



31 GIORNATE CARDIOLOGICHE TORINESI

TURIN
October
24th-26th
2019

The role of Start-up enterprises

Alberto Audenino

Politecnico di Torino



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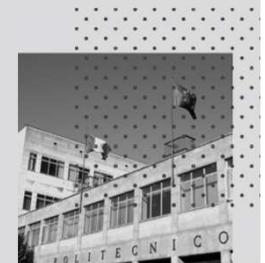
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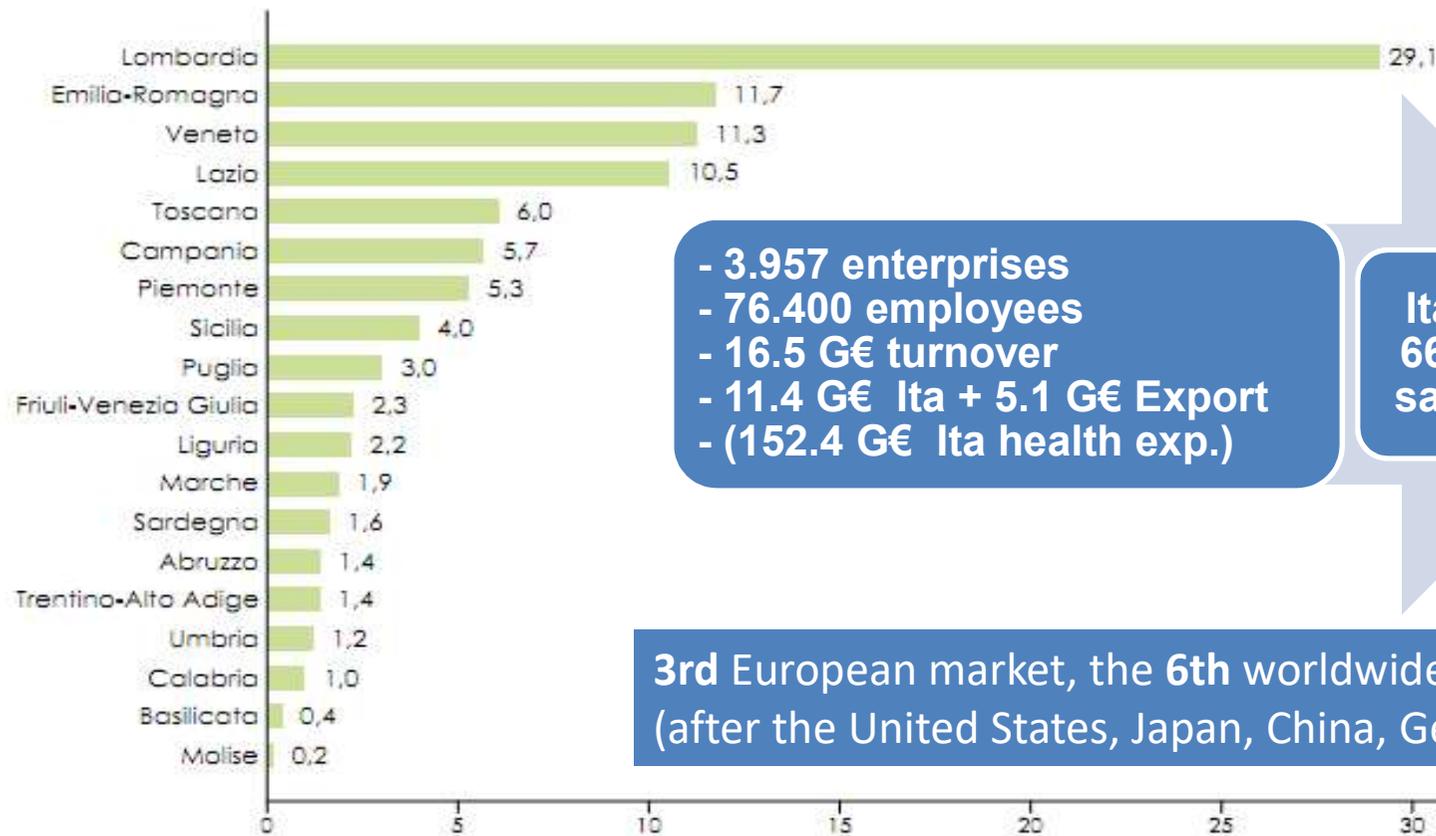




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THE MEDICAL DEVICES SECTOR IN ITALY



- 3.957 enterprises
- 76.400 employees
- 16.5 G€ turnover
- 11.4 G€ Ita + 5.1 G€ Export
- (152.4 G€ Ita health exp.)

Italy
66 %
sales

Public
Health

3rd European market, the 6th worldwide
(after the United States, Japan, China, Germany, France)

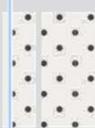


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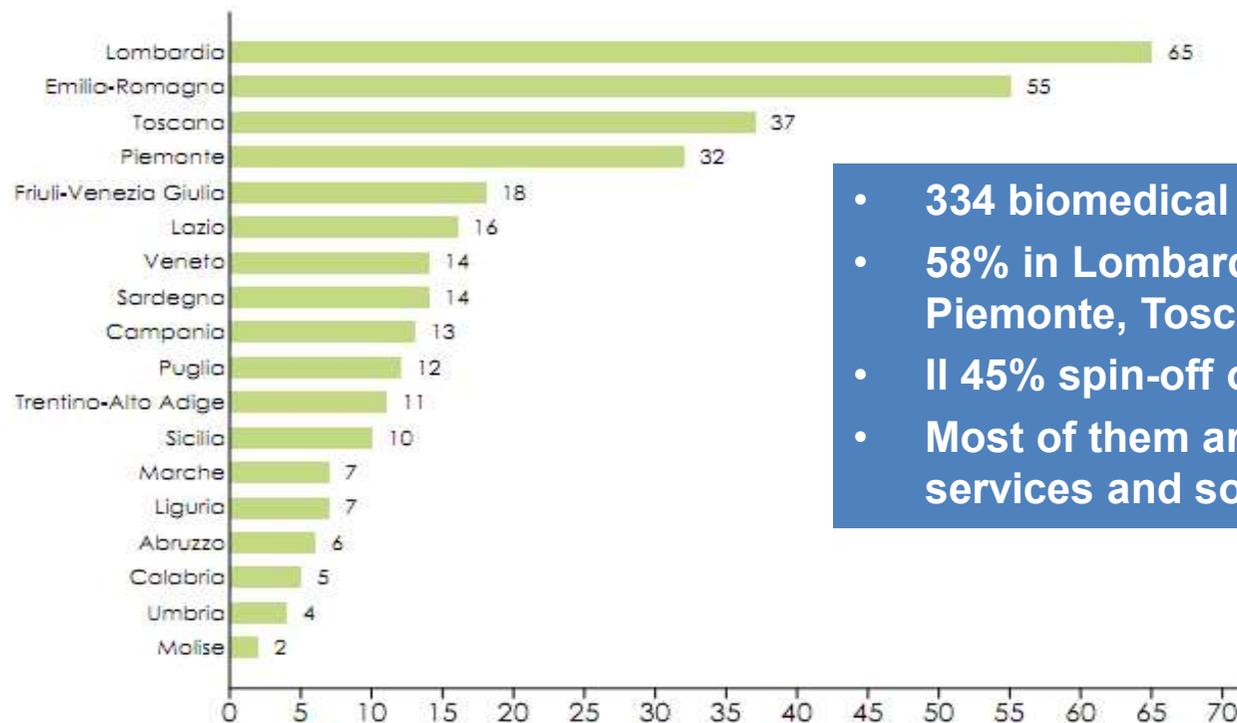


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THE MEDICAL DEVICES START-UPS IN ITALY

GRAFICO 2 - START-UP: DISTRIBUZIONE GEOGRAFICA



Fonte: elaborazioni CSA su database start-up

- 334 biomedical start-up
- 58% in Lombardia, Emilia-Romagna, Piemonte, Toscana.
- Il 45% spin-off of public research
- Most of them are active in the services and software sector



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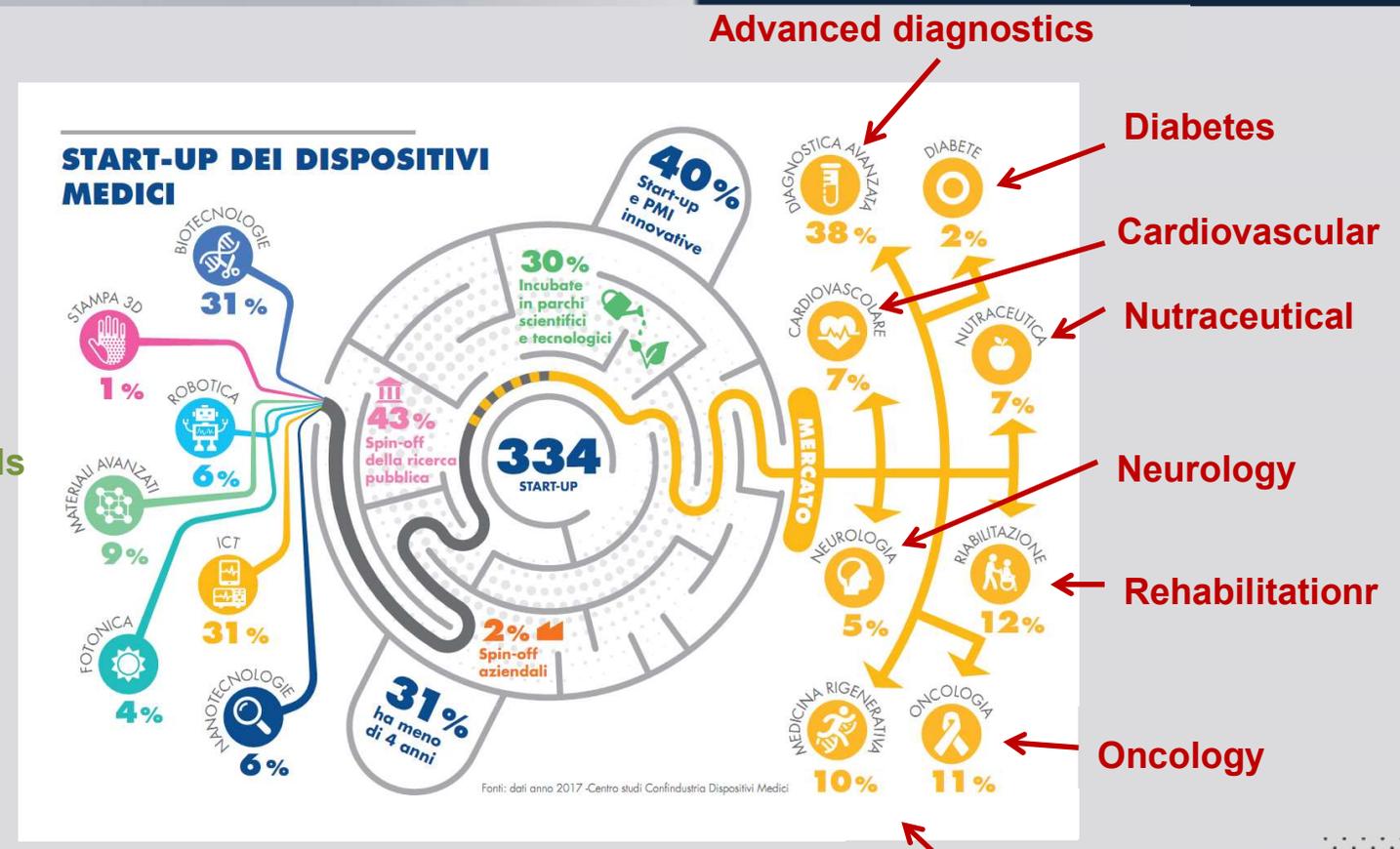


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THE MEDICAL DEVICES START-UPS IN ITALY

- Biotechnology
- 3D Printign
- Robotics
- Advanced materials
- ICT
- Fotonics
- Nanotechnology



Advanced diagnostics

Diabetes

Cardiovascular

Nutraceutical

Neurology

Rehabilitation

Oncology

Regenerative
medicine



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- Skills and technologies in our health system certainly place it among the most advanced in the world.
- It is mandatory to: 1) seize the opportunities present in the framework of European innovation funding; 2) offer services to companies in terms of R & D, technology transfer, clinical investigations.
- The winning idea of scientific and technological center where industry and university research laboratories can interact already during the programming phase of the respective activities and then collaborate in the phase of R & D and technology transfer.
- Structural actions are mostly possible at net cost equal to zero



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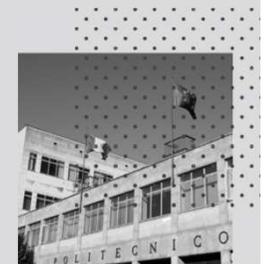
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STARTUP

Più spin-off universitari, ma il mercato resta lontano

—di Giampaolo Colletti | 16 gennaio 2018

Il Sole **24 ORE**

- Today 2000, average turnover di 260k, 5% exceeding 1M euros
- Nord 46%, Central 20% South 34%
- Health and life sciences greater number of connections with research
- **58% only prototypes and only 3.1% on the market!**

La lunga vita delle start-up targate Poli: tre su
quattro sopravvivono dopo il lancio

LA STAMPA

L'incubatore I3P riceve 600 proposte l'anno, ma solo le 70 più solide e innovative passano la dura selezione



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HIGH-TECH SERVICES FOR ENTERPRISES
The new public research infrastructures



Addressing Societal challenge
Health & Wellbeing



Technological skills

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Medical skills
Clinical needs

PArco per le Teccnologie Innovative per la Salute
(Innovative Health Technologies Park)

Scientific Excellence - Technology Transfer to Territory

Advanced certification services for PMI - Increase in Piemonte competitiveness



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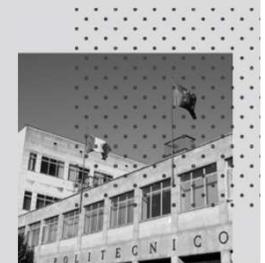
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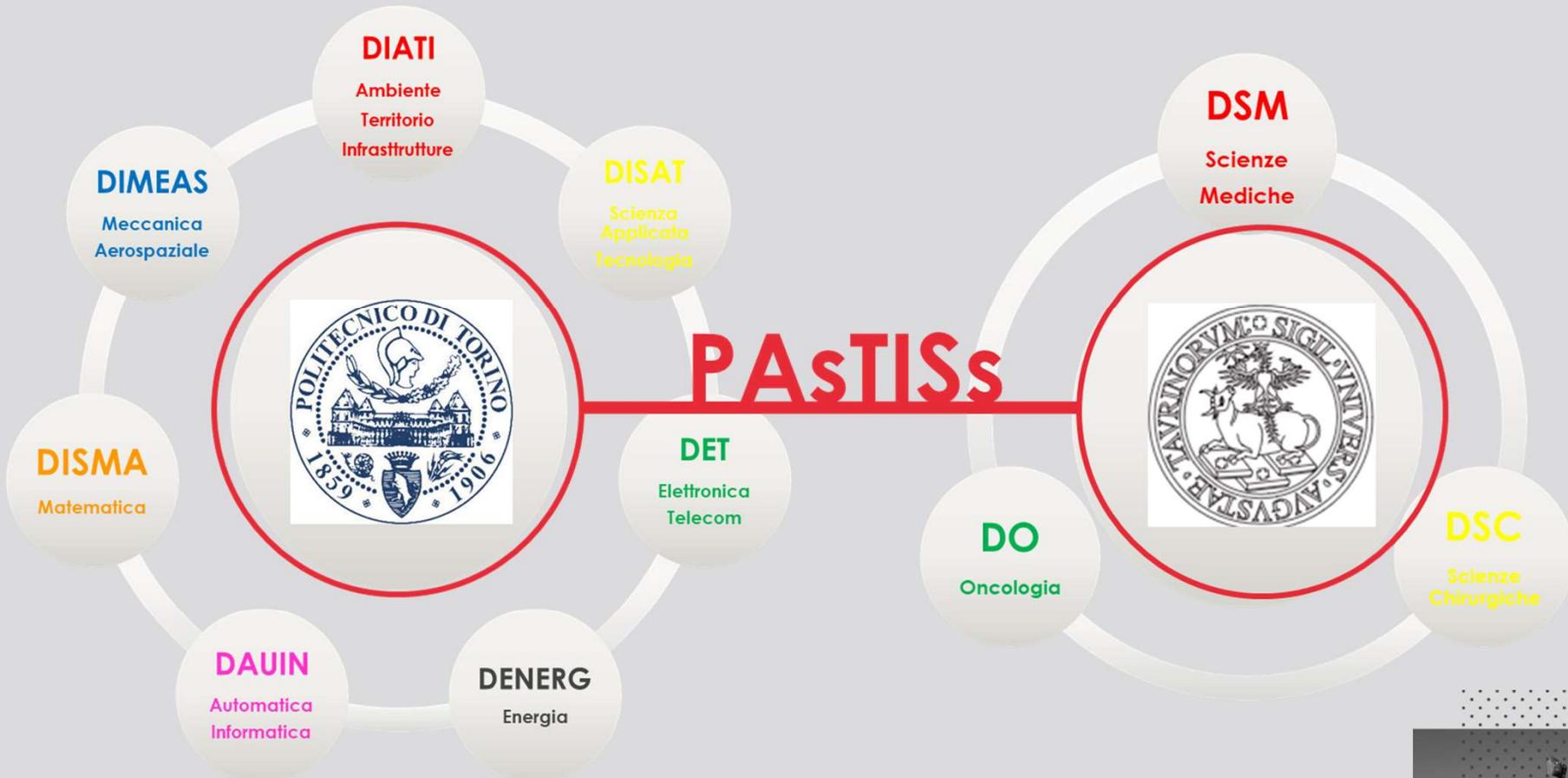




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STAFF



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Topics

New Materials & Nanotechnologies

- **Tissue & Regenerative Eng.**
Cell culture: biocompatible architectures reconfigurable by external stimuli application (e.g. pH, temperature, UV-Vis light).
- **Organic/inorganic interactions at the nanoscale**
New technologies for NPs kinetic monitoring, multifunctional theranostic NPs and robust lab-on-chip point of care systems
- **Advanced Optical Imaging**
Holographic imaging systems of thick biological samples such as tumor organoids

ICT & AI for Health

- **Human Machine Interface**
Adaptive sport; Rehabilitative devices; Tele-rehabilitation/monitoring
- **Oncology**
Diagnostic devices; Bioimage processing and interpretation; Implantable chips and organs on chip
- **Ageing and Fragility**
Motor weakness, osteoporosis; Psychological fragility; Voice disorders Occupational voice use; Cerebrovascular fragility

Biomechanics & Biorobotics

- **Cardiovascular Engineering**
Cardiovascular image/signal processing; Integration of imaging and in silico hemodynamics; Blood recirculating devices; Emulators for surgical training
- **Prostheses, Implants, Systems for Fracture Synthesis and CAS**
Arthroprostheses; Dental implants; Design in silico and experimental validation; Soft and hard biological tissues mechanics
- **Biorobotics**
Minimally invasive surgery (MIS) and laparoscopic surgery and devices; Rehabilitation Orthoses



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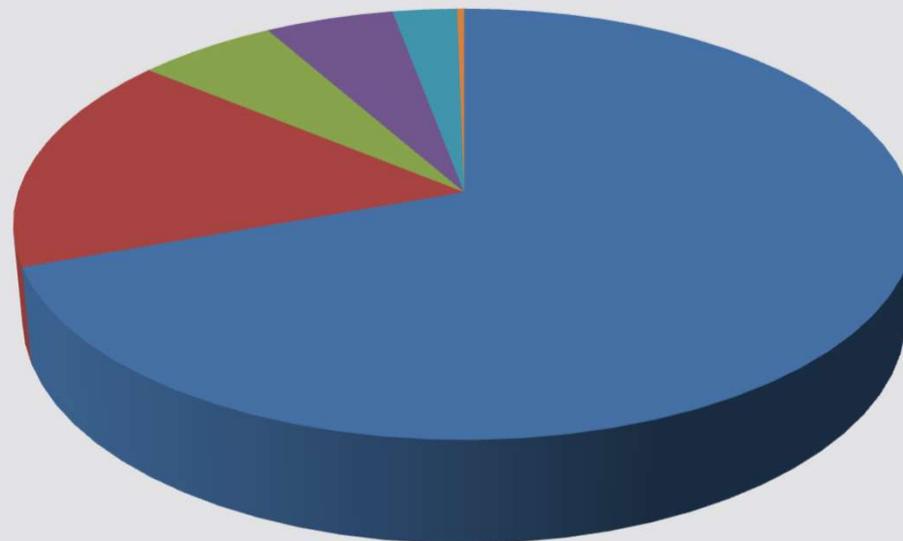




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Budget 5 M€ – 3 years



- Equipments
- PhD Student
- Researchers
- Consumables
- Services
- Travels



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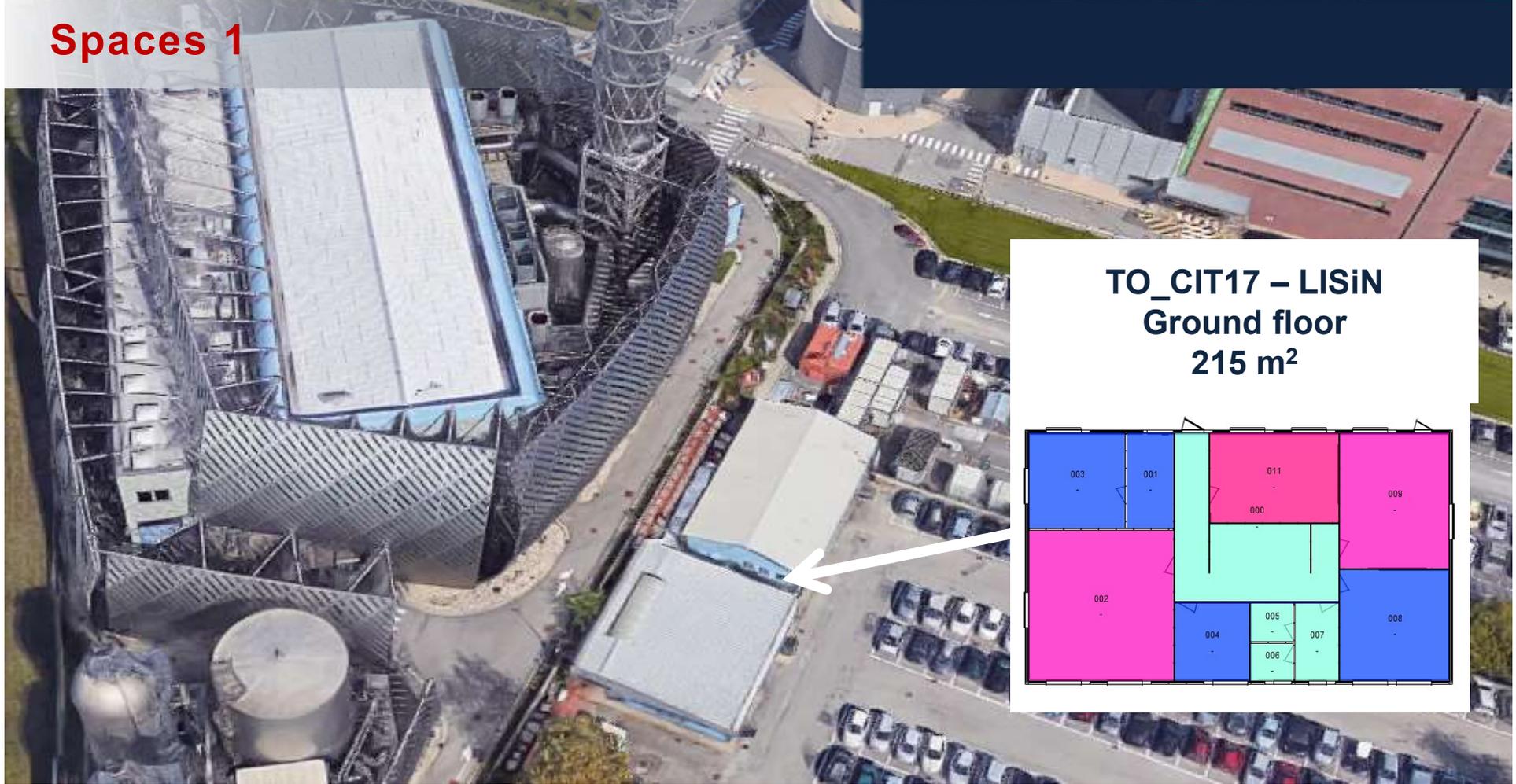




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Spaces 1



TO_CIT17 – LISiN
Ground floor
215 m²



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TO_CIT07 – GRAPHENE LAB
Ground floor
250 m²

Spaces 2



TO_CIT07 - NUOVI SPAZI
First floor
220 m²

PIANTA PRIMO PIANO



PIANTA - PIANO TERRENO

685 m²

TOTAL



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Main services

- Multiscale mechanical and thermal characterization and computational modeling of biological materials and medical devices
- In vitro and in silico evaluation of thermo-fluid dynamics in cardiovascular devices
- Chemical and biochemical synthesis of biocompatible materials
- 3D printing of scaffolds, lab on chips and organ on chips for biological applications
- Motion system for rehabilitation, sport, ergonomics; ultrasound non-invasive electromyographic evaluation
- Tissue characterization, Doppler fluximetric evaluation of micro and macrovascularization, properties associated with thermal diffusion and acquisition and processing services of biological signals and images
- Drug design and computational drug screening
- Services for advanced certification of medical devices; regulatory affairs



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Equipment 1

- Open ultrasound system for quantitative elastography (Verasonics Ultrasound System)
- 3D printer at the nanoscale
- Confocal microscopy and spinning disk for live cell imaging
- Robotic system for multi-scale scanning of cellular images
- Multiaxial test machines (plana biaxial, axial & torsional)
- Cardiovascular device testing
- Quartz Crystal Microbalance - QCM
- Vicon 3-D motion tracking system and accessories
- Nanoindenters for hard & soft tissues characterisation
- Computational facilities
- Emulators for surgical and interventional training
- Integrated test bench for innovative sensors and electronics
- N-Lab Station for live imaging and analysis at the nanoscale



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Equipment 2

- Imaging GLIM
- Facility for the management of cryogenic fluids for biomedical applications
- Optical sensing interrogator for high-definition fiber optic sensors
- Stereoscopic PIV systems for experimental fluid dynamics
- Profilometer microscopy
- Multichannel biopotential acquisition systems with sensors (ECH, EMG, EEG)
- VICON 3-D motion tracking room for sport and rehabilitation
- Dynamic measurements of 3D coordinates, displacements and surface strain.
- Thermal infrared camera for soft tissues characterization
- Hocoma system for the upper limb rehabilitation
- Applanation Tonometry System



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Equipment 3

- Electrospinning for polymeric solution
- Dynamic light scattering (DLS) for nanoparticles analysis
- Eye tracking systems
- Laser Doppler Vibrometry for non-contact monitoring of vital signs
- Spectrophotometric analysis for nucleic acid quantitation
- Near-infrared spectroscopy device for brain and tissue monitoring
- Polymerase Chain Reaction (PCR) system
- Western blot
- Spin coater



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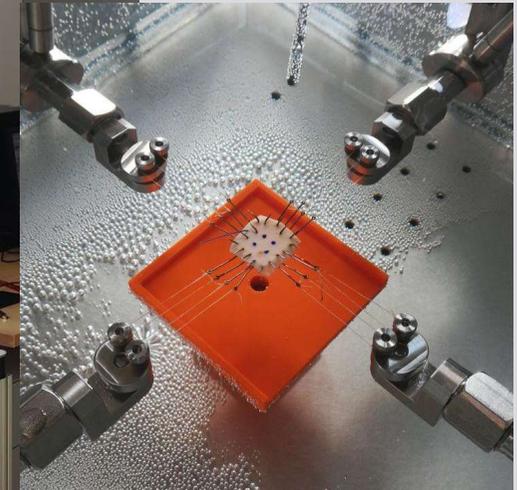
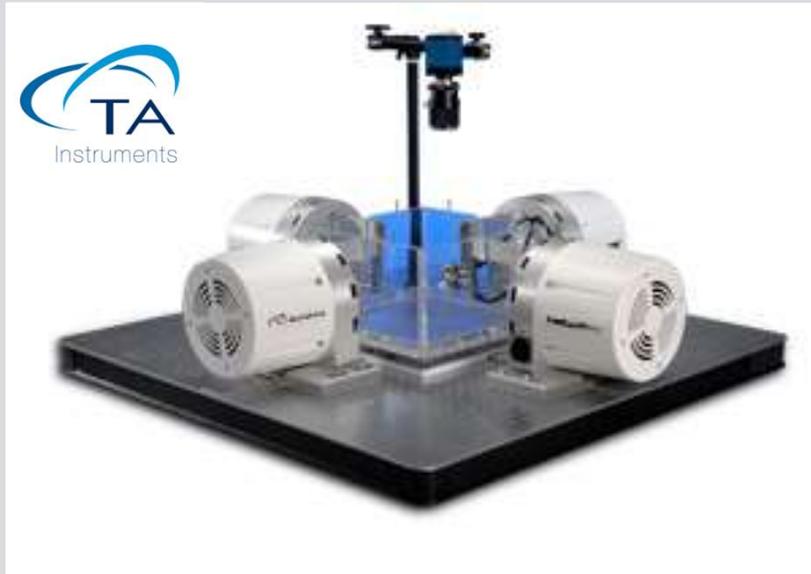


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TA Instruments Planar Test Bench

- 225 N, e 25 mm
- Up to 100 Hz;
- Saline bath for testing at 37°C



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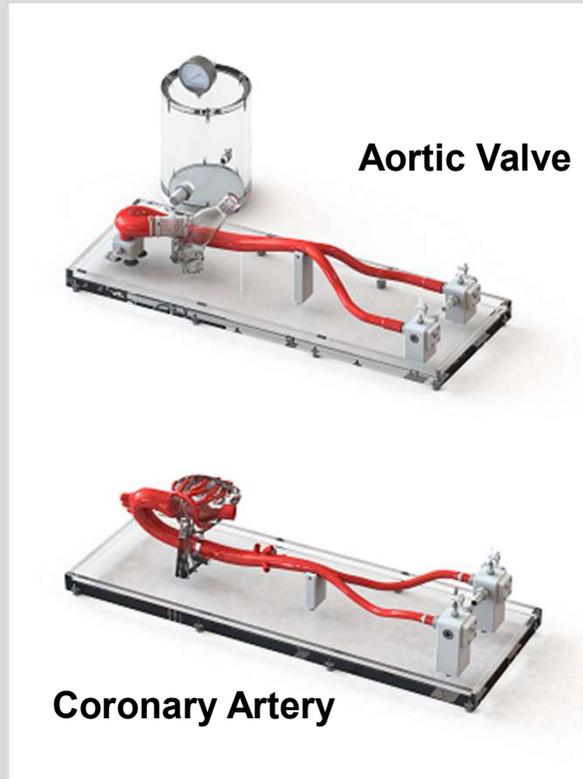




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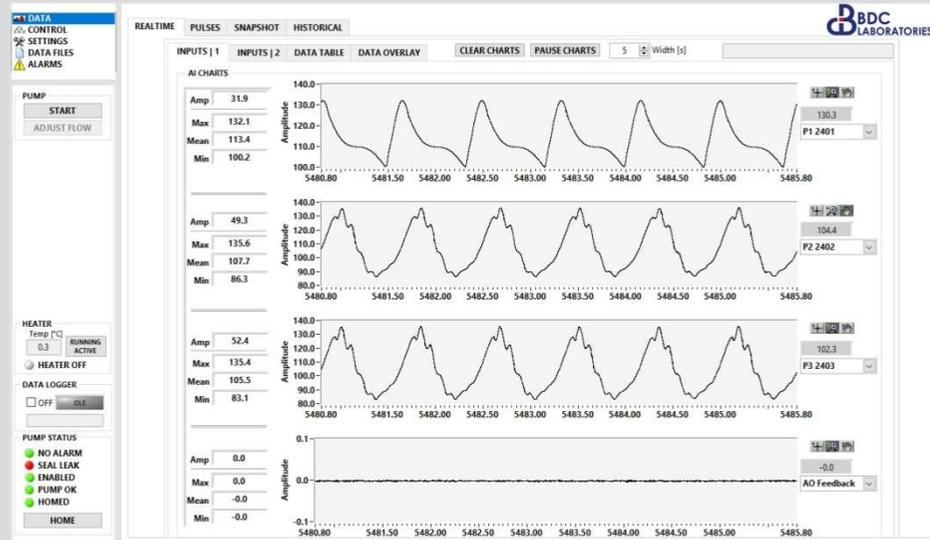
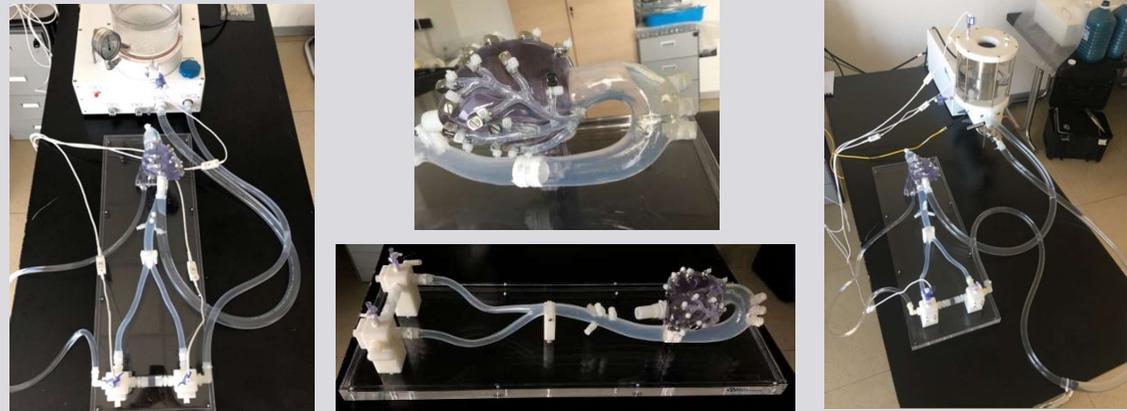
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Simulated Use Test Systems (BDC Laboratories)



Aortic Valve

Coronary Artery



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SUSTAINABILITY



The technological innovation in healthcare is part of the solution, not part of the problem.

The fear that it can push public spending out of control is not only lacking in real foundations, but above all it prevents us from fully grasping the opportunities that Italy would expect from the enhancement of its National Health Service.



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