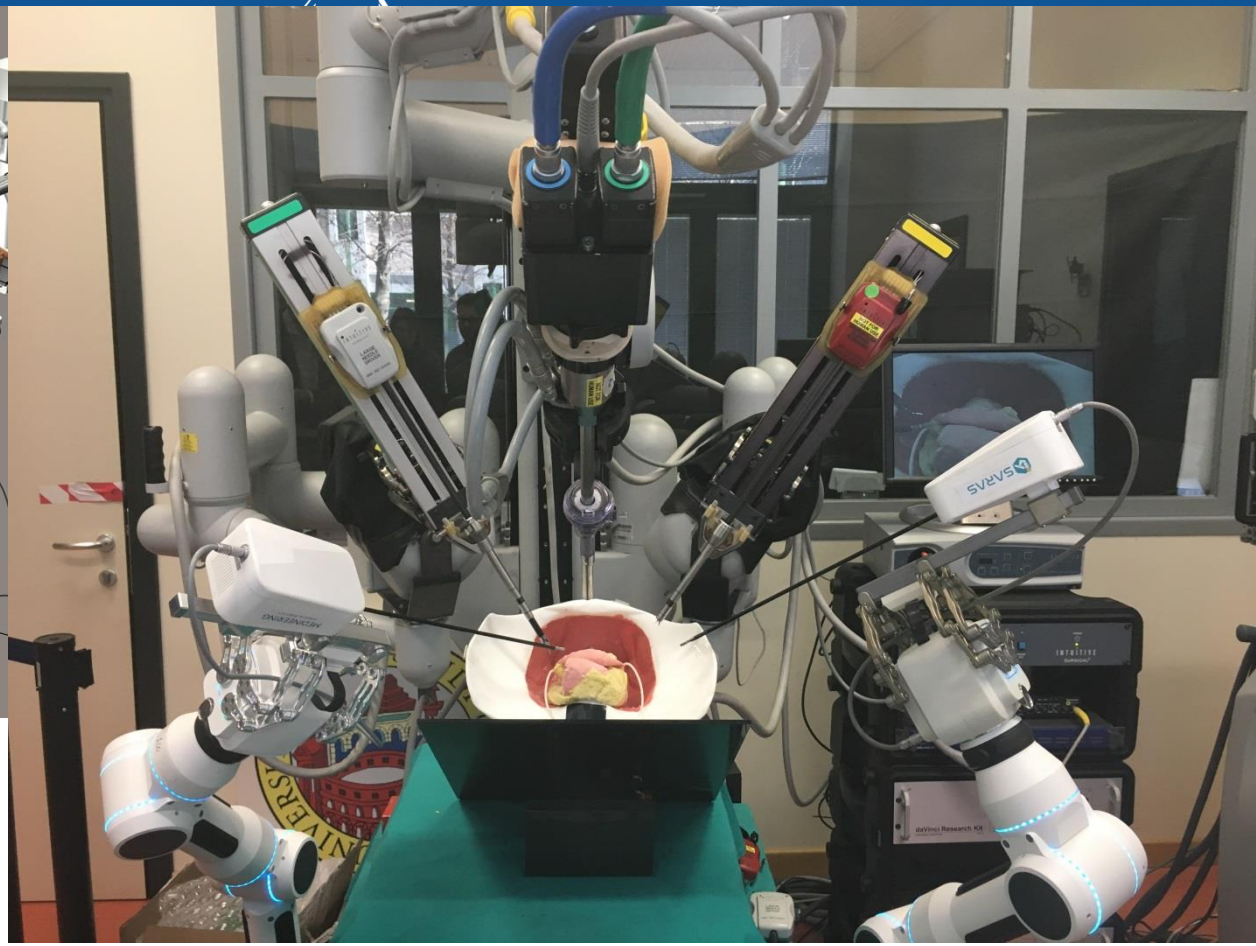
Operating room (~26M€)





Robotics





SARAS

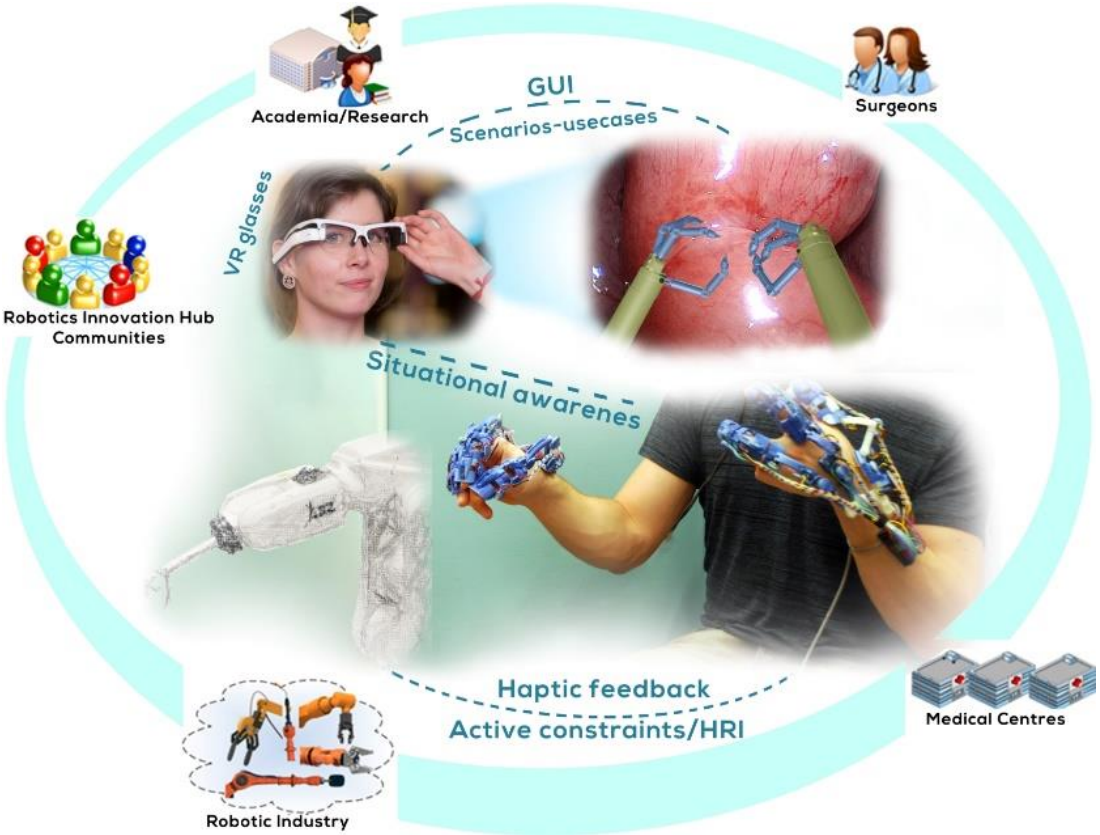
H2020 call-4 (2017)

4.2 M€

https://saras-project.eu/

Smart Autonomous Robotic Assistant Surgeon

Next-generation of surgical robotic systems that will allow a single surgeon to execute Robotic Minimally Invasive Surgery (R-MIS) without the need of an expert assistant surgeon



SMARTsurg

H2020 call-3 (2016)

4.0 M€

http://www.smartsurg-project.eu

SMart weArable Robotic Teleoperated Surgery

Developing a novel robotic platform for assisting the surgeon in complex minimally-invasive surgical operations

European Commission

MURAB

ENDOO (ex ENDOVESPA)

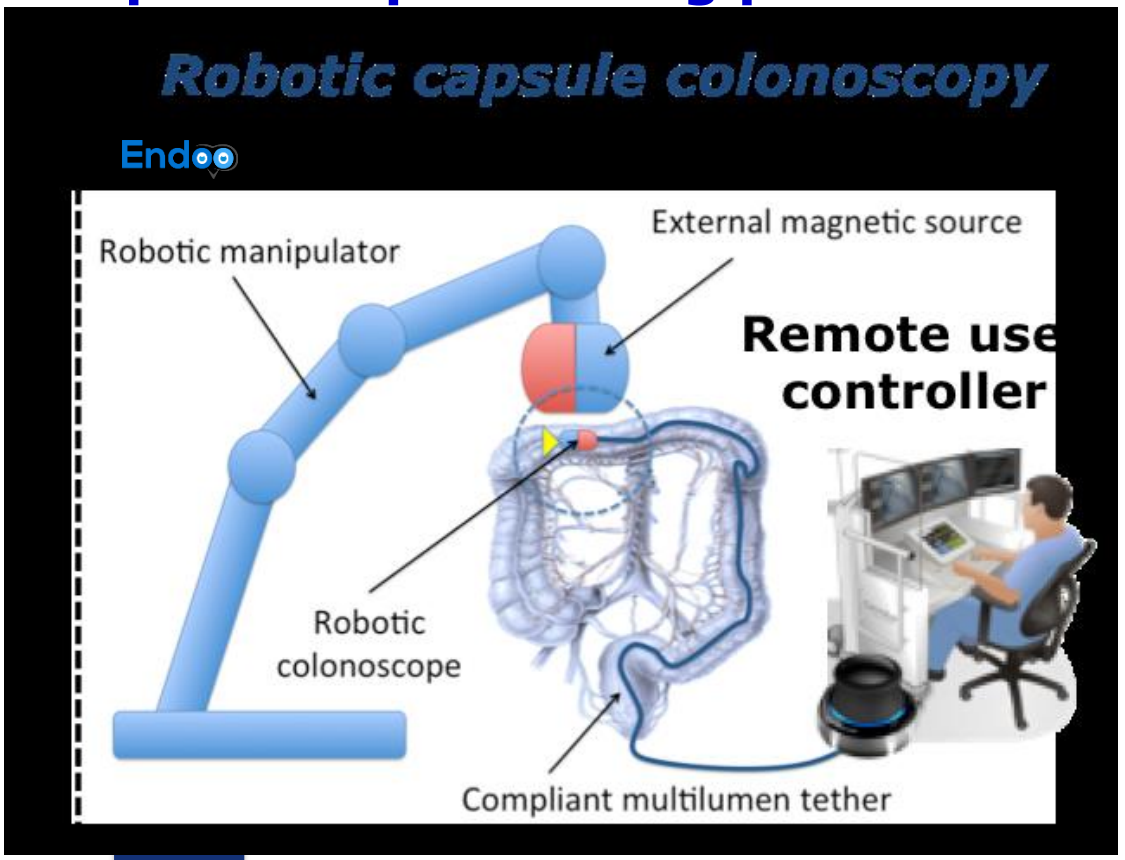
H2020 call-2 (2015)

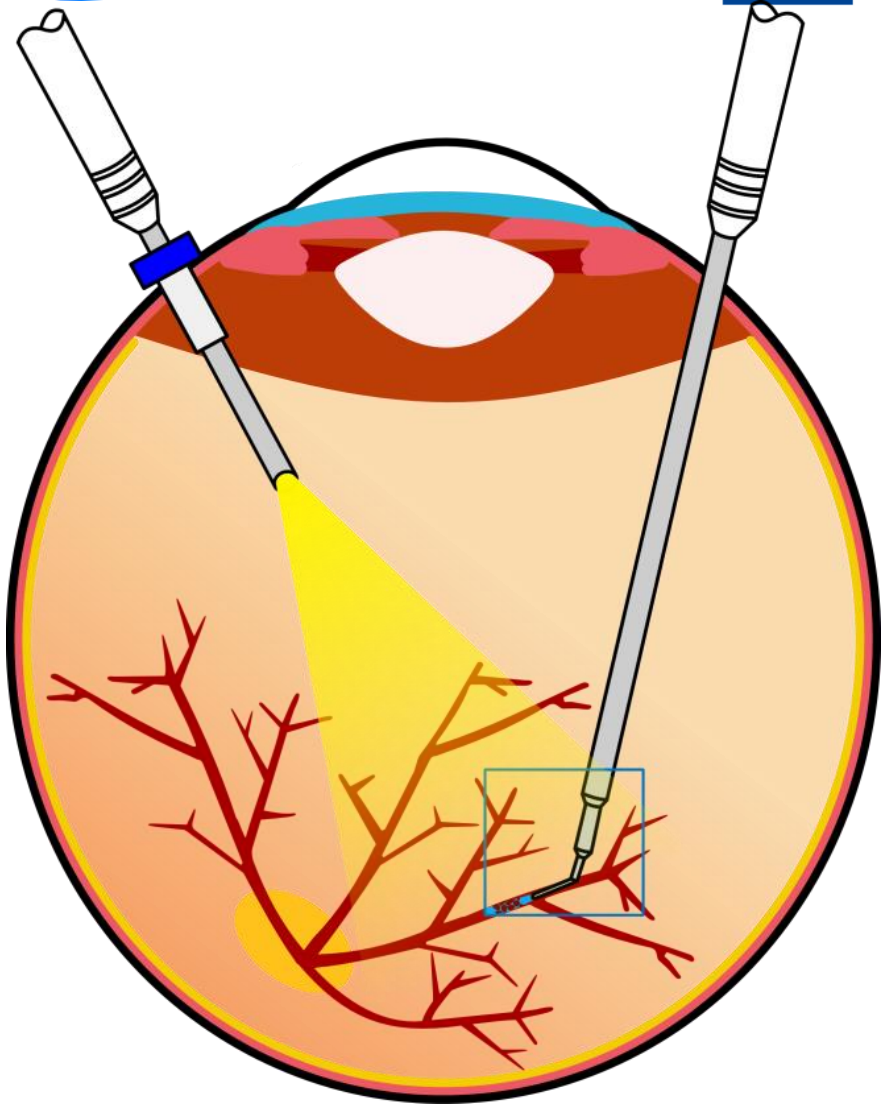
2.7 M€

http://www.endoo-project.eu/

Soft-tethered colonoscope capable of performing painless diagnosis and treatment.

Colorectal cancer is one of the major causes of mortality but survival rate dramatically increase in case of early diagnosis.





EurEyeCase

H2020 call-1 (2014)

2.6 M€

https://www.eureyecase.eu

Use Case for European Robotics in Ophthalmologic Micro-Surgery

Going beyond human skills to treat vitreoretinal diseases

European Commission

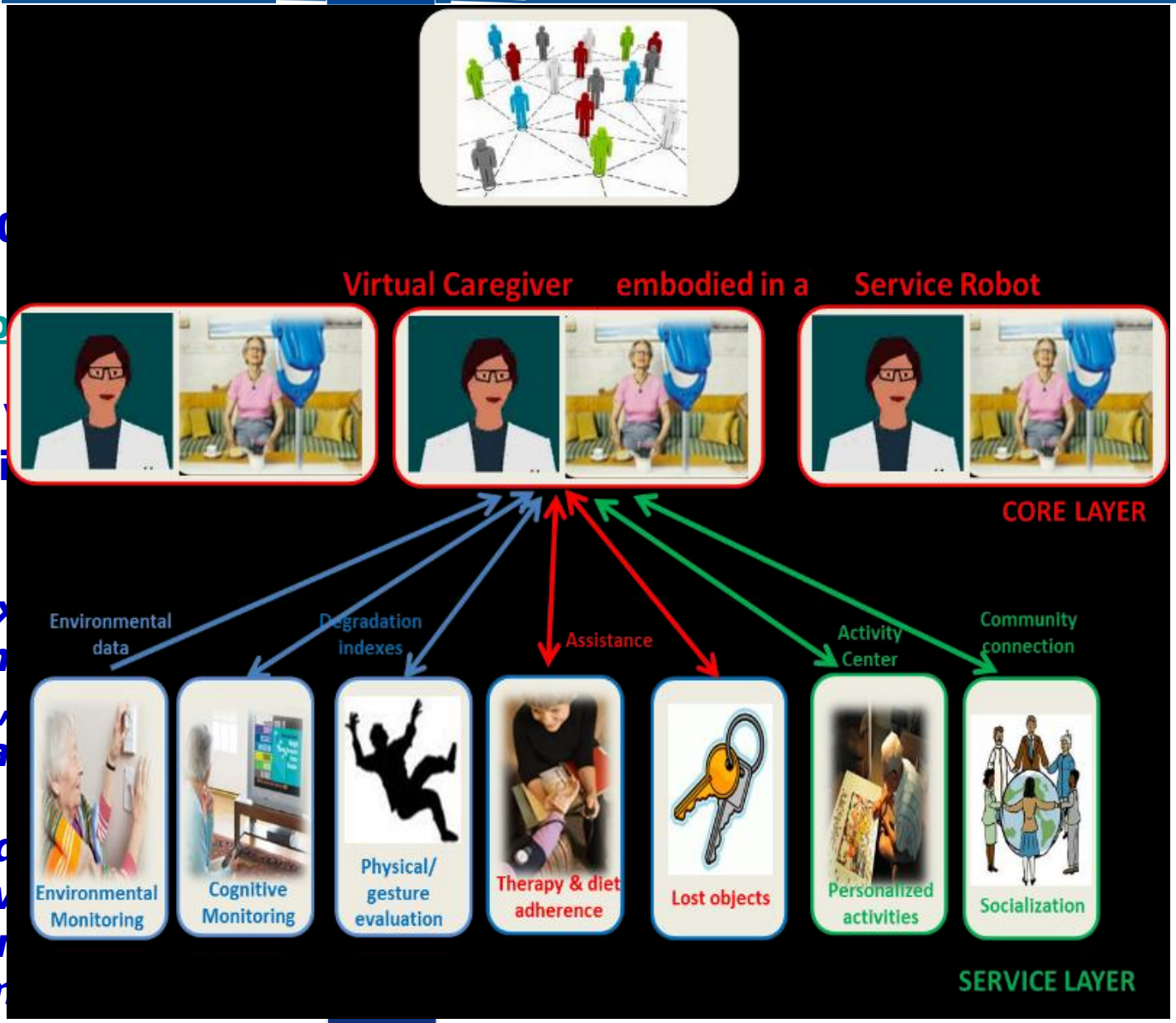
Robotics

Support at Home
(Assistive living)
(~10M€)

MoveCare

H2020 call-3 (20
5.9 M€
http://www.mo
project.eu
Multiple-Actors
Empathic Caregi
the Elder

Integrates an ex
robotic platform
domotic system,
objects, a virtua
community and
center, to provi
assistance, activ
transparent mo
the elder at hom

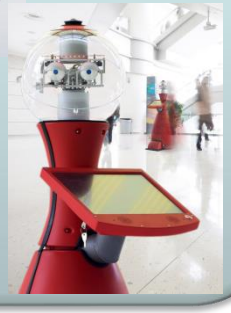


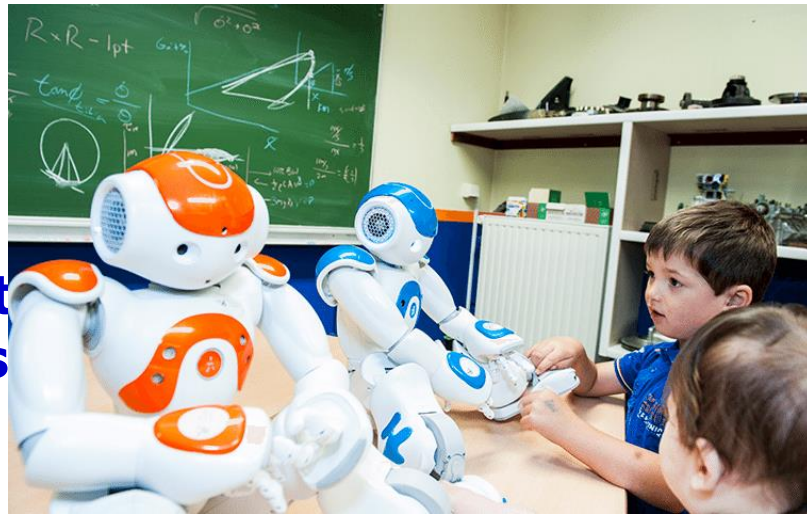
EC-Funded Projects in AI & Robotics for Healthcare – H2020 / LEIT / ICT

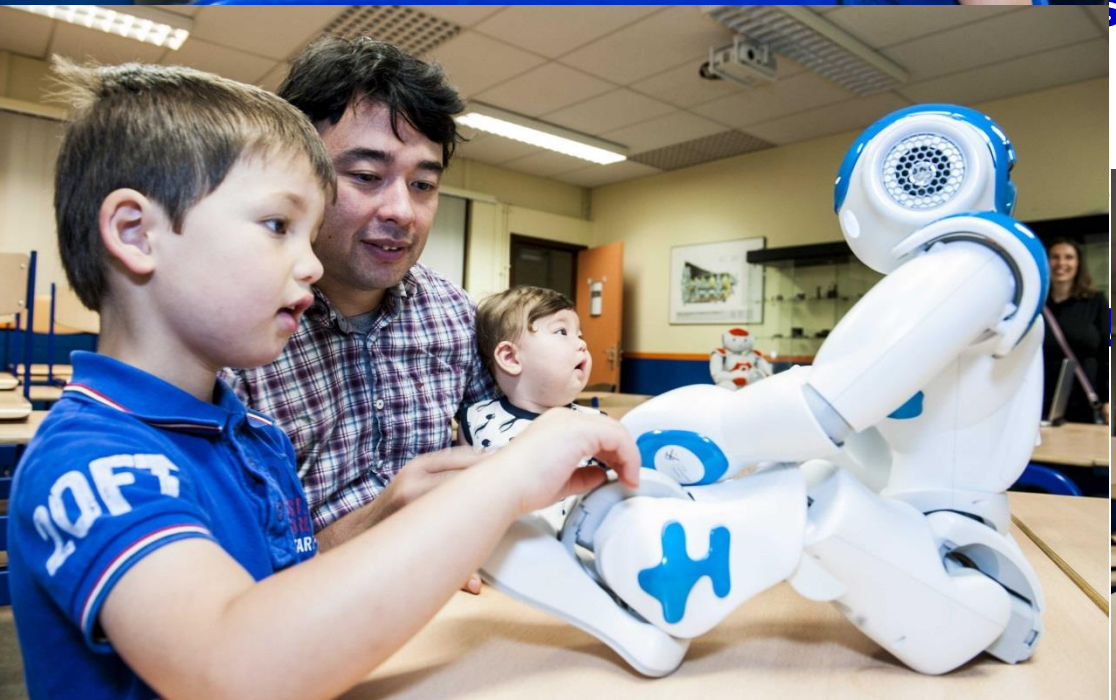
European Commission

Robotics

Support in Hospitals (~4M€)







STRANDS

FP7 call-9 (2012)
8.2 M€
Long-Term Scenarios
http://strands.acin.tuwien.ac.at/

Robots able to run for months in dynamic human environments

- ***Home for elderly people***

MOnarCH

FP7 call-9 (2012)

3.3 M€

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- *Some generalities on Robotics & Healthcare*
- *H2020 & some H2020 Projects*
- **Some outlook to the future, end of H2020, Horizon Europe & Digital Europe**

End of H2020 - Robotics

- **ICT-09-2019-2020: Robotics in Application Area**

  ICT-10-2019-2020: Robotics Core Technology

  DT-ICT-12-2020: The smart hospital of the future
  Large scale pilot of technology in Hospital/ Home care environnement
  (to be published second half 2019)

  https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities

End of H2020 - Health

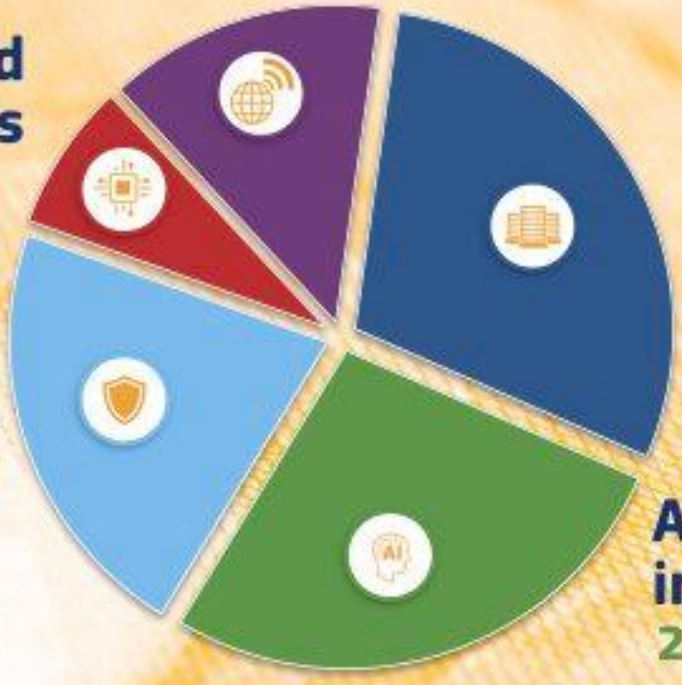
- ***SCI-DTH-03-2018**: Adaptive smart working and living environments supporting active and healthy ageing*
- ***SCI-DTH-01-2019**: Big data and Artificial Intelligence for **monitoring health** status and quality of life **after the cancer treatment***
- ***SCI-DTH-05-2019**: Large scale implementation of digital innovation for **health and care in an ageing society***
- ***SCI-DTH-11-2019**: Large Scale pilots of **personalised & outcome based integrated care***
- ***DT-TDS-01-2019**: **Smart and healthy living at home***
- ***SC1-DTH-04-2020**: International cooperation in digital solutions and robotics for independent living*
- ***SC1-DTH-02-2020**: Personalised early risk prediction, prevention and intervention, RIA*
- ***SC1-BHC-06-2020**: Digital diagnostics – developing tools for clinical decisions integrating in vitro and in vivo diagnostics*
- ***Active and Assisted Living Programme** - http://www.aal-europe.eu/wp-content/uploads/2018/03/AAL_Call-2018_29March.pdf*

Beyond H2020 : 2021-2027

- **Horizon Europe,** *follow up of H2020*
- **Digital Europe & Connecting Europe Facility**
  NEW: Capacity and Deployment
- **European Social Fund & European Globalisation Adjustment Fund**
- **European Regional Development Fund**
- **InvestEU**

- **COST Program**
- **National Funding**
- **Regional Funding**

Investing in the future: **Digital Europe** Programme



Interoperability & Digital transformation
1.3 € billion

Advanced digital skills
0.7 € billion

Cybersecurity & trust
2 € billion

High performance computing
2.7 € billion

Artificial intelligence
2.5 € billion

€ 9.2 billion in total

#EUBudget
#DigitalEurope

European Commission

Investing in the future:
Digital Europe Programme

€2.5 billion for Artificial intelligence

Bring the power of the AI to businesses & public administrations

Strengthen testing and experimentation facilities across the EU

Facilitate safe access and storage of data and algorithms

#EUBudget
#DigitalEurope

European Commission

Thank you!

Digital Innovation Hubs (DIH) ?

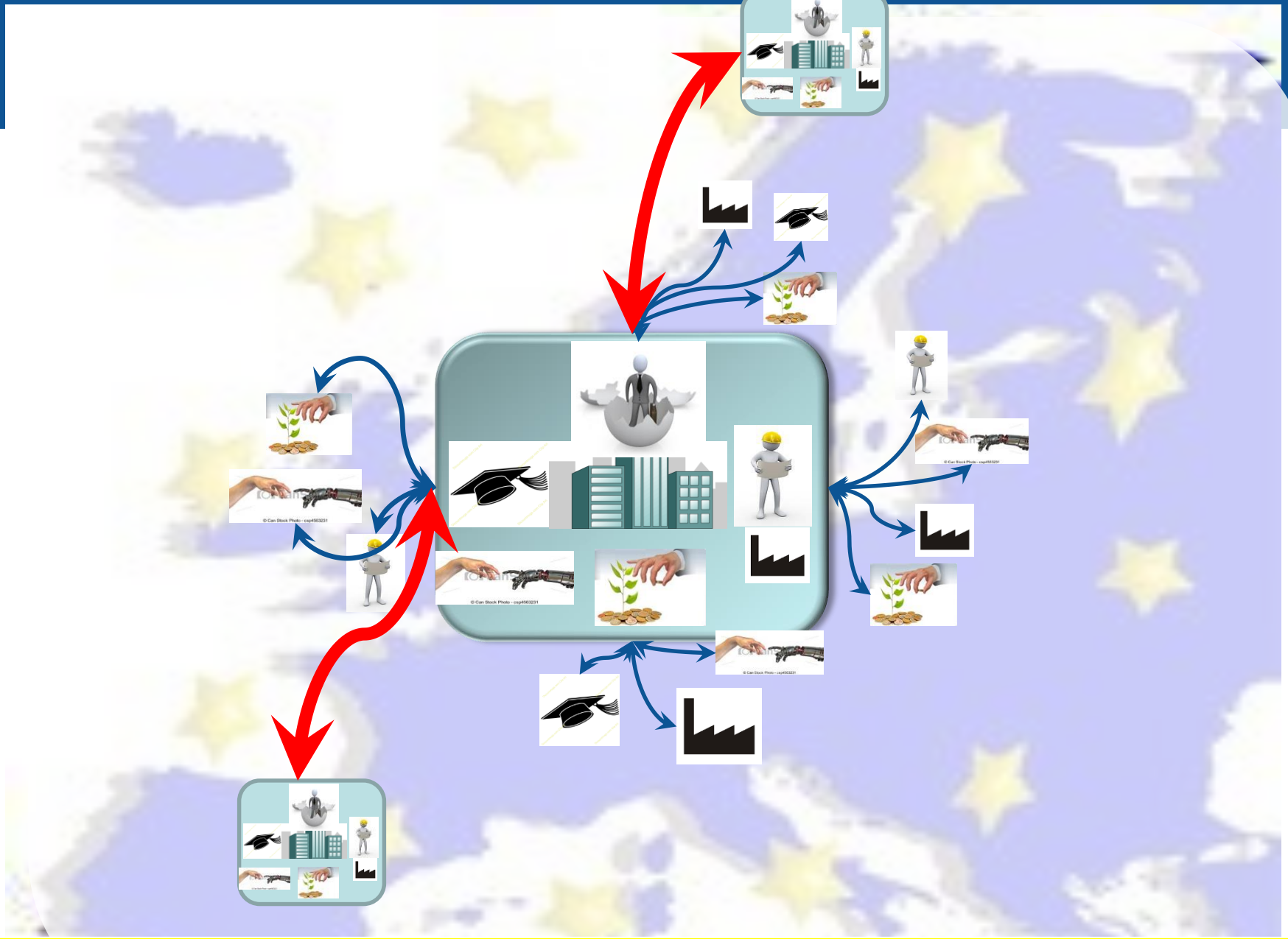
Commissioner Oettinger:
"My objective is to have at least one world class digital innovation hub in every region in Europe."

Objective:
Ensure that every business in Europe, whatever its sector of activity, wherever located and whatever its size, can take full advantage of digital innovations and competences
Access to digital technologies and expertise within "working distance" for any industry in Europe, especially SMEs, mid-caps, non-tech

- *Regions and local authorities have a key role to play*
- *EU funding: at least 500 million € in the next 5 years*

European Commission

THE HUB = CENTER OF A NETWORK EXPLOIT COMPLEMENTARITIES (LOCAL AND EUROPEAN)



COLLABORATION AND NETWORKING BETWEEN CENTRES
→ ONE-STOP-SHOP FOR EXPERTISE, COMPLEMENTARITY & SPECIALISATION

COMBINED FUNDING:
PRIVATE & PUBLIC

European Commission

PRIVATE

National, regional, local Funding

EU Regional funding

EC Investment Plan

PUBLIC

COMBINED FUNDING:
PRIVATE & PUBLIC

EARTO – HEALTHCARE
27 JUNE 2017

PRIVATE

National, regional, local Fu[illegible]ng

EU Regional [illegible]

COMBINE FUNDING:
PRIVATE ←→ PUBLIC
LOCAL ←→ EU

EC Inv[illegible]t Plan

PUBLIC

→ PUBLIC SECTOR SHARING RISK WITH INDUSTRY IN INNOVATION

Digital Innovation Hubs: Towards organic Growth

"Ensure that every business in Europe, whatever its sector of activity, wherever located and whatever its size, can take full advantage of digital innovations and competences"

Member States & regions:
build-up/strengthening of national and regional structures of digital innovation hubs

Commission:

- Set up a pan-European network of Digital Innovation Hubs
- Support activities *such as cross-border experiments, catalogue and assistance in the creation of hubs*

- particular attention to **SMEs**
- Ensure companies can **access** advanced technologies and enhance their **digital competences**
- **€100 million per year (EU)** of support to the hubs and **10 times more from the Member States and regions**

Opportunities offered by DIH-HERO

There will be calls to engage with SMEs and healthcare providers to create technology transfer experiments and demonstrators that have the potential to stimulate uptake and to showcase excellence in healthcare robotics. This include a three-step funding approach:

1) Stimulation of cross-border cooperation by travel vouchers for SMEs,

2) Funding of experiments that enable transfer of technology to the robotic solutions for the healthcare domain and

3) Funding of the development of technology demonstrators in healthcare application domains.

The main application domains targeted are: diagnostics, clinical intervention, rehabilitation, patient-support, and healthcare professional support.

At least 50% of the DIH-HERO budget will be distributed to SMEs using such mechanisms.

Digital Europe Programme

https://eur-lex.europa.eu/resource.html?uri=cellar:321918fd-6af4-11e8-9483-01aa75ed71a1.0003.03/DOC_2&format=PDF

“Co-investment with Member States in **world class reference sites for experimentation and testing in real setting** focusing on the applications of AI in essential sectors such as **health**, earth/environment monitoring, mobility, security, manufacturing or finance, as well as in other areas of public interest. The sites should be open to all actors across Europe and connected to the Network of Digital Innovation Hubs. They should be equipped with large computing and data handling facilities as well as latest AI technologies including emerging areas such as neuromorphic computing, deep learning and robotics. »

TRANSPORT

- *Electromobility*
- *Automated road transport / Traffic / Mobility / Freight and logistics / Automated trains / Security for personal vehicles / autonomous Maritime Ecosystem*
- *5G / 5G & mobility*

HEALTHCARE

- *Digital health innovations*
- *Home-based digital services for the elderly*
- *Biobanks*

INFRASTRUCTURES / UTILITIES / PUBLIC SERVICES

- *Smart energy*
- *Smart cities*
- *Road maintenance and asset management*
- *Earth Observation data processing*

INDUSTRY

- *Industry 4.0 - manufacturing and production*
- *Components*

TECHNOLOGIES

Harwdware for AI (= components?)

APPLICATION AREAS

Healthcare (smart hospital, etc.)

Smart mobility (connected and autonomous driving /logistics) & Autonomous shipping

Energy

Manufacturing / Industrial production

Security / Safety

Smart cities

Agrifood

Finance

MS INPUTS

TECHNOLOGIES

- *AI, data/image/text and language processing,5G, robotics, components*

APPLICATION AREAS

- *Health (incl. elderly)*
- *Mobility / automotive / Aviation, Trains, Vessels*
- *Great global and social challenges, such as the climate change*
- *Energy*
- *Circular economy*
- *Cleantech*
- *Bio economy*
- *Manufacturing*
- *ICT*
- *Cybersecurity/Security*
- *Space applications*
- *Smart cities*
- *Road maintenance and asset mgt.*
- *Earth Observation*