



Istituto di Tecnologie Industriali e Automazione  
Consiglio Nazionale delle Ricerche

from research .... to market



## Il Trasferimento tecnologico come motore della competitività dei territori

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Director ITIA-CNR

Milano, Regione Lombardia 27 Nov 2017



# Outline

## Current Collaborations between ITIA and IWU

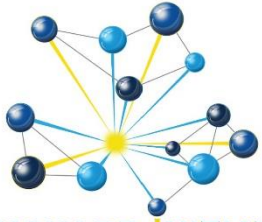
- Vanguard initiative connecting Lombardy and Saxony
- FiberEUse Horizon2020 project
- Collaboration ITIA and IWU in Serbia

## Collaborations under development between ITIA and IWU

- Human robot cooperation
- Micro manufacturing of biobased devices

# **Vanguard initiative connecting Lombardy and Saxony**

# Criteria for joining Vanguard Initiative



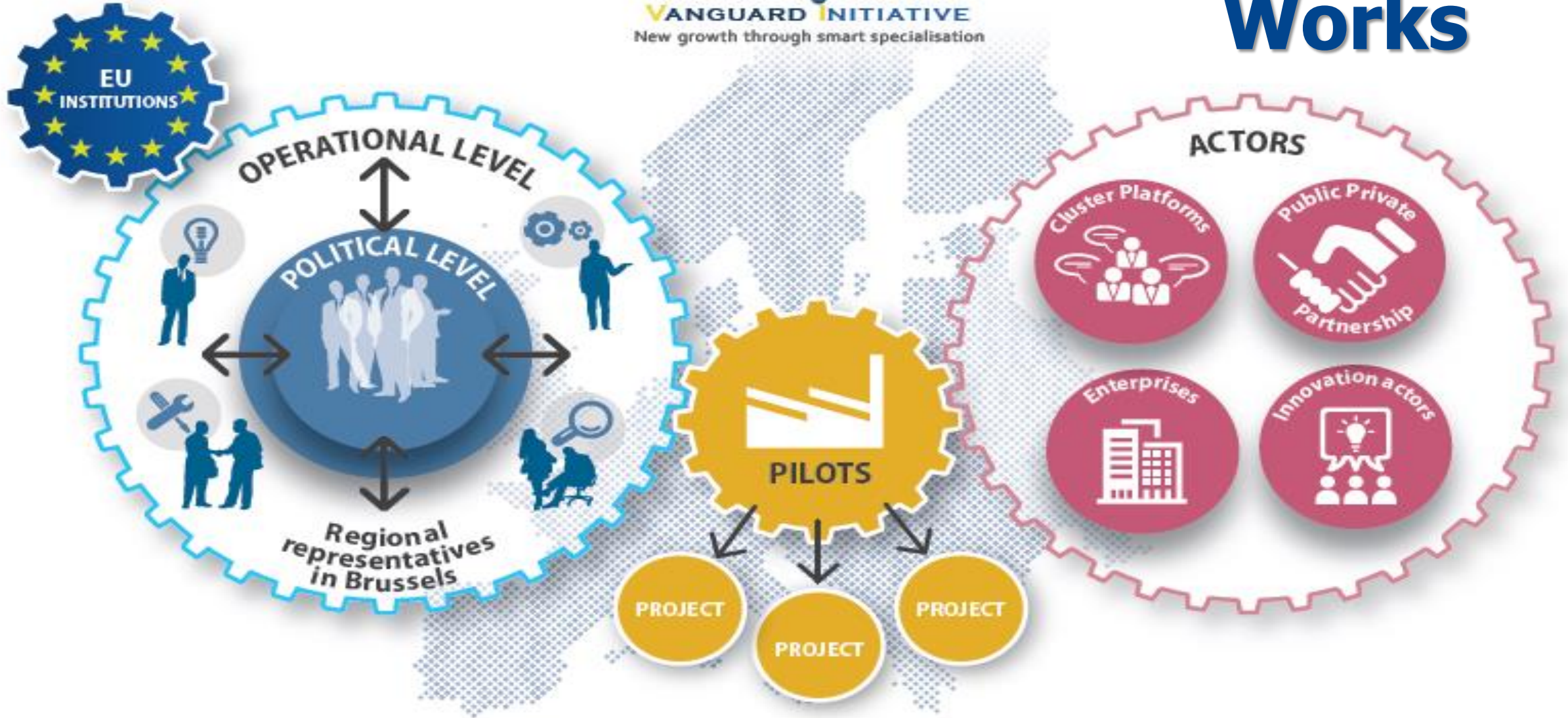
**VANGUARD INITIATIVE**  
New growth through smart specialisation

- ❖ **Regions**
- ❖ **industry based S3**
- ❖ **ambition**
- ❖ **political commitment (Milan Declaration)**
- ❖ **mobilizing and organizing industrial stakeholders in the region**
- ❖ **active participation in the network structure**
- ❖ **active participation in core activities (pilots and demo cases)**

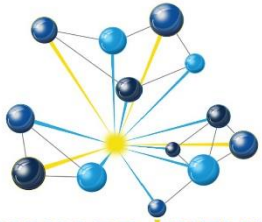
# How Vanguard Works



**VANGUARD INITIATIVE**  
New growth through smart specialisation

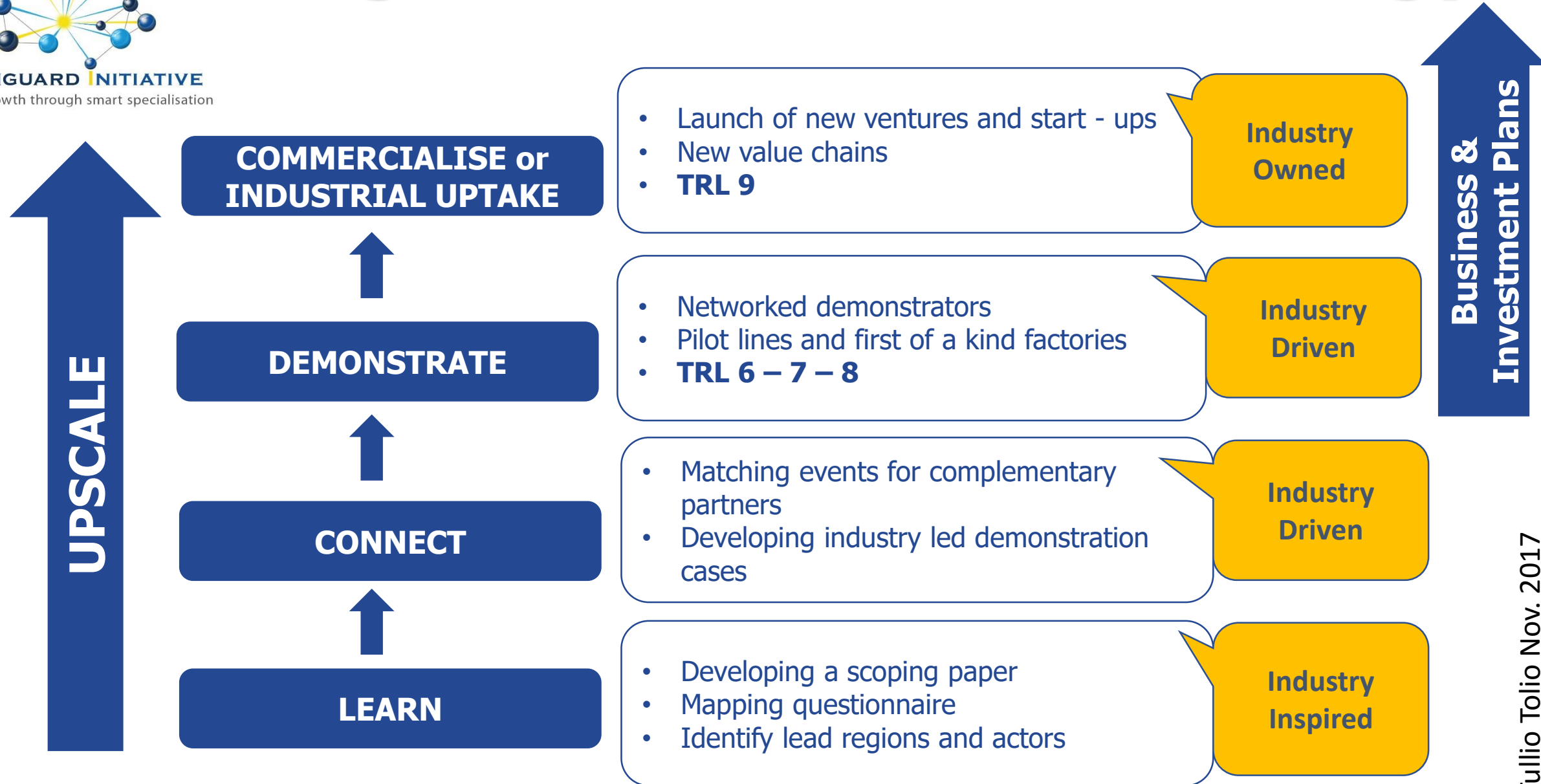






**VANGUARD INITIATIVE**  
New growth through smart specialisation

# Vanguard Initiative methodology



# What is a Vanguard Pilot Initiative?

**Coordinated Initiative (strategic project)**

**Formally supported by multiple Regional Governments**

**Focused on a strategic challenge for industry**

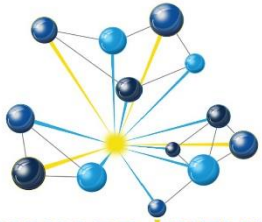
**Aimed at generating and supporting inter-regional projects for the establishment of pilot plants supporting manufacturing innovation**

# Pilot Projects and Demo cases: test bed for systemic change

## Criteria for demo cases

- **Demonstration projects**, no research (>TRL 5 - post prototyping)
- **Industrial Commitment** (to lead/participate/co-invest)
- **European dimension** - added value compared to what exists at regional level
- Added-value of **joint demonstration**





**VANGUARD INITIATIVE**  
New growth through smart specialisation

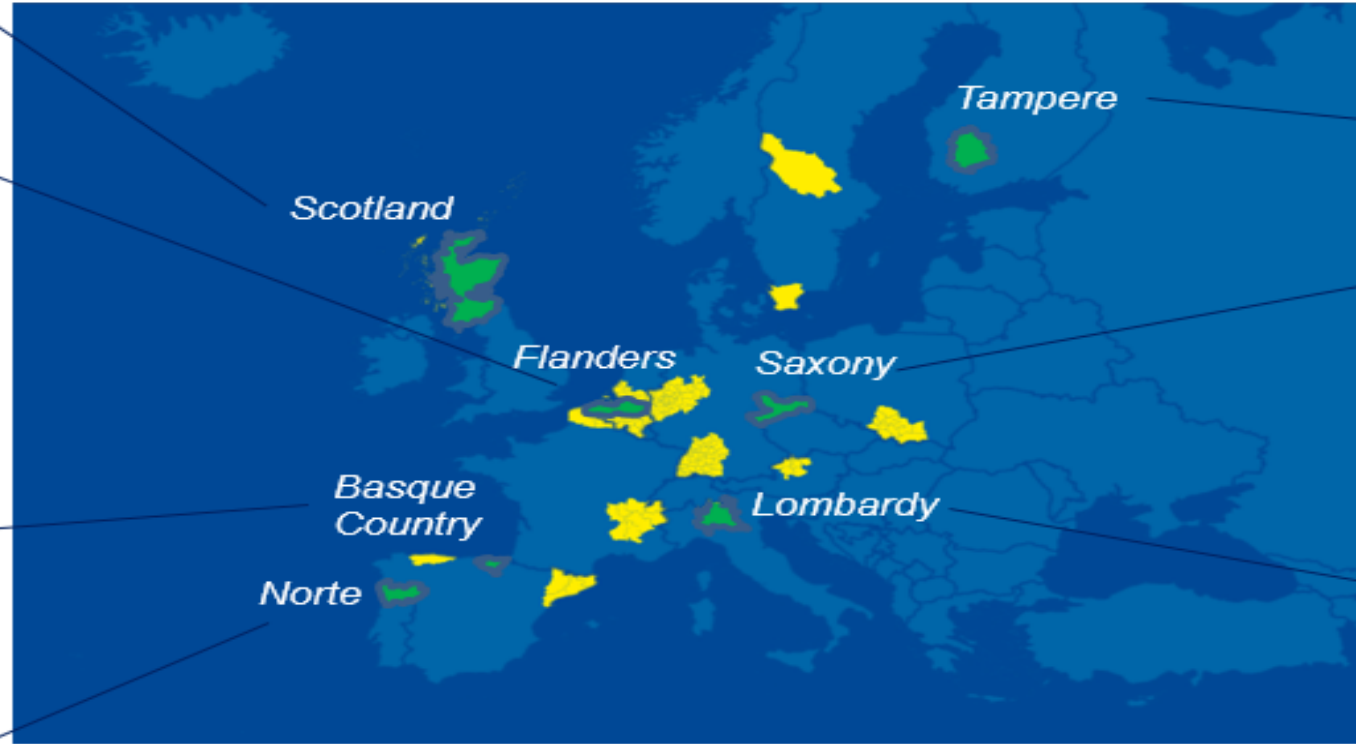
# Example of demo case: De- Re manufacturing

**Mechanical remanufacturing and in-use product monitoring** in the automotive industry

**Pre-treatment technologies for remanufacturing of photovoltaic panels and end-treatment techniques for thermoplastics** (i.e. sorting, compounding, regranulation)

**Re-use of composites by thermal processes** from aeronautic sector and wind energy system.  
**Recovery and re-use of metal scrap by plasma process**

**Robotics handling systems** supporting disassembly and reassembly operations in the automotive industry



**Laser-based remanufacturing** of the mechanical parts in large machinery

**Re-production of steel sheets by Hydroforming and CNC-bulk metal forming**

**Sustainable demanufacturing processes**: including **human-robot cooperation for disassembly, electronics remanufacturing, key-metals and composite recovery and re-use by mechanical processes**, for the automotive and electronics industry

## Industrial Participants and investors.

More than 60 European companies, with a cumulative **turnover of 32 B€** and with some **175,000 employees**, and 69 universities and RTOs distributed among the involved regions are involved.

TECforce	Filartex Spa	Gamesa
Candy	Gafitex	Xnext
RoldElectronics	Pass Maglia	Lot Quantum Design
TP Vision	Samatex	MH Systems
Barco	PTMT PANTER	Holonix
Worldilne	Rivierasca	Idealtech
Turner Aviation	Brianza Plastica S.p.A.	Cosberg
Cargotec Finland Oy	Sintostamp S.r.l.	Giasini
Sandvik Mining and Construction Oy	Magniplast S.p.A.	AERNNOVA
Metso Minerals Oy	OCV Owenscorning	ITP
Valmet Power Oy	Covestro	Galloo
John Deere Forestry Oy	Campine	Van Gansewinkel
Bronto Skylift Oy Ab	Galloo Plastics	TKM TTT Finland Oy
Avant Tecno Oy	Kokkola LCC Oy	IRIZAR
Magneti Marelli	A2A Ambiente	Meleghy Automotive
Cannon	Relight	GKN
Mercedes	Fincoat OY	Enginsoft
Tenova	Telatek Oy	MCT Reman
Maier	Marzotto	Cobat
Indeva	Batz	ASPIRE Eng.
DMG Mori	Ki-lab	
	Weir Group	



The stakeholders have signed **Letters of Intent** to participate to the definition of this Pilot Network and, in the case of future end-users, to access the pilot network and to carry on industrial take-up, in case of positive evaluation of the developed solution.

# FiberEUse Horizon2020 project



***Large scale demonstration of new circular economy value-chains based on the reuse of end-of-life fiber reinforced composites.***

Topic: Systemic, eco-innovative approaches for the circular economy: large-scale demonstration projects (CIRC-1-2016)

The FiberEUse project aims at integrating in a holistic approach different innovation actions aimed at enhancing the profitability of *composite recycling and reuse in value-added products*.

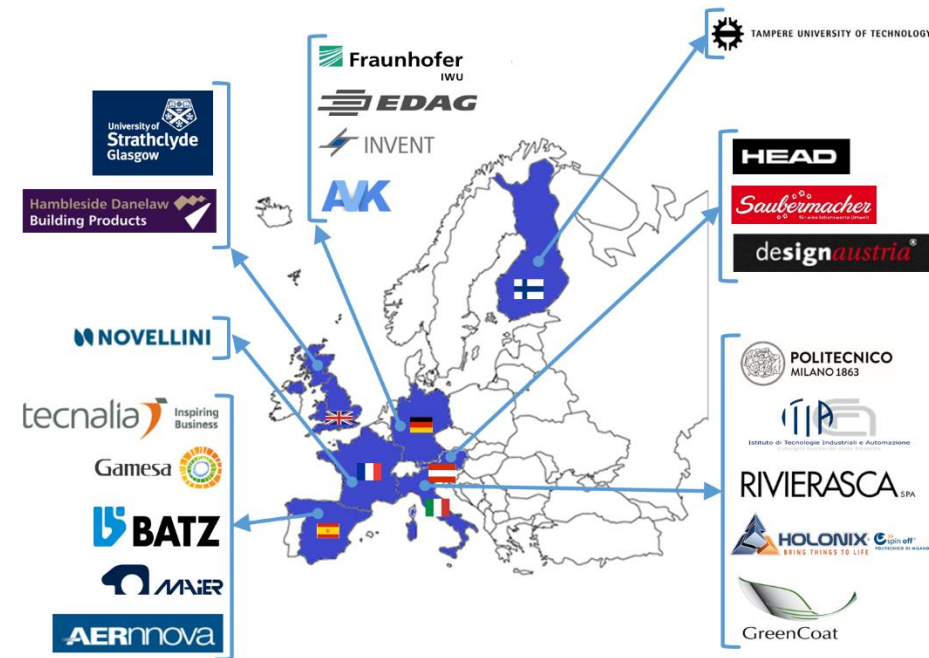


**Duration:** 48 months, starting on June 2017.

**Consortium:** 21 partners, from 7 EU countries.

**Coordinator partner:** Politecnico di Milano

**EC Funding:** ca. 10 mln €.

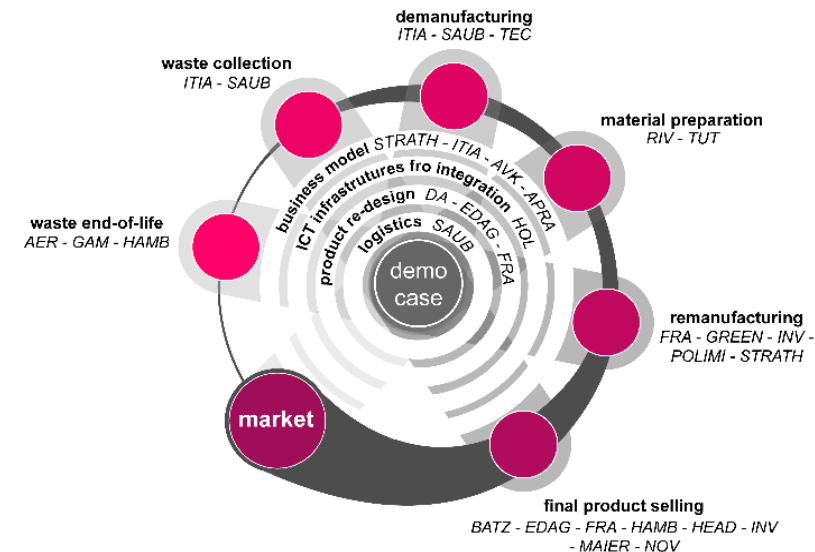
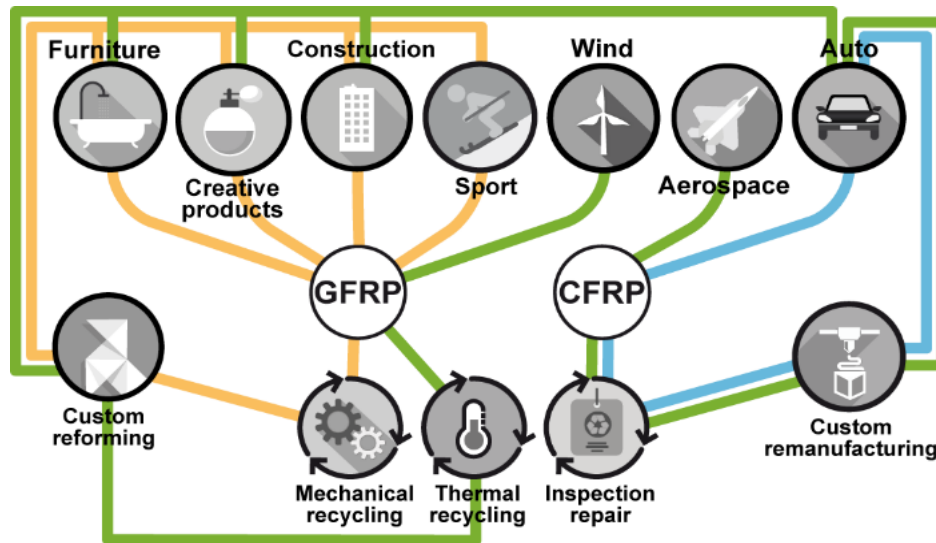


# FiberEUse cross-sectorial use-cases



The FiberEUse proposal aims to develop and demonstrate at a large scale:

- The integration of *innovative remanufacturing technologies* addressed to develop profitable reuse options for mechanically or thermally recycled EoL GFRP and CFRP composites.
- The development of *an innovation strategy for mobilization and networking of stakeholders* from all the sectors related to composites.





# Collaboration ITIA and IWU in Serbia





# Partners

<b>Participant No</b>	<b>Participant organisation name</b>	<b>Country</b>
1 (Coordinator)	University of Belgrade (UB)	Republic of Serbia
2	Scuola Superiore Sant'Anna (SSSA)	Italy
3	Consiglio Nazionale delle Ricerche, Istituto di Tecnologie Industriali e Automazione (CNR-ITIA)	Italy
4	Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V. (FhG-IWU)	Germany

# Objective

SI4.net federates Italy and Germany to leverage the Serbian 2020 industry policy, which already recognizes the FoF and National Technology Platforms as strategic pillars accelerating industrial development, while the Government proceeds in developing the national Industry 4.0 strategy (SMART I4.RS).

The SI4.net general objective is to **strengthen the scientific and technological bases of the Republic of Serbia** by fostering the full participation of Serbia in the European Research Area (“ERA”), with free circulation of researchers, scientific knowledge and technology. Serbia is in the process of the negotiations on the accession to the EU and needs a **boost to advance towards a knowledge society** and to become a **more competitive and sustainable economy** in respect of its **industry**. To pursue this objective, the SI4.net consortium will create the pathway for **Serbia to fully enter European collaborations in the field of Industry 4.0 research, technological development, demonstration and innovation**. Towards this ambition, the Serbian Initiative towards Industry 4.0 **networking** will promote international cooperation, disseminate and optimise results and stimulate training and mobility in a field that is strategic for the **prosperity of Europe as a whole**.

# Project Structure



WP 1: Management

WP 2: Community Building

WP 3: Roadmapping

WP 4: Conferences

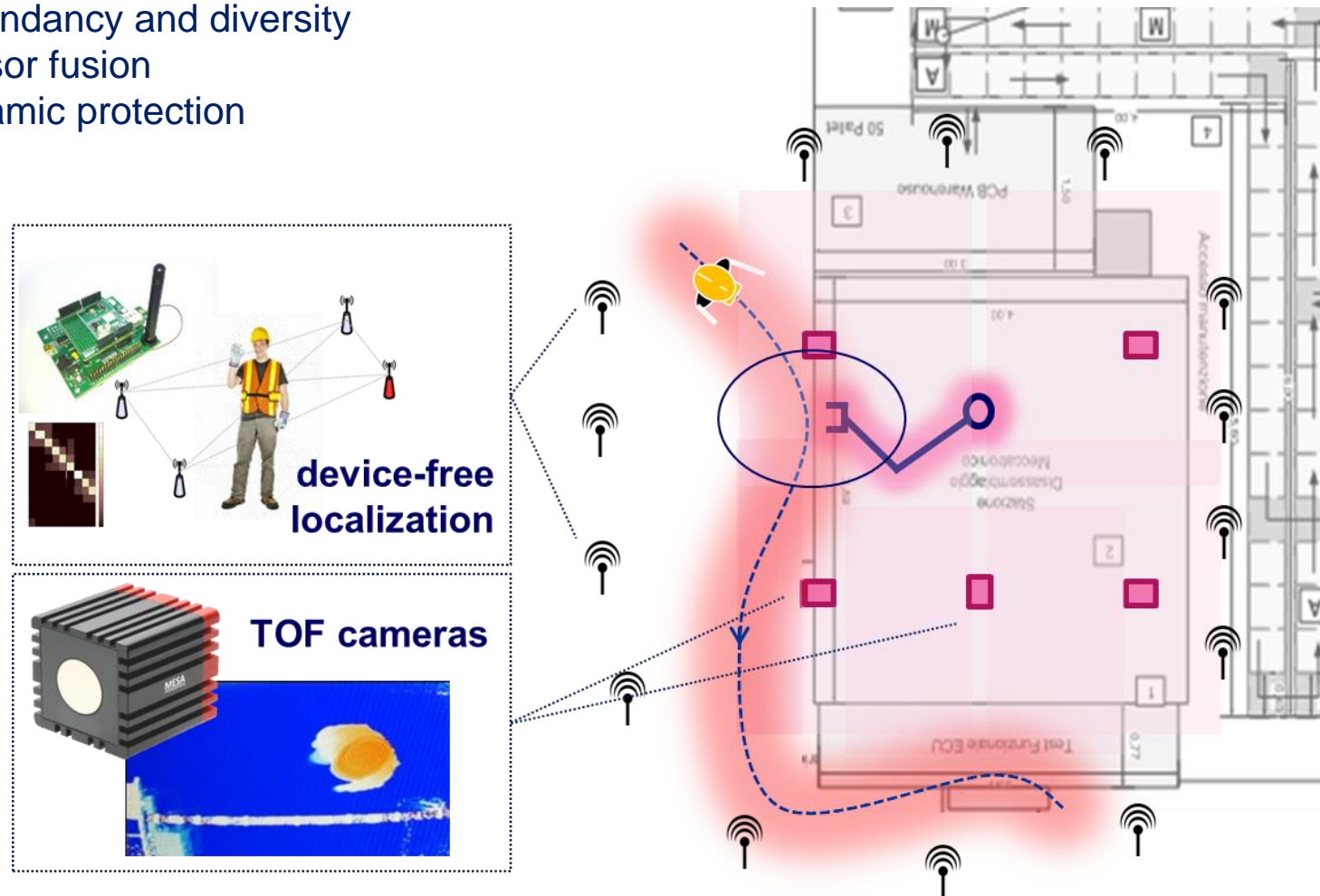
WP5: Summer Schools

WP6: Communication & Dissemination

# **Collaborations under development between ITIA and IWU**

- **Human robot collaboration**

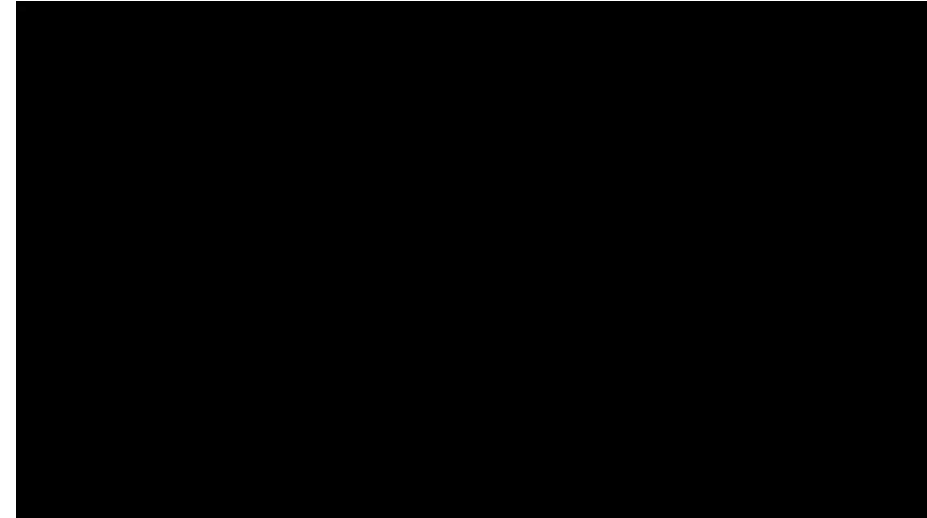
- ❑ redundancy and diversity
- ❑ sensor fusion
- ❑ dynamic protection



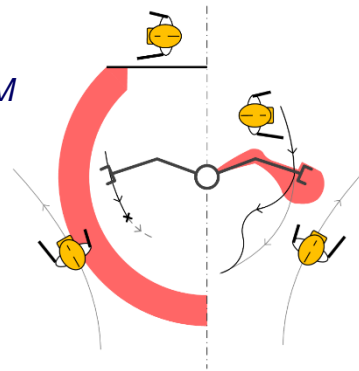
- Kianoush, S., Savazzi, S., **Vicentini, F.**, Rampa, V., & Giussani, M. (2017). Device-free RF human body fall detection and localization in industrial workplaces. *IEEE Internet of Things Journal*, 4(2), 351-362.
- Savazzi, S., Rampa, V., Vicentini, F., & Giussani, M. (2016). Device-free human sensing and localization in collaborative human–robot workspaces: A case study. *IEEE Sensors Journal*, 16(5), 1253-1264

- dynamic safeguarded areas
- user-centered safety
- flexibility and robustness

- reduction of power and force
- user-centered safety
- flexibility and robustness

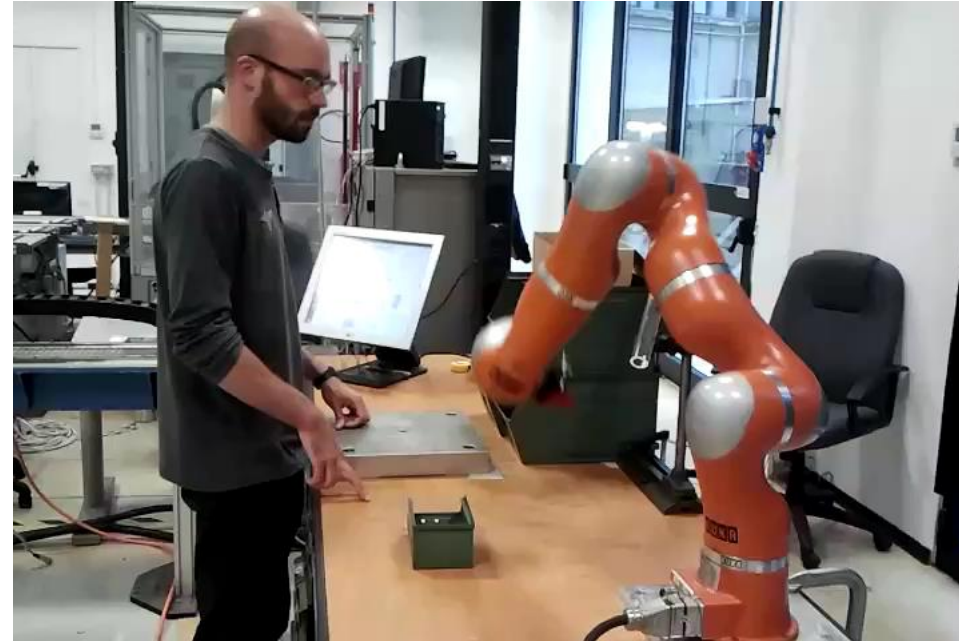


\*\* ISO TS 15066  
Speed and Separation Monitoring – SSM



\*\* ISO TS 15066  
Power and force limitation – PFL





Experiment 1

**Experiment 1**

General Info

Name: The user 1 - 3 different

Perceived Robot Velocity

Perceived Robot Proximity

Perception of safety

Experiment 2

**Experiment 2**

General Info

Name: Test trial nb 1 \ Out of 27

Perceived Robot Velocity

Perceived Robot Proximity

Perception of safety

Experiment 3

**Experiment 3**

General Info

Name: Test trial nb 1 \ Out of 27

Perceived Robot Velocity

Perceived Robot Proximity

Perception of safety

1 - Negligible risk

2 - Low risk

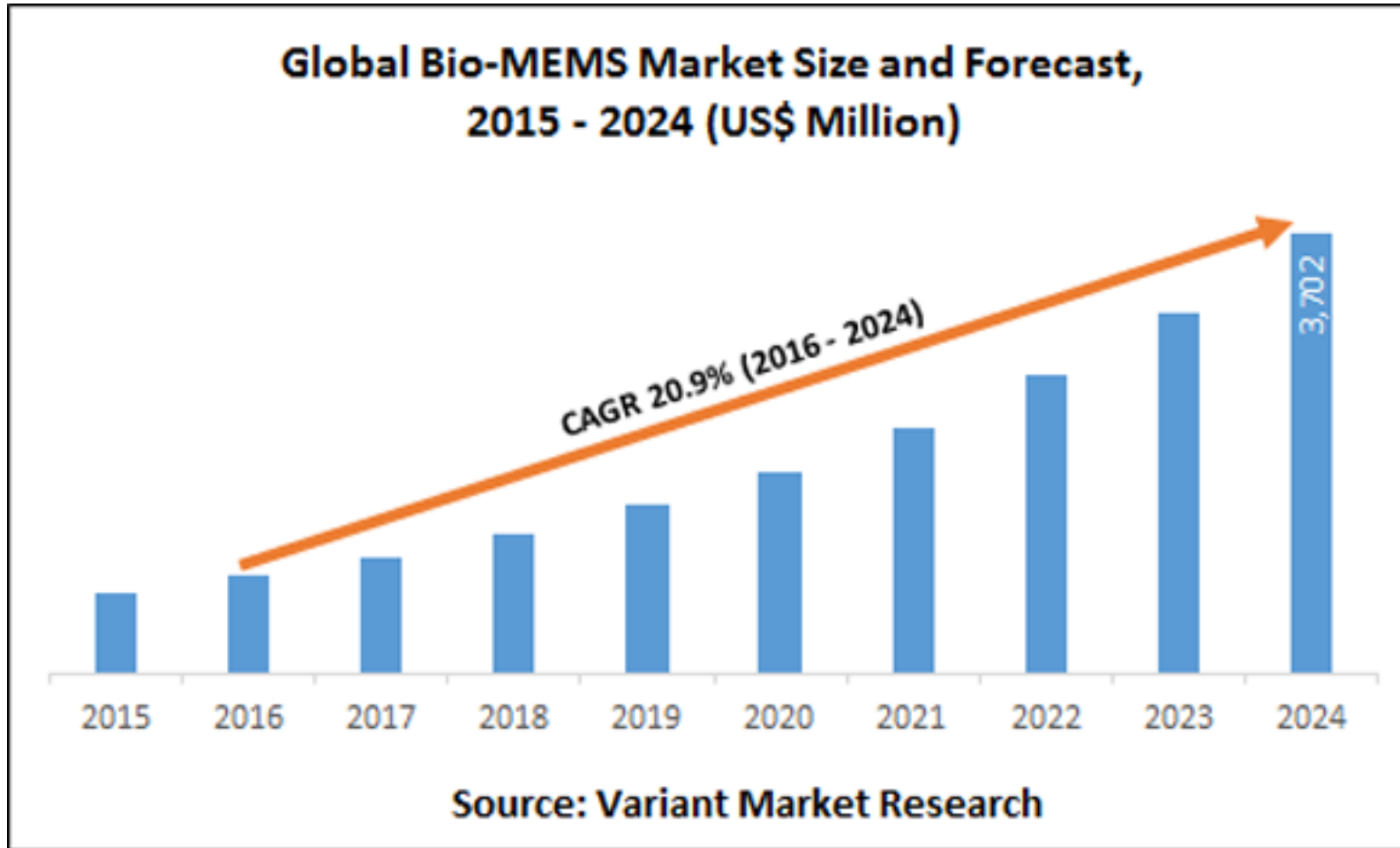
3 - Medium risk

4 - High risk

Save

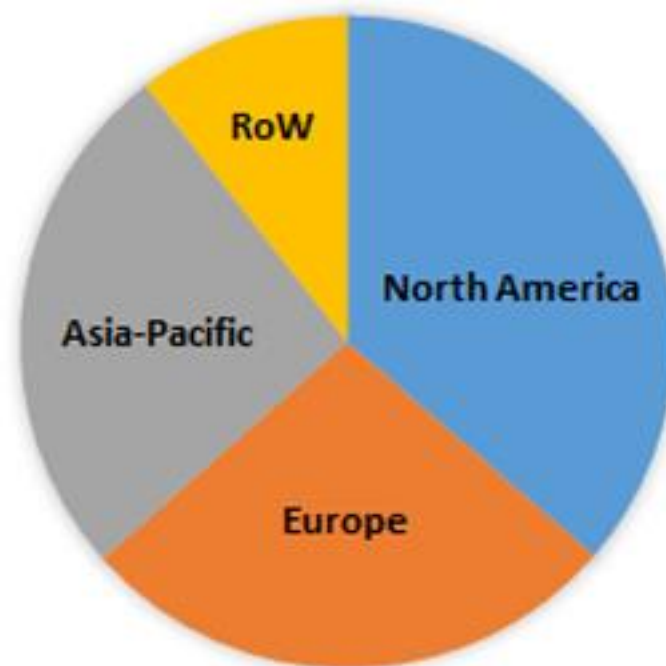
***Collaborations under  
development between ITIA and  
IWU***

***Micro manufacturing of  
biobased devices***



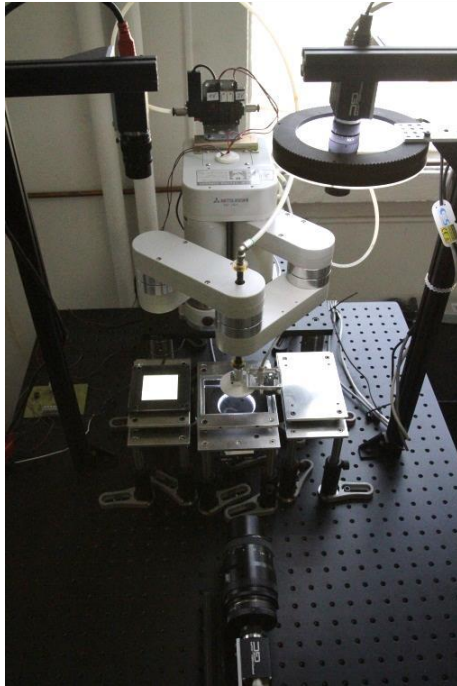
Global Bio-MEMS Market is estimated to reach \$3,702 million by 2024. A range of healthcare sectors such as pharmaceutical, medical devices, medical home care and in-vitro diagnostics pose a huge demand for Bio-MEMS.

**GLOBAL BIO-MEMS MARKET SHARE BY REGION, 2024 (VALUE %)**

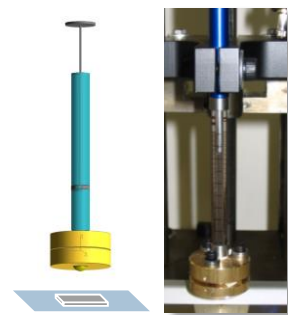


**Source: Variant Market Research**





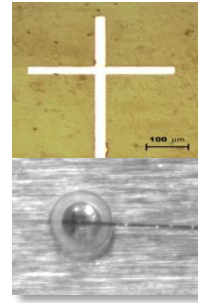
ITIA work-cell



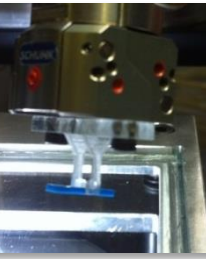
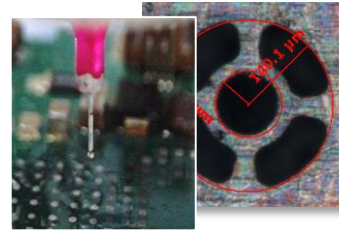
Variable geometry micro gripper (capillary)



Electrostatic micro gripper

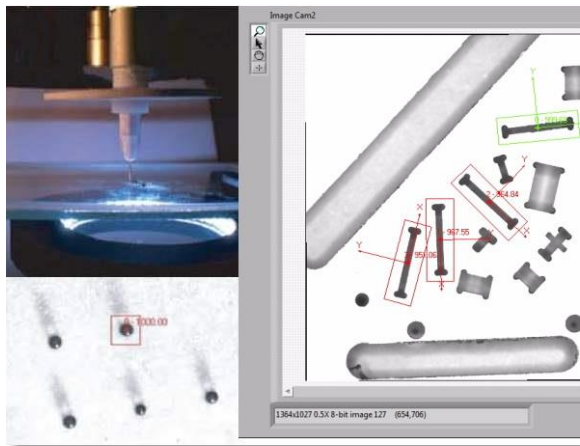


Vacuum micro grippers

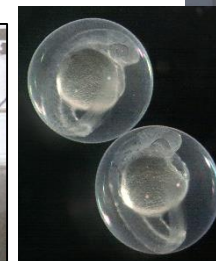
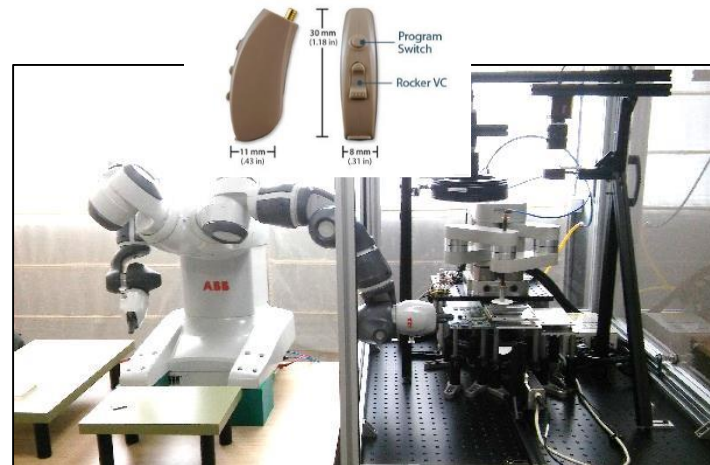


Mechanical tweezers

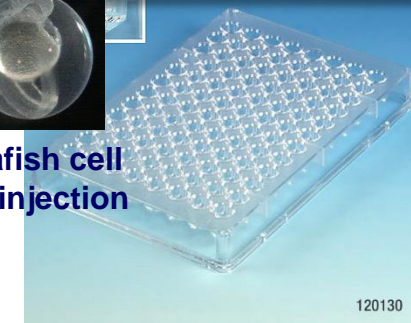
**Robotized micro-manipulation of bio materials (cells) and micro-assembly of biomed devices**



Vacuum microgripper and vision system processing

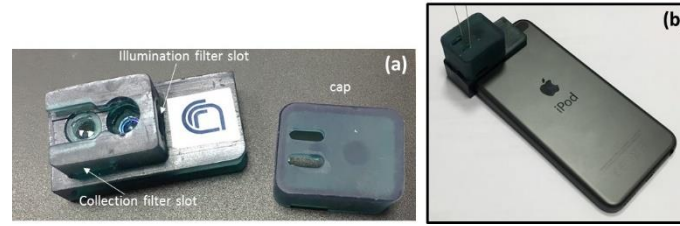


Zebrafish cell microinjection

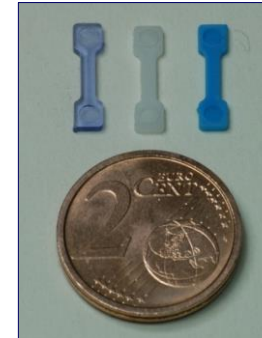




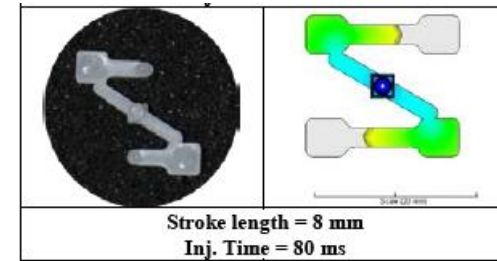
**Materials:** POM, HDPE, PMMA, PPS, PC, PP, PP  
**Fillers:** talc, nanoclay, glass beads/fibers, MWCNT



**Portable Plastic LOC for flow-cytometry**



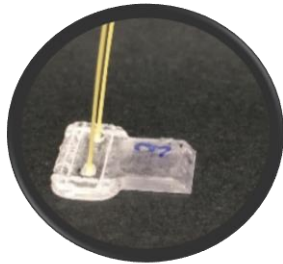
**Simulation**



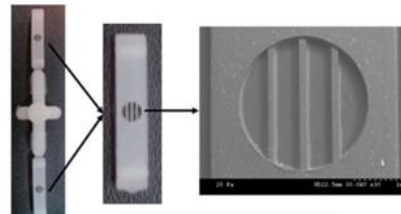
**Monitoring**

*Materials, process study and optimization for high-performance micro-manufactured biotech products*

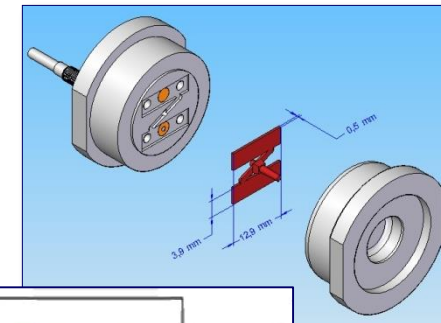
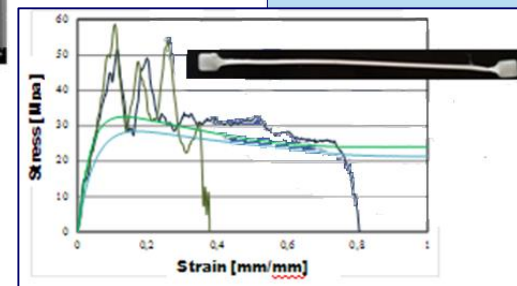
**Micro channel (fluidic application)**



**Micro rib (filter application)**



**Testing**



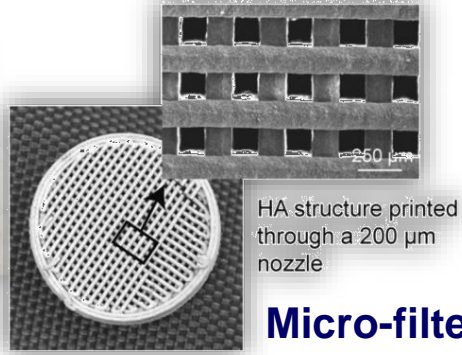
**Mould with insert**







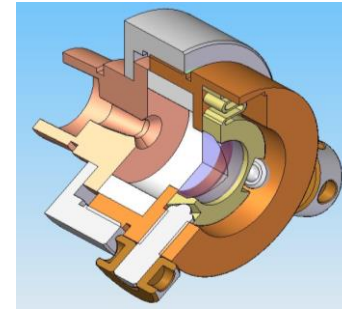
Mini-fixation devices:  
 $\text{Si}_3\text{N}_4\text{-TiN}$ ,  $\text{ZrO}_2$



HA structure printed through a 200 μm nozzle

Micro-filter

Optic Collimator



(Internet)

Trust Insert  
Air Bearing



UF Middle Ear  
Prosthesis  
(Ti)



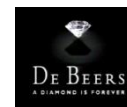
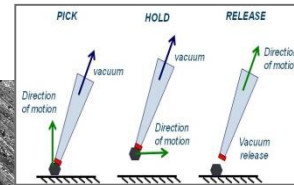
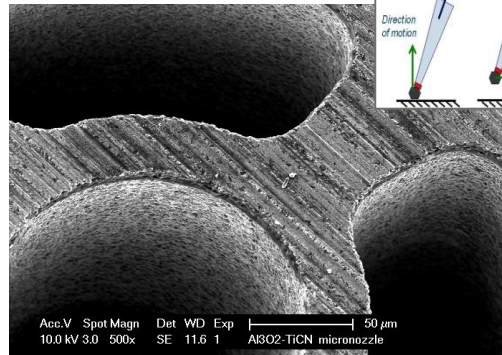
*Hard to machine materials and freeform micro-features for biomedical micro-devices*



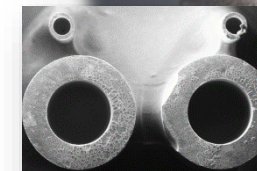
Jaws of  
aneurysm  
clip



Micro-nozzle



Extrusion  
Head for  
catheter  
mfg



ENKI engineering & manufacturing  
microcatheters | microballoons | microtubes | micromoulding





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