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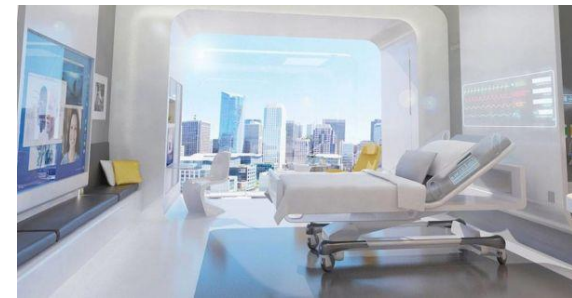
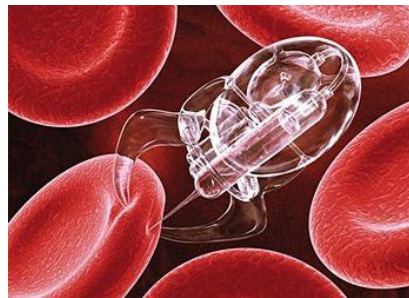
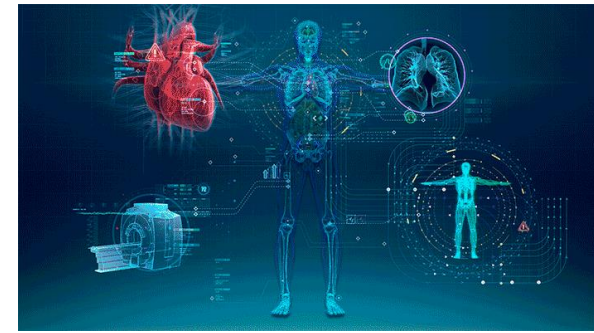
# Clinical Engineering in outsourcing services

**Diego Bravar**

Chairman and CEO of Biovalley Group SpA

**September 29<sup>th</sup> 2022**

# IMAGINING THE FUTURE OF HEALTH CARE: DIFFERENT PERSPECTIVES



Many highly innovative solutions... that do not interact each other

# WHAT WE ARE TALKING ABOUT: BIOHIGHTECH

## BIOINFORMATICS



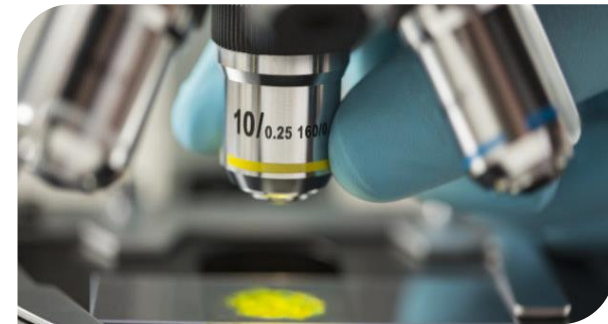
- Medical and Bio IT
- Cloud & IoMT
- Business Intelligence and High Performance Computing

## BIOTECHNOLOGIES



- Red Biotech
- White Biotech
- Green Biotech

## BIOMEDICAL



- Biomedical device
- In vitro diagnostic device
- Bioimaging device

# BioHighTech Industrial field: World and European Market on % Growth

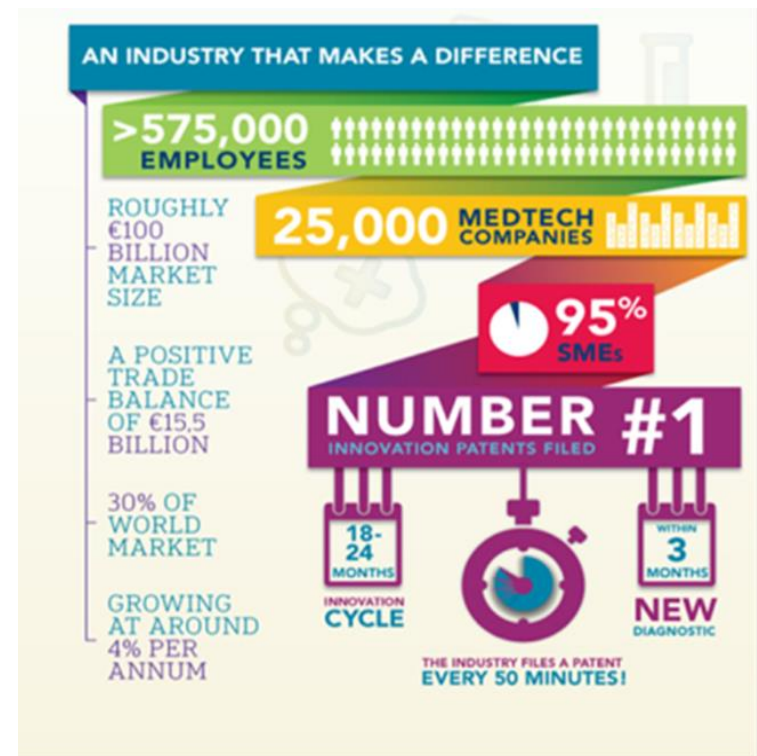


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## BioHighTech International Market & Growth

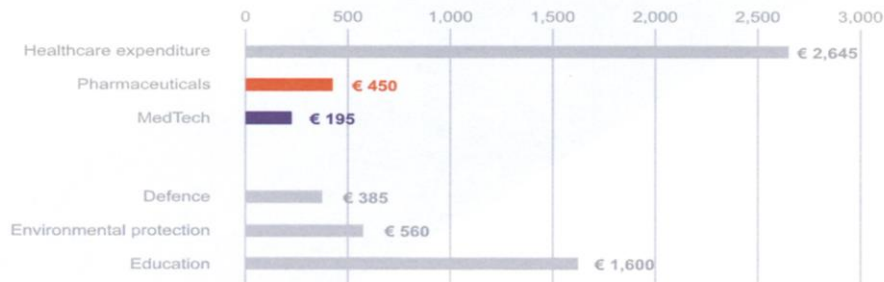
Industry Sector	Market	Growth (CAGR%)
BioMed (MedTech)	about 300 bln	about 4%
BioTech	about 150 bln	about 10%
BioICT (IT Healthcare)	about 150 bln	about 10%
BioHighTech	about 600 bln	about 7%

## BioMed/MedTech Industry in Europe: Companies & Market



## European BioHighTech Market: comparison with other relevant markets

Per capita spending on various fields, in €, latest year available





# APPROACH TO ENHANCE THE BIOHIGHTECH: OPEN INNOVATION

## CLOSE INNOVATION



## OPEN INNOVATION



Not all the smart people work for us. We need to work with smart people inside and outside our company

External R&D can create significant value; internal R&D is needed to claim some portion of that value

Building a better business model is better than getting to market first

If we make the best use of internal and external ideas, we will win

We should profit from others' use of our IP, and we should buy others' IP whenever it advances our business model

«Companies should use their business model to identify a more enlightened role for R&D in a world of abundant information, better manage and access intellectual property, advance their current business, and grow their future business»

*«Open Innovation: The new imperative for creating and profiting from technology», Henry William Chesbrough, 2003*



# IFMBE: CLINICAL ENGINEERING DIVISION AND OPEN INNOVATION

## CED Vision Statement:

To become an international forum for developing and promoting of the clinical engineering profession resulting in improvement of global healthcare delivery through **the advancement of safe and effective innovation**, management and deployment of **healthcare technology**.

The IFMBE is the only international professional federation that has a Clinical Engineering Division focusing specifically on the life cycle management of healthcare technology and embracing all those who professionally practice in the clinical engineering field, whether in academic institutions, health care facilities, industry, business, voluntary sector, or government.

***Clinical Engineers*** play a crucial role for enhancing Open Innovation in Healthcare  
Technology improving connections between research and industry

# Trends in Medical & ICT Technologies: Open Innovation for Health and Social Organizations

## ■ Digitization & Convergence:

- Increased **penetration of digital information** (and the related software applications and hardware infrastructure supporting it);
- **Medical Equipment** evolving towards standard **hardware/operating system architecture**, with added specialized software application and sensors.
- **Integration of Medical Equipment and Hospital ICT.**
- **New regulation including all IT systems** with “intended clinical use” in Medical Devices calling for application of risk management practices typical of medical equipment.

## ■ Technology dispersion:

- The prevalence of chronic diseases and ageing population in developed countries, and the challenge to provide access to Healthcare to huge rural populations in the developing world, are creating the ground for **healthcare systems to extend far out of the hospital**;
- Such extend system calls for **integrated wide area networks connecting patients (home devices), physicians and hospitals** (EMR and diagnostic tools).

## ■ Need for Efficiency:

- Healthcare innovation generating the **need for new technology** (shorter product lifecycle, faster replacement), while **budget constraints** call for cost control and better asset utilization in Hospitals.

## ■ Hospital and Social Organizations “pains”.

- Typical **technology purchasing and management processes** not suitable for facing the challenge.
- Leading to:
  - Over-purchasing;
  - Inefficient use;
  - Lack of integration
  - Risk / Non compliance.

## ■ Hospital and Social Organizations needs:

- “Holistic” approach to **Technology Planning**:
  - Integrated IT and Medical Equipment;
- **Integrated ICT platform to “glue” the system**;
- **Efficient Integrated Clinical Engineering**:
  - Lifecycle management;
  - All Medical Devices (including IT & IoT)
  - In the Hospital and outside
  - Manage functionality and usage.

# Open Innovation in Top EU countries: Focus on Multivendor Medical Equipment Services

Year 2008		Italy	France	Germany	Spain	UK	Total
Medical equipment replacement value	€ bn	10,8	11,4	15,2	5,1	8,4	50,9
Services on Medical Equipment	€ mn	771	675	996	307	688	3437
Of which:							
Biomed	€ mn	381	418	586	178	409	1972
Diagnostic Imaging	€ mn	390	257	411	129	279	1466
Clinical Engineering Outsourcing	€ mn	204	78	166	60	41	549
Penetration on Services		26%	12%	17%	20%	6%	16%
OEM maintainance	€ mn	316	279	482	153	307	1537
Penetration on Services		41%	41%	48%	50%	45%	45%
In House services	€ mn	251	318	349	94	341	1353
Penetration on Services		33%	47%	35%	31%	50%	39%

Potential addressable market (Medical Equipment management)

- **5 major European Countries account approximately for 75% of Eu29 services on Multivendor Medical Equipment.**
- **Value of Multivendor Maintenance Services Market estimated as a % of Medical Equipment replacement value**
  - Biomed: average of 5,6% of installed base replacement value;
  - DI: average of 8,7% of installed base replacement value
- Current Maintenance Services market is covered by In House Hospital departments, OEM's maintenance and Clinical Engineering Outsourcing maintenance services (independent players providing a range of multivendor services)



# Clinical Engineering Outsourcing Services – Market potential Europe, India and USA



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## Medical Equipment

- Medical Equipment Management: over € 5 bn estimated market potential for current TBS countries.
- India and China already a sizeable market.
- DI: the largest new market opportunity.

€ bn	Bio	DI	Total Med. Equip. Serv.
EU Top 5	1,97	1,47	3,44
EU TBS current	2,25	1,68	3,93
Middle East	na	na	0,15
India	na	na	0,15
China	na	na	1,00
<b>Total TBS</b>	<b>na</b>	<b>na</b>	<b>5,23</b>
USA	3,56	2,66	6,22

- **Healthcare Technology Assessment and Planning consulting:** we estimate an average pricing for a 5 years Capital (renewal) Plan of € 120 per year per bed (in USA). EU market stand alone practically non existing.
- **Financing/insurance services:** Financial and Operating Lease widely adopted by hospitals to optimize capital deployment (high cost non movable equipment), worth several USD billions in the US and EU.
- **Asset utilization tracking and optimization:** Operating short term lease of peak-need movable equipment is a market niche estimated around USD 900 m in USA. EU market practically non existent.

## Other Medical Devices

- Selected other Medical Devices (i.e. Surgical Instrumentation), that can be managed with substantial delivery synergies with services on medical Equipment.
- **ICT maintenance and system management** still underdeveloped in the Healthcare market.
- **Integrated Home Care services**, with the joint provision of Telehealthcare Services and home technology management, is currently driving strong attention in Italy (Domino project).
- Other **Medical Technology Outsourcing** services.

Lifecycle Management Services

Value Added  
Services

## What Services?

### Hospital need:

- Guaranteed uptime of equipment also with IIoMT;
  - Access to continuously upgraded technology skills.
  - Compliance.
- 
- Optimization of technology buying process.
  - "Certain" budget
  - Optimization of cash flow;



### Clinical Engineering Outsourced services provides:

- **Lifecycle management of Medical Equipment**, other **selected Devices** and the associated spare parts and consumables (test, calibration, maintenance, repair, disposal,...);
  - **Leading to approximately 20% reduction in maintenance cost and increased availability!**
- 
- **Added Value Services** linked to Lifecycle management services:
    - Assessment and Planning consultancy;
    - Equipment utilization tracking and optimization;
    - *Bundles with financial/insurance services.*
    - *IIoMT Services*
  - **Leading to 5-10% reduction in Capital Expenditures and 3-14% reduction on purchase of consumables!**
- 
- **Medical Equipment** (the historical focus of the outsourcing market);
  - A wider range of **Medical Devices** (large opportunity to widen the market) leveraging synergies with the historical core market:
    - ICT systems
    - Technology related Business Process Outsourcing processes (digitization, technical facilities,...).

## What Technologies?

- Unique point of contact managing hundreds of OEM's also with IIoMT;
- To contain cost through economies of scale also with IIoMT.



# Clinical Engineering Outsourced Services: A 2010 historical study

## Potential Market

### Lifecycle Management Services

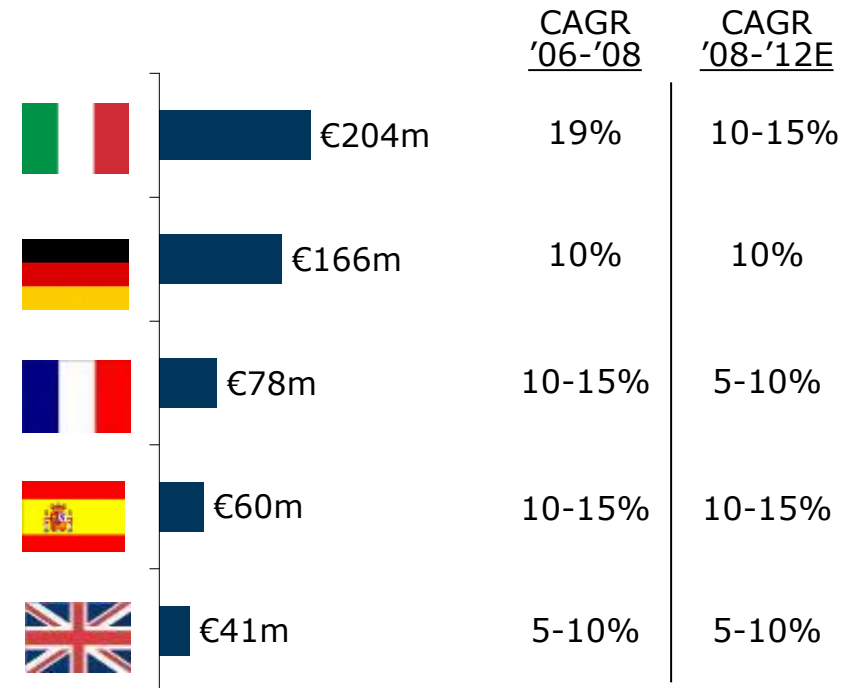
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### Value Added Services

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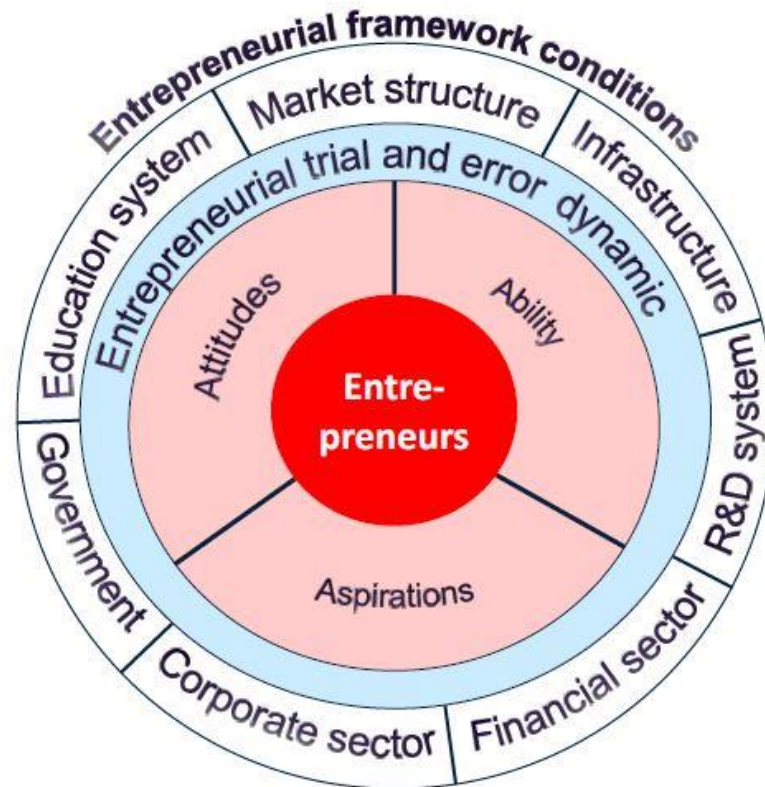
## Non Cyclical Market with Stable & Continuous Growth in EU Top 5



- Market characterized by significant growth, also in economic downturns
- Italy is the most developed market. Recourse to outsourcing is spreading through the largest European countries (and is starting in emerging markets)

# CLINICAL ENGINEERING OUTSOURCED SERVICES and OPEN INOVATION: CRUCIAL ROLE FOR CONNECTING THE ENTREPRENEURIAL AND THE RESEARCH ECOSYSTEM WITH HOSPITALS AND CITIZENS AT THE INTERNATIONAL LEVEL

## Global Entrepreneurial Index (GEI Index)



# Entrepreneurial Ecosystem

The modern temple of the entrepreneurial ecosystem is like many temples of the ancient world: both are held up by pillars. Like the pillars of ancient temples—made of sand and limestone held together by cement—the pillars of the economic ecosystem are made of individuals and institutions that are held together by the “cement” of incentives created by institutions that influence the behavior of people

The entrepreneurial ecosystem rests on 14 pillars of development, which hold up three large building blocks consisting of attitudes toward entrepreneurship, entrepreneurial abilities, and entrepreneurial aspirations. The pillars must be of similar height and strength for a fully developed economy to flourish, and they need constant attention, continuous improvement, and careful maintenance.



# Entrepreneurship and Economic Development

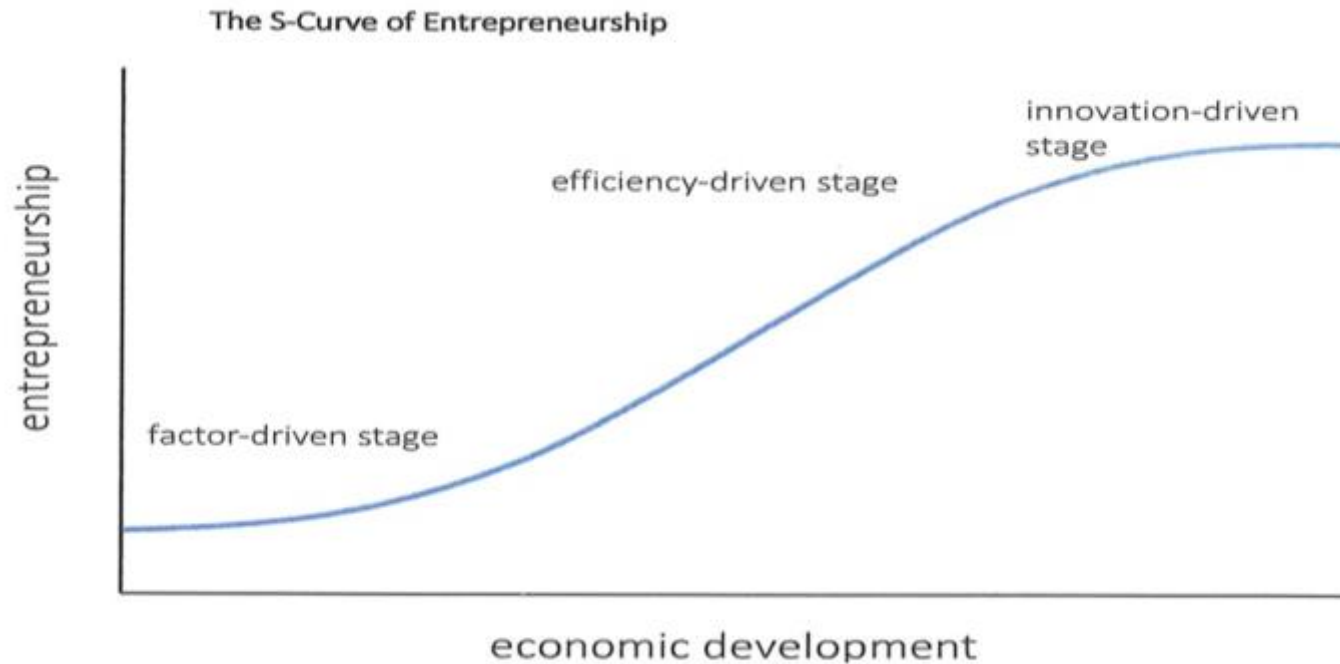


GEI defines entrepreneurship as “the dynamic, institutionally embedded interaction between entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations by individuals, which drives the allocation of resources through the creation and operation of new ventures.”

In his classic text, *The Stages of Economic Growth*, W. W. Rostow suggested that countries go through five stages of economic growth.

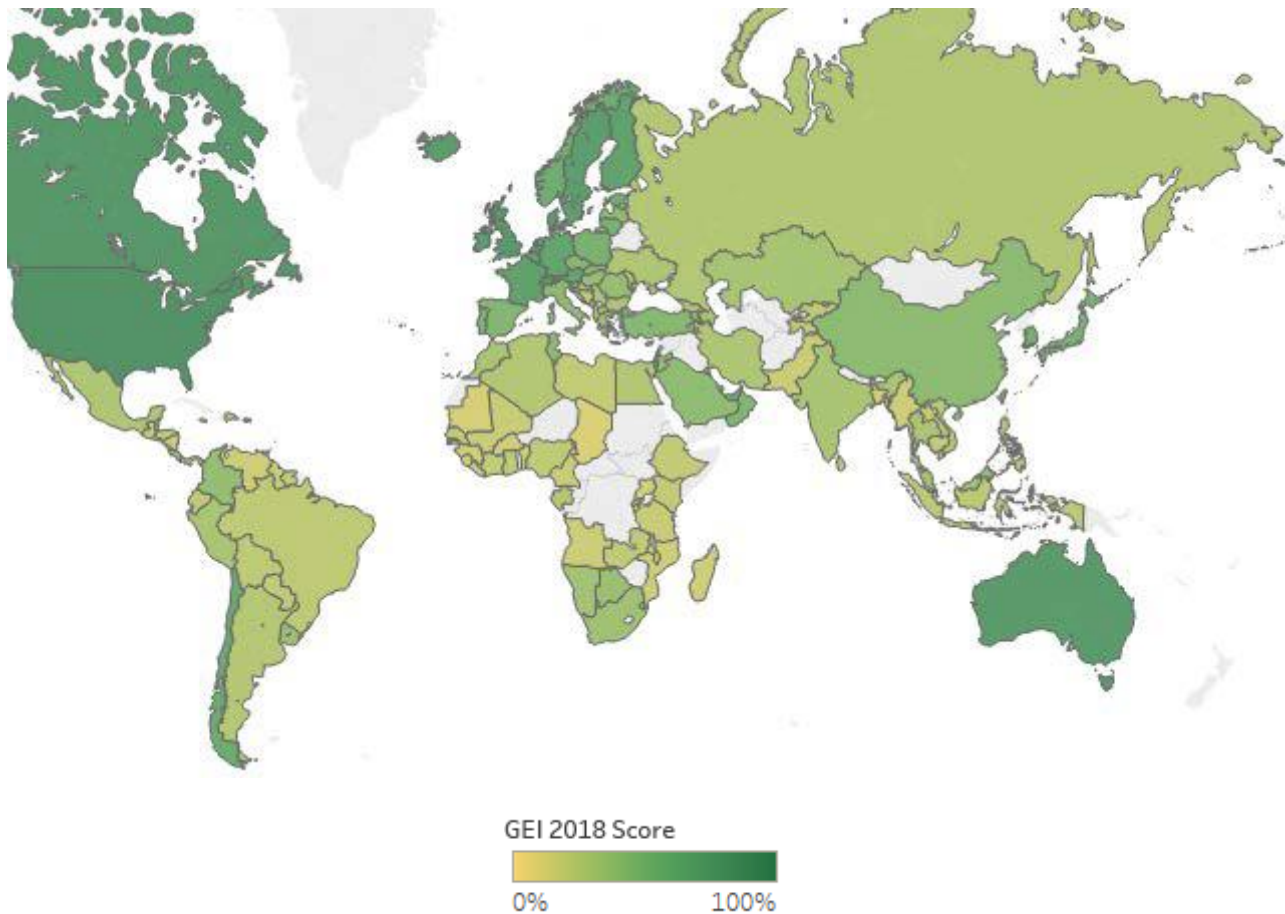
While focused on the age of high mass consumption, Michael Porter followed recent developments in the economics of innovation. Porter has provided a modern rendition of Rostow’s approach by identifying three stages of development: (1) a factor-driven stage, (2) an efficiency-driven stage, and (3) an innovation-driven stage.

# Relationship between entrepreneurship and economic development: the s-curve of entrepreneurship





## 2018 GEI SCORE AND RANKING OF 132 COUNTRIES



# 2018 GLOBAL ENTREPRENEURSHIP INDEX

The 3% improvement in  
GEI scores over last  
year could add

**\$7 trillion  
to global GDP**

because  
institutions that support  
entrepreneurs also positively  
impact the economy as a whole.

**Asia-Pacific**  
has improved by

▲ **4.0%**  
on average over last year's GEI score



Australia leads at 75%

**Quick win:** The Asia-Pacific region would see the quickest gains by improving **Risk Acceptance**: improving risk tolerance and reducing country risk factors

**Europe**  
has improved by

▲ **3.4%**  
on average over last year's GEI score



Switzerland leads at 80%

**Quick win:** The European region would see the quickest gains by improving **Networking**: supporting the geographic and social networks that connect entrepreneurs

**The Middle East and North Africa**  
has improved by

▲ **2.9%**  
on average over last year's GEI score



Israel leads at 65%

**Quick win:** The MENA region would see the quickest gains by improving **Competition**: reducing barriers to entry for new firms

**North America**  
has improved by

▲ **2.5%**  
on average over last year's GEI score



United States leads at 84%

**Quick win:** The North American region would see the quickest gains by improving **High Growth**: supporting the willingness and ability of new firms to grow and scale

**South / Central America & the Caribbean**  
has improved by

▲ **4.6%**  
on average over last year's GEI score



Chile leads at 59%

**Quick win:** The South / Central America & Caribbean region would see the quickest gains by improving **Process Innovation**: increasing the use of new technology and presence of STEM workforce

**Sub-Saharan Africa**  
has improved by

▲ **1.5%**  
on average over last year's GEI score



Botswana leads at 35%

**Quick win:** The Sub-Saharan Africa region would see the quickest gains by improving **Startup Skills**: improving access to the education and skills that support careers in entrepreneurship

# 2018 GEI SCORE AND RANKING OF 132 COUNTRIES

COUNTRY	RANKING	GEI
United States	1 /132	86.8
Switzerland	2 /132	82.2
Canada	3 /132	80.4
Denmark	4 /132	79.3
United Kingdom	5 /132	77.5
Australia	6 /132	74.3
Iceland	7 /132	73.0
Netherlands	8 /132	72.3
Ireland	9 /132	71.3
Finland	10 /132	70.2
...		
Italy	36 /132	45.1

GEI Score and Ranking of 132 Countries

## Biggest Gains in GEI Score

Country	Score 2018	Score 2017	Difference in Score	Difference in Rank
United Kingdom	77.8	71.2	6.5	4
Israel	65.4	59.4	6.0	1
Bulgaria	27.8	22.7	5.1	13
China	41.1	36.1	5.0	5
Iran	26.8	22.1	4.7	13
Italy	41.4	37.1	4.3	4
Poland	50.4	46.5	3.9	1
Canada	79.2	75.5	3.7	0
Ireland	73.7	70.2	3.5	1
Korea	54.2	50.7	3.5	3

### Italy

Global Rank:  
42 of 137

Strongest area:  
Product Innovation

Weakest area:  
Human Capital

Overall GEI score:

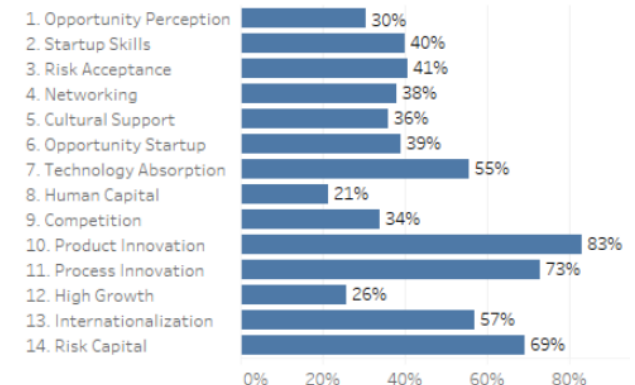


Individual score:  
entrepreneurial qualities of  
the people in the ecosystem

Institutional score:  
quality of the institutions  
that support  
entrepreneurship



Component scores







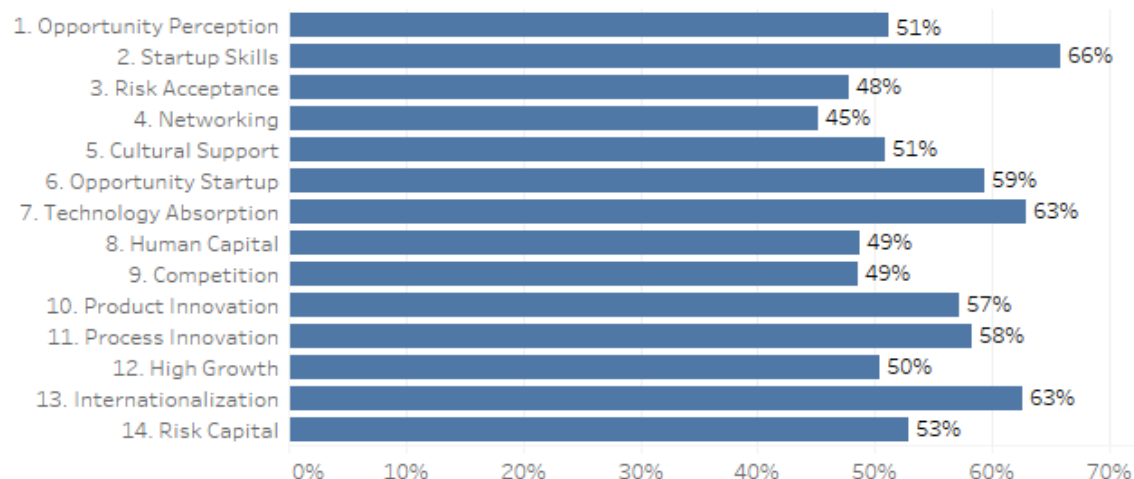
# GEI RANKS WITHIN THE EUROPE REGION



## Regional ranks and scores

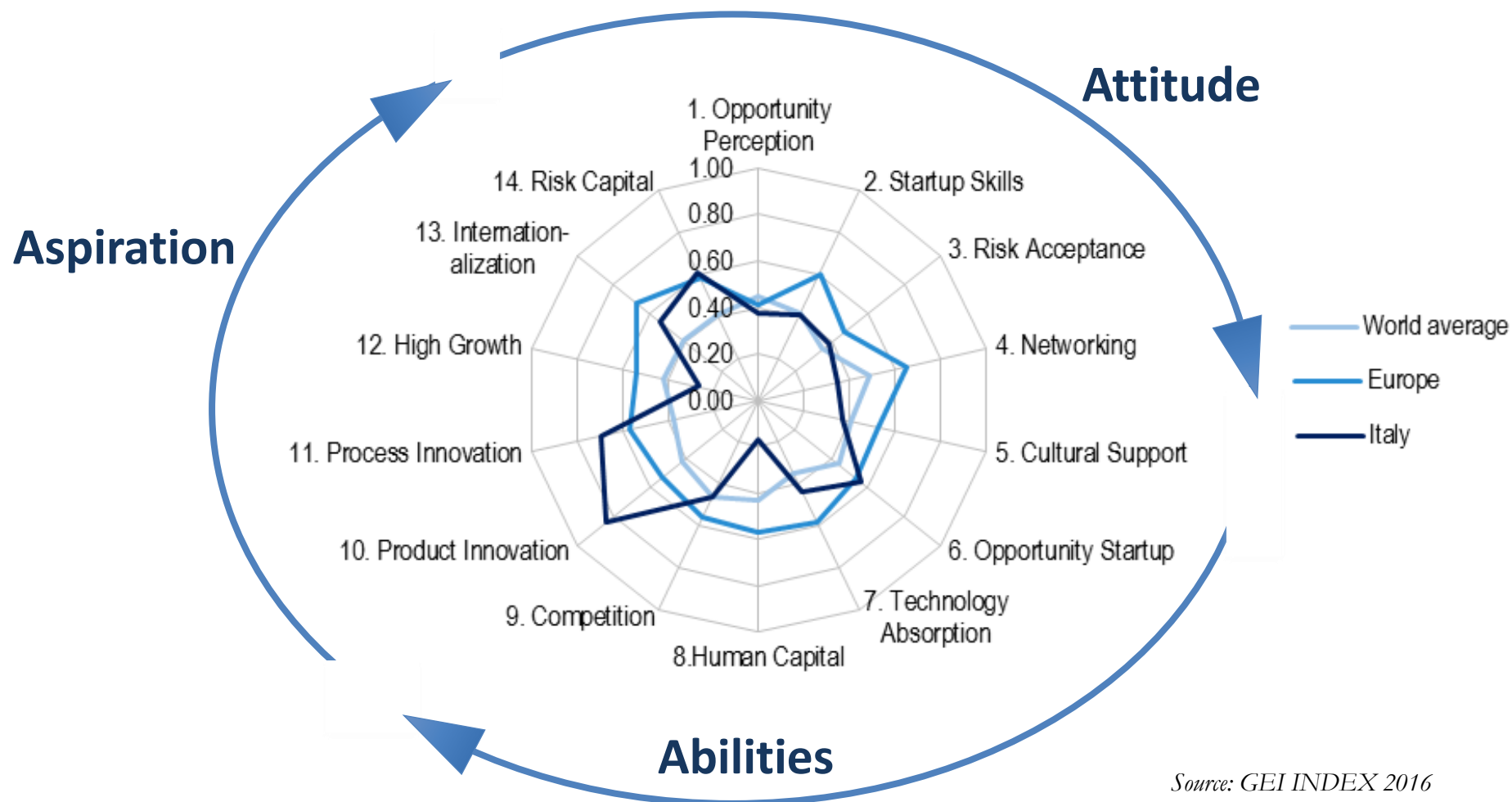
	GEI
1	Switzerland
2	United Kingdom
3	Denmark
4	Iceland
5	Ireland
6	Sweden
7	France
8	Netherlands
9	Finland
10	Austria
11	Germany
12	Belgium
13	Luxembourg
14	Norway
15	Estonia
16	Slovenia
17	Lithuania
18	Poland
19	Portugal
20	Cyprus
21	Spain
22	Slovakia
23	Czech Republic
24	Italy
25	Latvia
26	Romania
27	Greece
28	Hungary
29	Croatia
30	Montenegro
31	Macedonia
32	Bulgaria
33	Ukraine
34	Serbia
35	Russia
36	Albania
37	Moldova
38	Bosnia and Herzegovina

## Regional component averages





## GLOBAL ENTREPRENEURSHIP INDEX (GEI): ITALY vs EUROPE vs WORLD



Source: GEI INDEX 2016

# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: ALBANIA

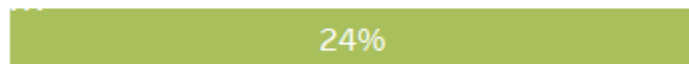
## Albania

Global Rank:  
83 of 137

Strongest area:  
Startup Skills

Weakest area:  
Risk Acceptance

Overall GEI score:

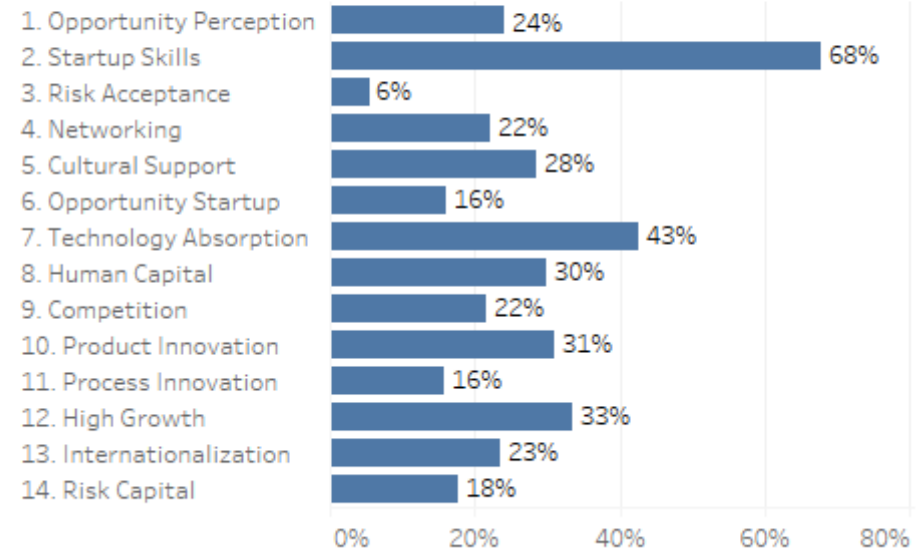


Individual score:  
entrepreneurial qualities of  
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Institutional score:  
quality of the institutions  
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Component scores



# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: AUSTRIA



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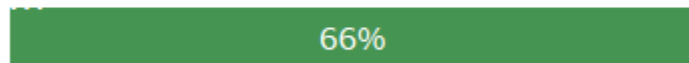
## Austria

Global Rank:  
14 of 137

Strongest area:  
Startup Skills

Weakest area:  
Human Capital

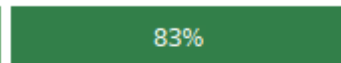
Overall GEI score:



Individual score:  
entrepreneurial qualities of  
the people in the ecosystem



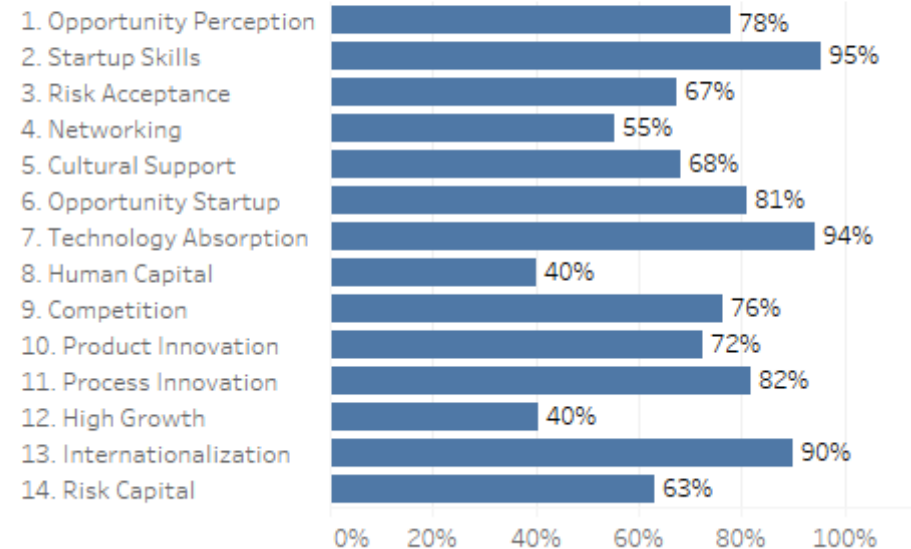
Institutional score:  
quality of the institutions  
that support  
entrepreneurship



Scores



Component scores



# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: CROATIA



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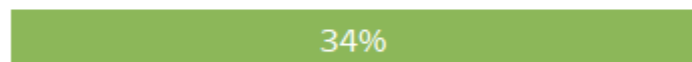
Croatia

Global Rank:  
54 of 137

Strongest area:  
Internationalization

Weakest area:  
Risk Acceptance

Overall GEI score:



Individual score:  
entrepreneurial qualities of  
the people in the ecosystem

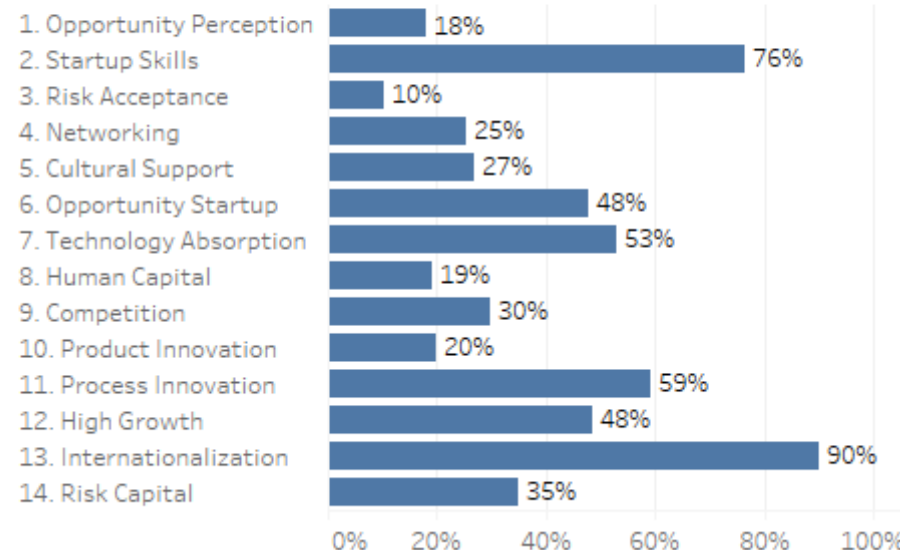
Institutional score:  
quality of the institutions  
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Scores



Component scores





# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: ITALY



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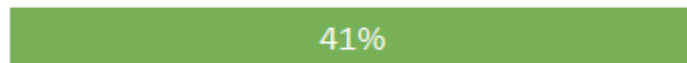
Italy

Global Rank:  
42 of 137

Strongest area:  
Product Innovation

Weakest area:  
Human Capital

Overall GEI score:



Individual score:  
entrepreneurial qualities of  
the people in the ecosystem

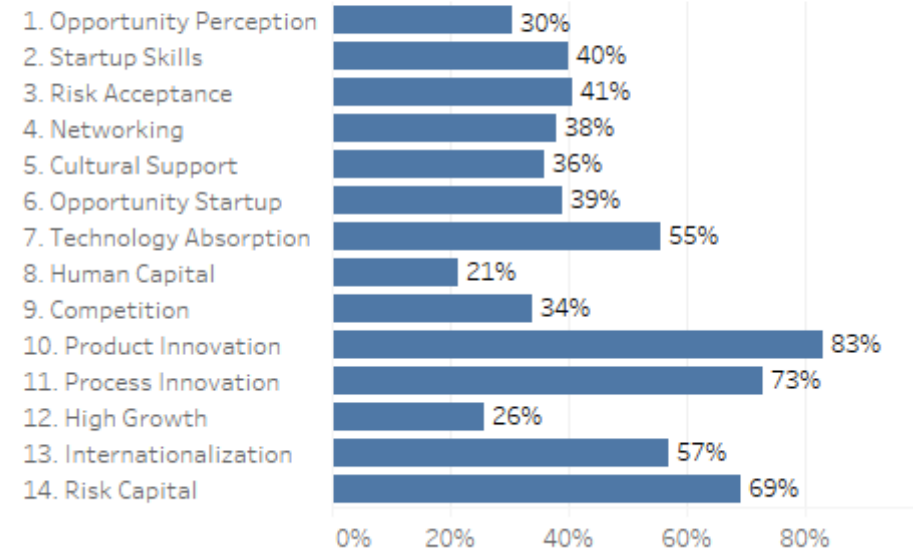
Institutional score:  
quality of the institutions  
that support  
entrepreneurship



Scores



Component scores



# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: MACEDONIA



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## Macedonia

Global Rank:  
66 of 137

Strongest area:  
Technology Absorption

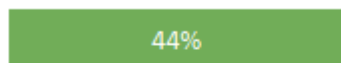
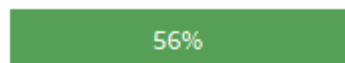
Weakest area:  
Risk Acceptance

Overall GEI score:



Individual score:  
entrepreneurial qualities of  
the people in the ecosystem

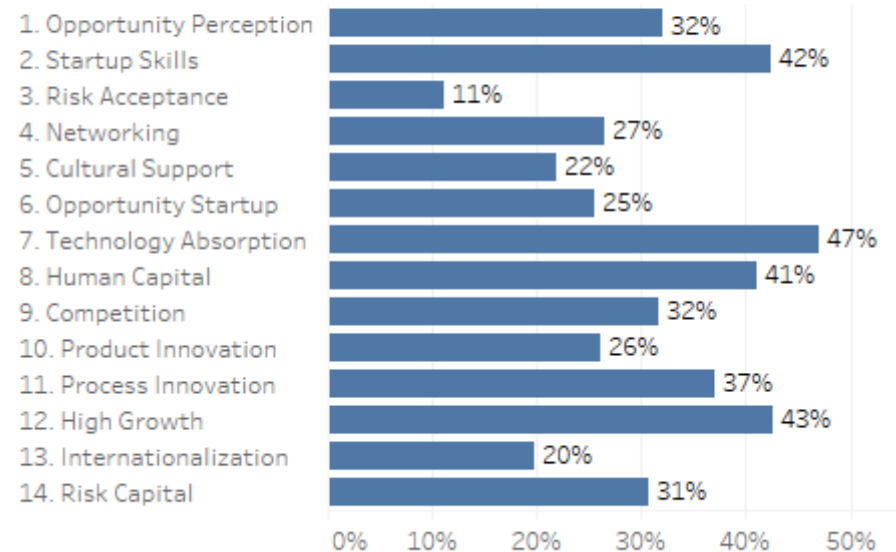
Institutional score:  
quality of the institutions  
that support  
entrepreneurship



Scores



Component scores



# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: SERBIA



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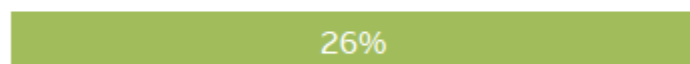
## Serbia

Global Rank:  
74 of 137

Strongest area:  
Startup Skills

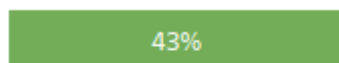
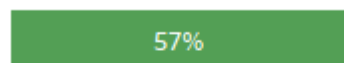
Weakest area:  
Risk Acceptance

Overall GEI score:



Individual score:  
entrepreneurial qualities of  
the people in the ecosystem

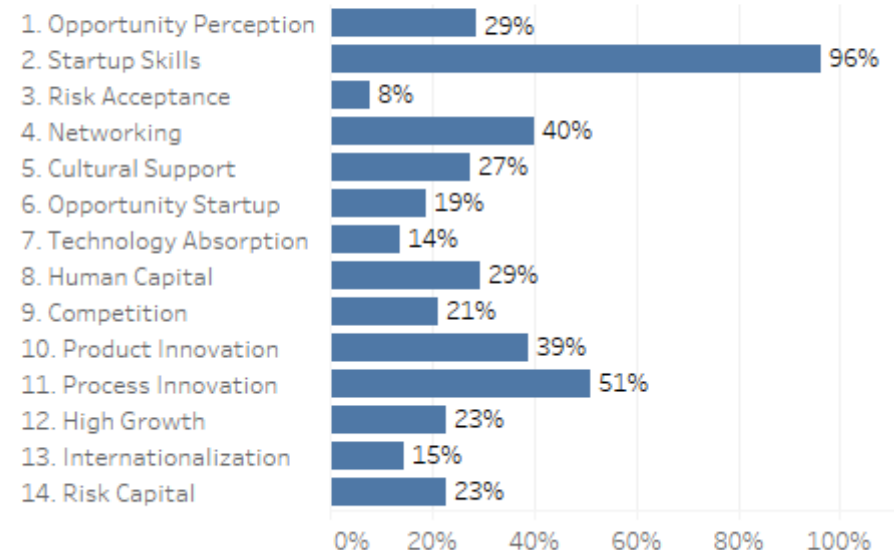
Institutional score:  
quality of the institutions  
that support  
entrepreneurship



Scores



Component scores



# GEI INDEX IN SOME CENTRAL AND EAST EUROPEAN COUNTRIES: SLOVENIA



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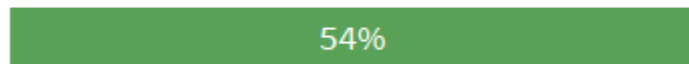
## Slovenia

Global Rank:  
25 of 137

Strongest area:  
Startup Skills

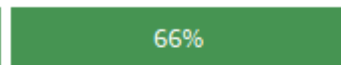
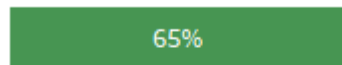
Weakest area:  
Networking

Overall GEI score:



Individual score:  
entrepreneurial qualities of  
the people in the ecosystem

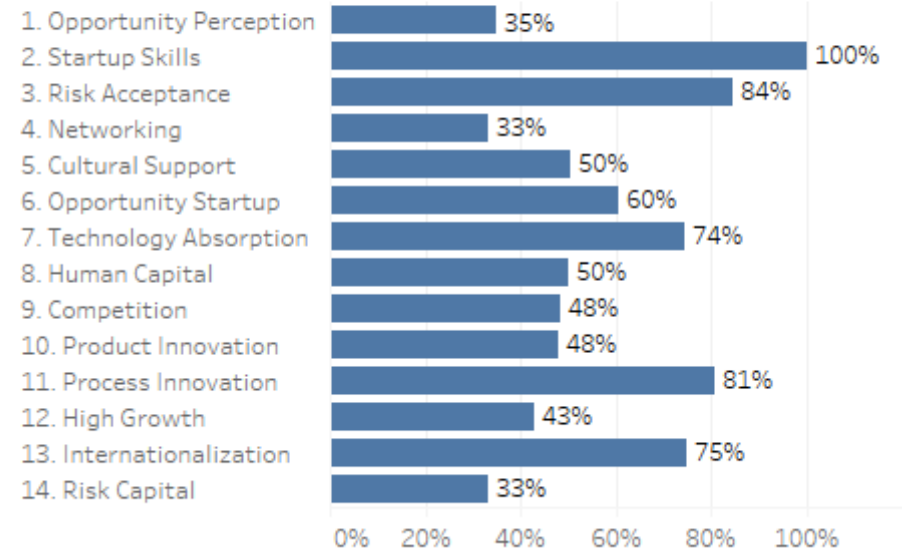
Institutional score:  
quality of the institutions  
that support  
entrepreneurship



Scores

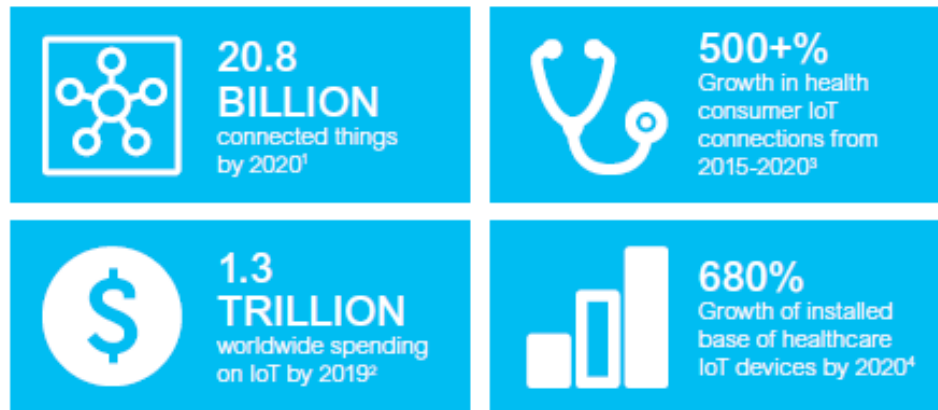


Component scores



# OPEN INNOVATION: TRENDS IN DIGITAL HEALTHCARE FROM 2015 TO 2020

*«Healthcare payers will step up their efforts to deploy new ways to connect IoT data with healthcare plans» (i-scoop)*



«The installed base of healthcare IoT devices (excluding wearables like fitness trackers) will grow from 95 million in 2015 to 646 million in 2020»

*(Rif. BI Intelligence, a research service of Business Insider)*



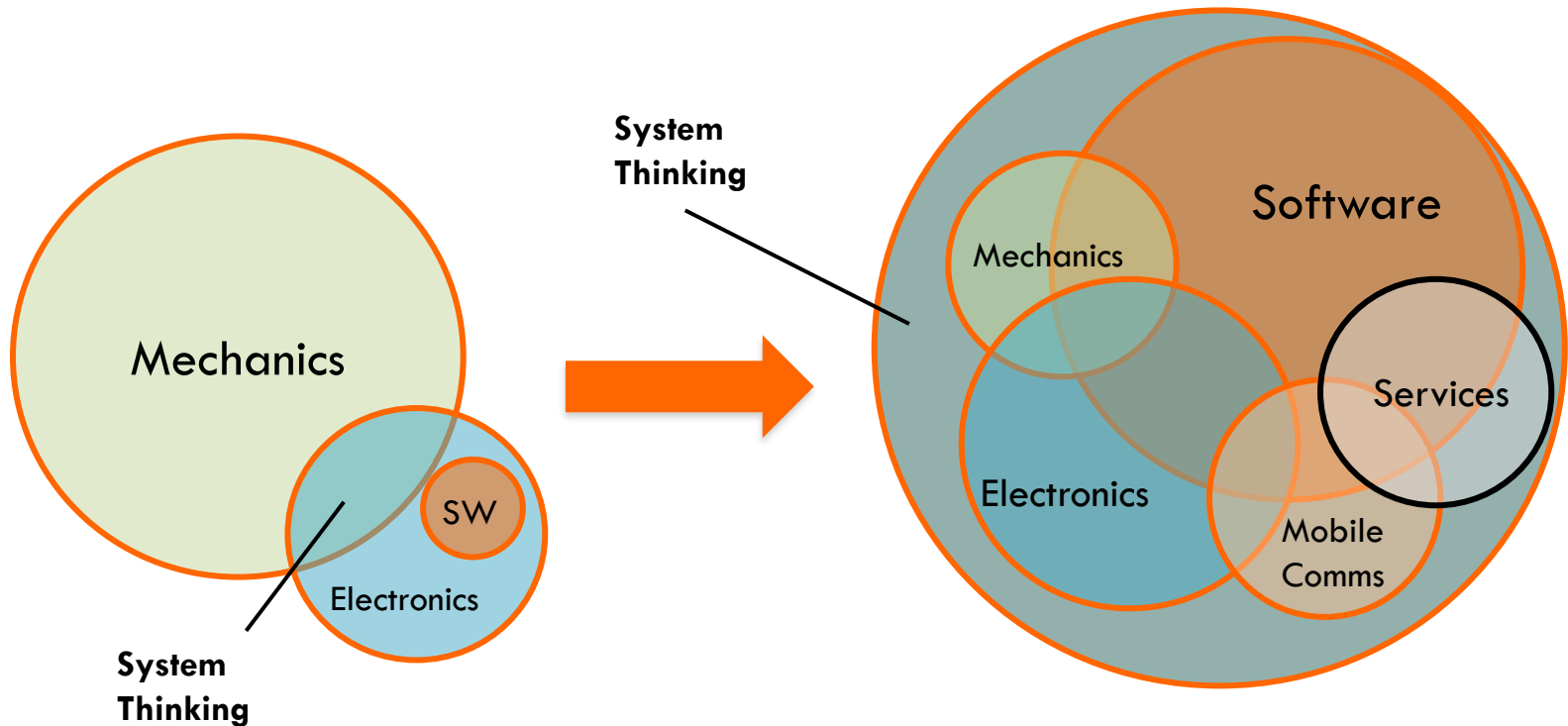
# DigitalHighTech Industrial Sector: Growth % in World Market



**Biovalley  
Group**

Industrial Sector	Market	Growth (CAGR%)
Big Data	About 50 Md \$	20%
Cyber Security	About 167 Md \$	10,9%
Artificial Intelligence	About 62 Md \$	40 %
IoT	About 0,826 Md \$	19,9%
Cloud Computing	About 371 Md \$	17,5%

# INDUSTRY 4.0: SOFTWARE-DEFINED MACHIN



Source adapted from "Software gibt den Takt vor", C. Kühnl in *Mechatronic & Fertigung*, 2010

# INDUSTRY 4.0: Data Deluge

## Data Deluge

1.000 Exabyte = 1 000 000 000 000 000 000 Bytes

1 Zettabyte ~ 250 000 000 000 000 000 000 Bytes

The total amount  
of data being captured  
and stored by industry  
doubles every 1.2 years

(HD Video)

Every 2 days  
we create as much  
information as we did  
from the beginning of  
time until 2003

Over 90% of all the  
structured data in the  
world was created in the  
past 2 years

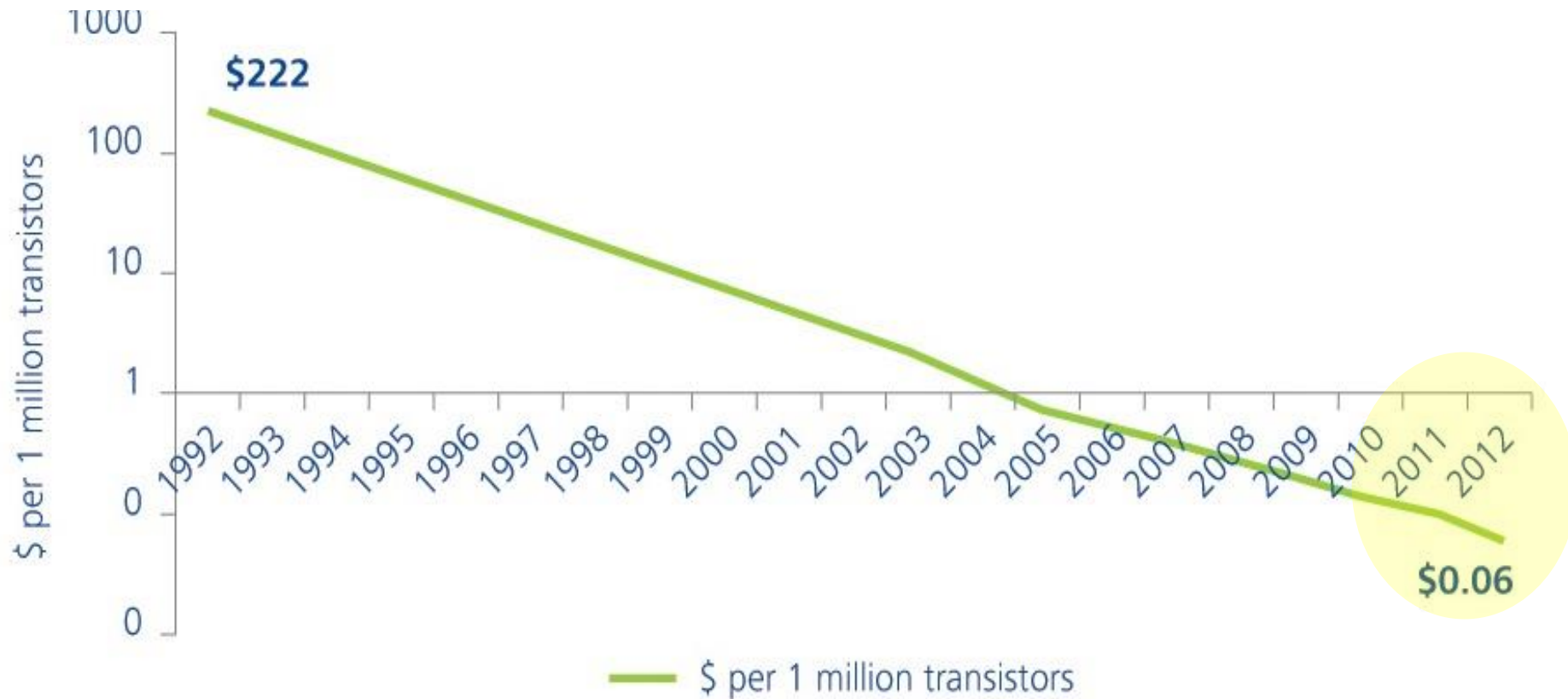
2005 2006 2007 2008 2009 2010 2011 2012

2016 2019 2020

UniPD



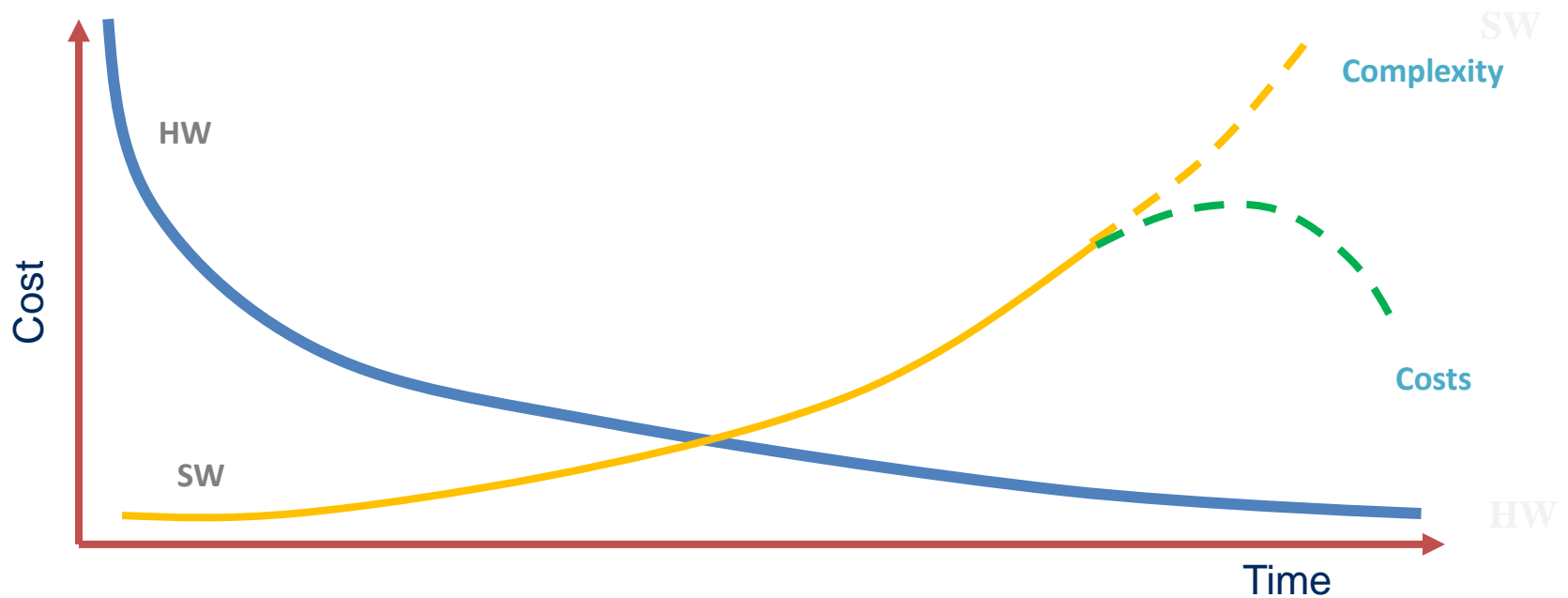
## Industry 4.0: 40 years of Moore's law ... and it is not the end of a generalized Moore's law



Source: Leading technology research vendor

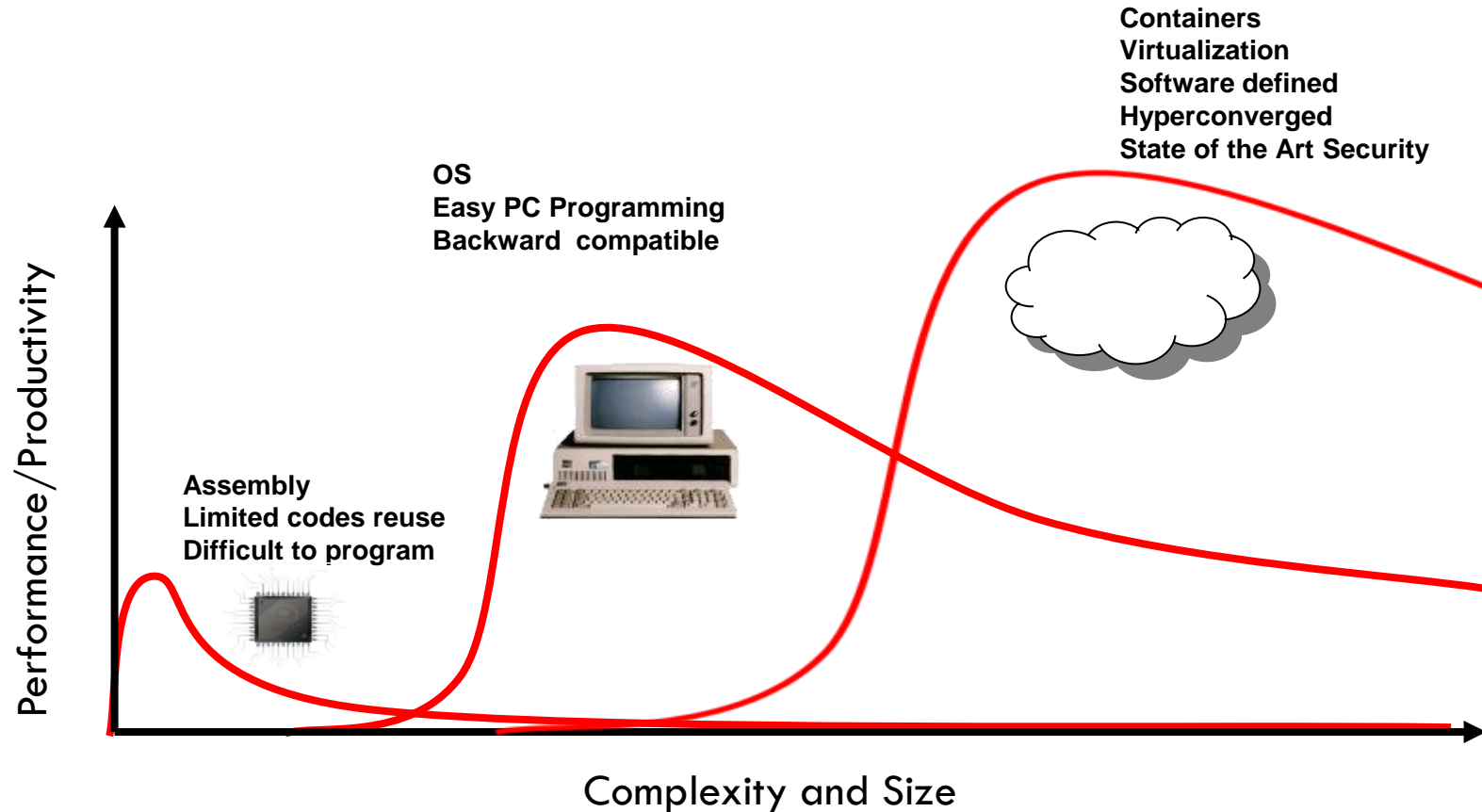
**Moore's law : Number of transistors doubles approx. every 18 months**

## Wirth's law: Software gets slower faster than hardware gets faster





# Industry 4.0: Complexity and Performance





# DATA ARE THE NEW RAW MATERIAL

New source of innovation & lever to achieve business sustainability



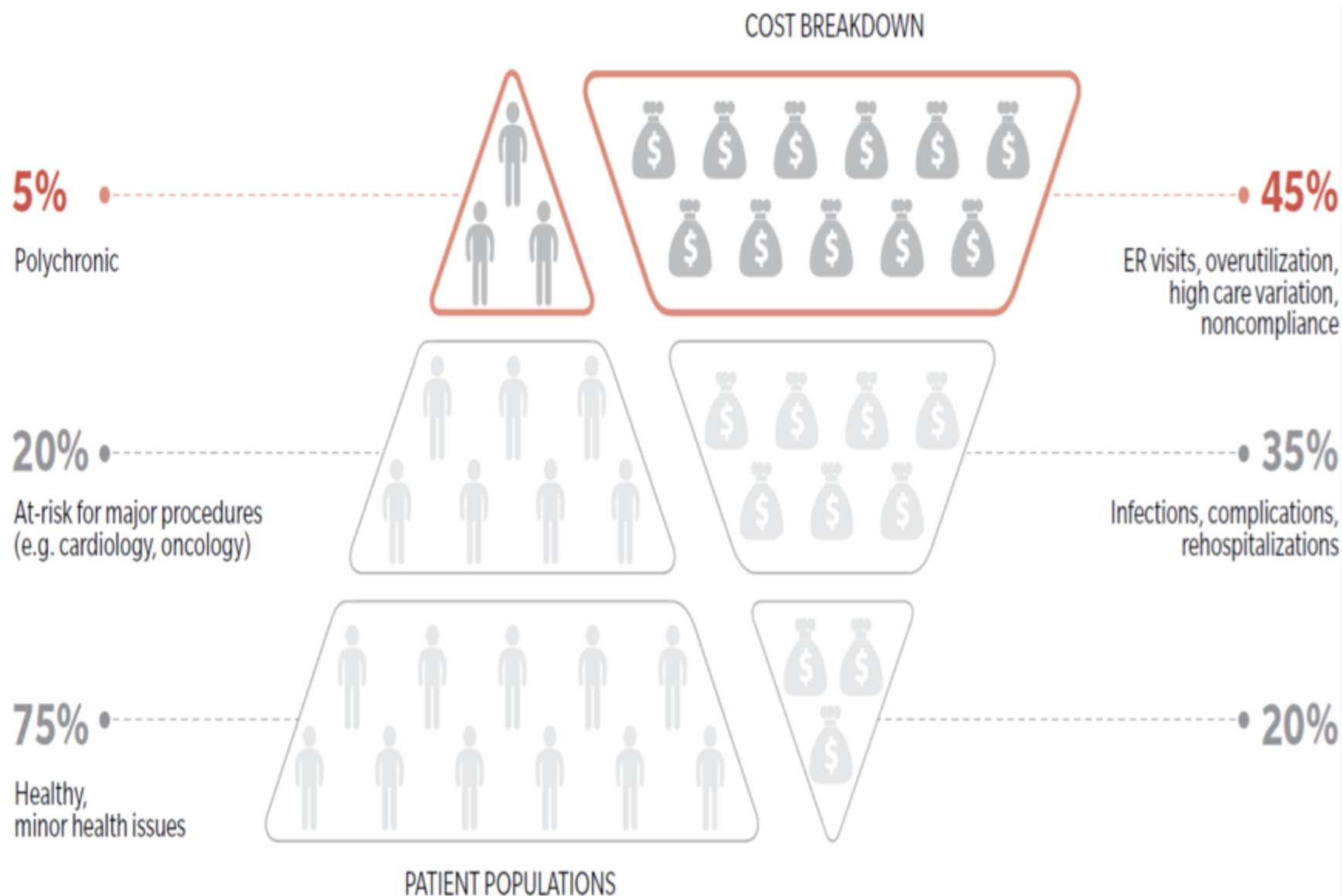
*“If you went to bed last night as an **industrial company**, you’re going to wake up this morning as a **software and analytics company**”*

Jeff Immelt - GE CEO

# Populations and Health Expenditure



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# Social determinants of Health



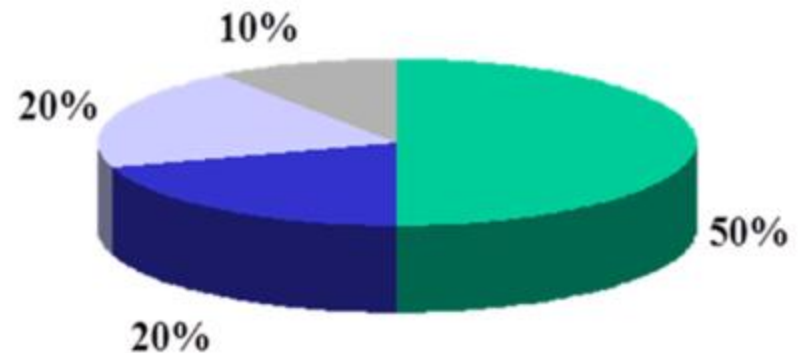
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Social determinants of health



Factors that Determinate the State of Health in Industrialized Countries



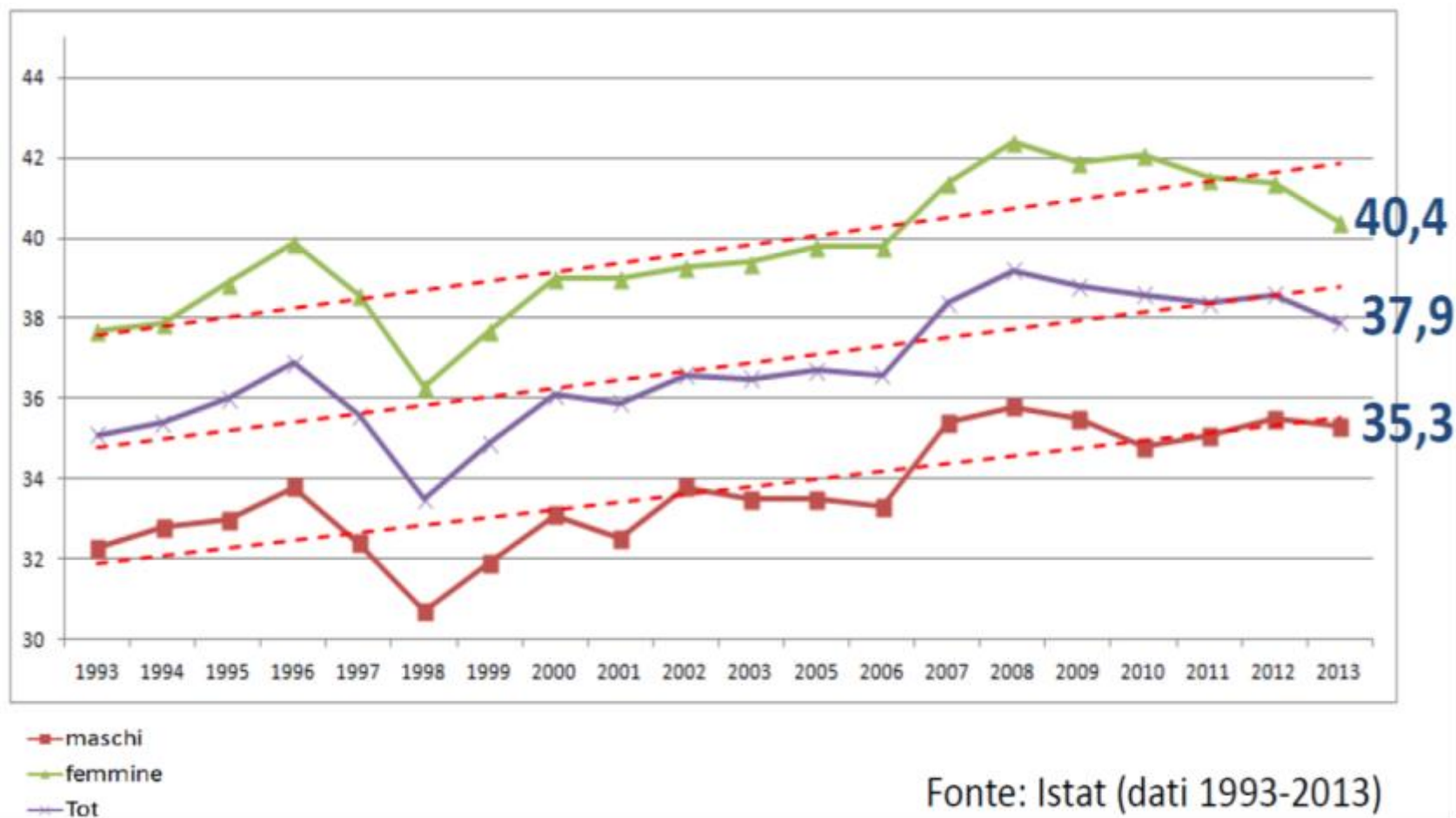
Behaviour  
Genetic Factors

Environmental Factors  
Access to Healthcare Facilities

# Chronicity

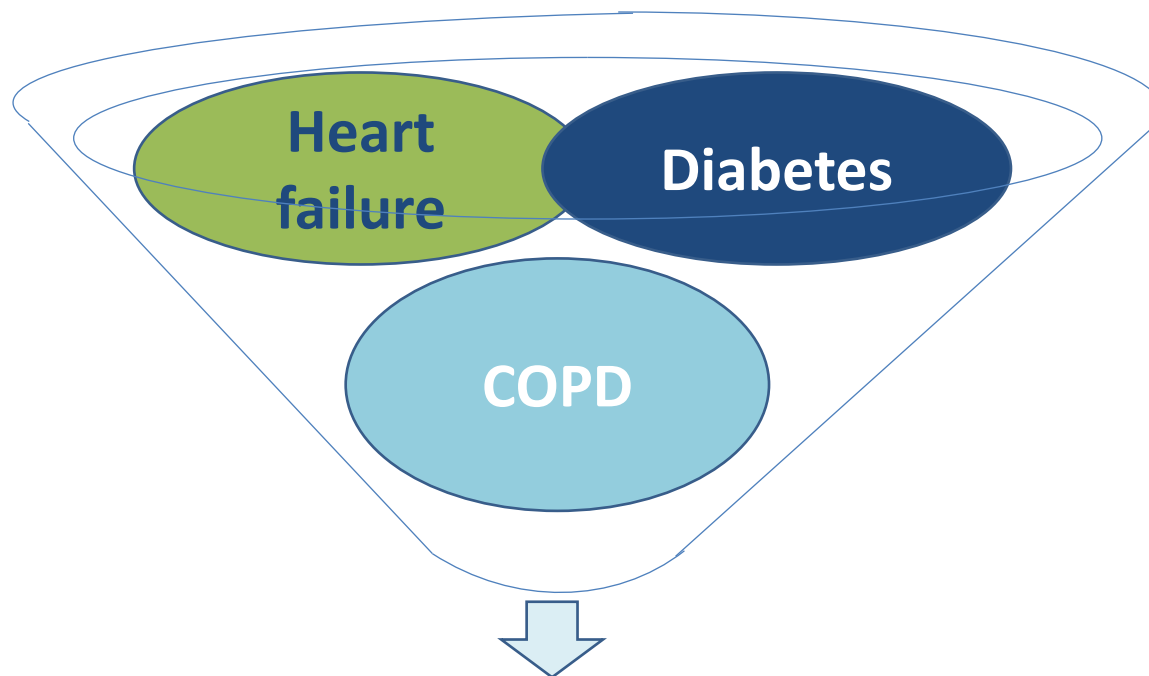


Italy: people with at least a chronic disease (in%)





# Healthcare expenditure in Italy for the Chronicity



**18,5 bln €/year = ~ 16,5%**

# NCD IN ITALY

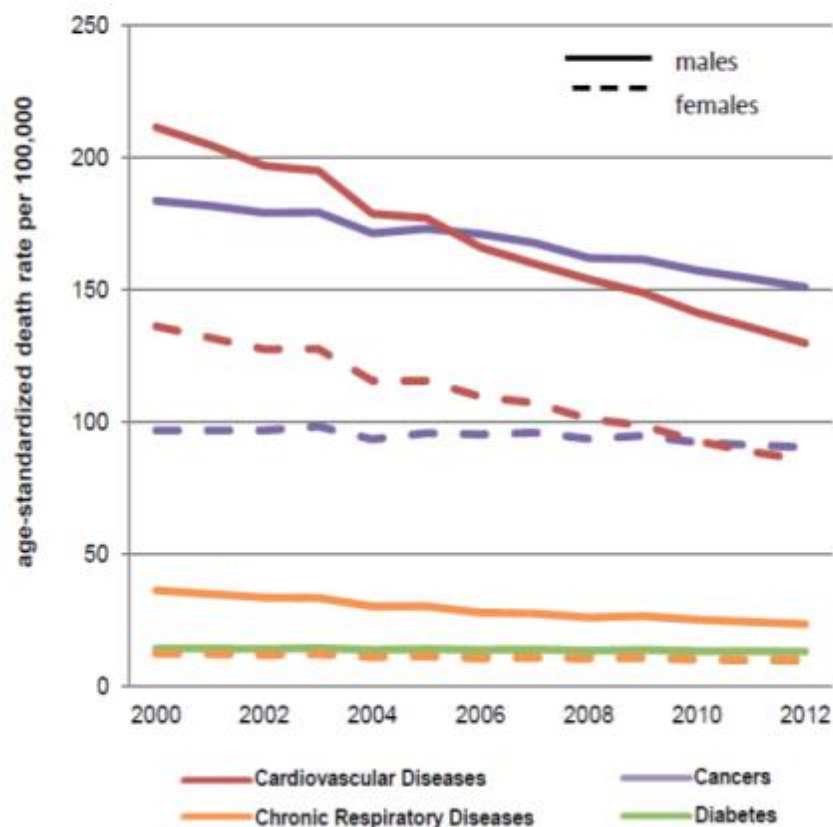


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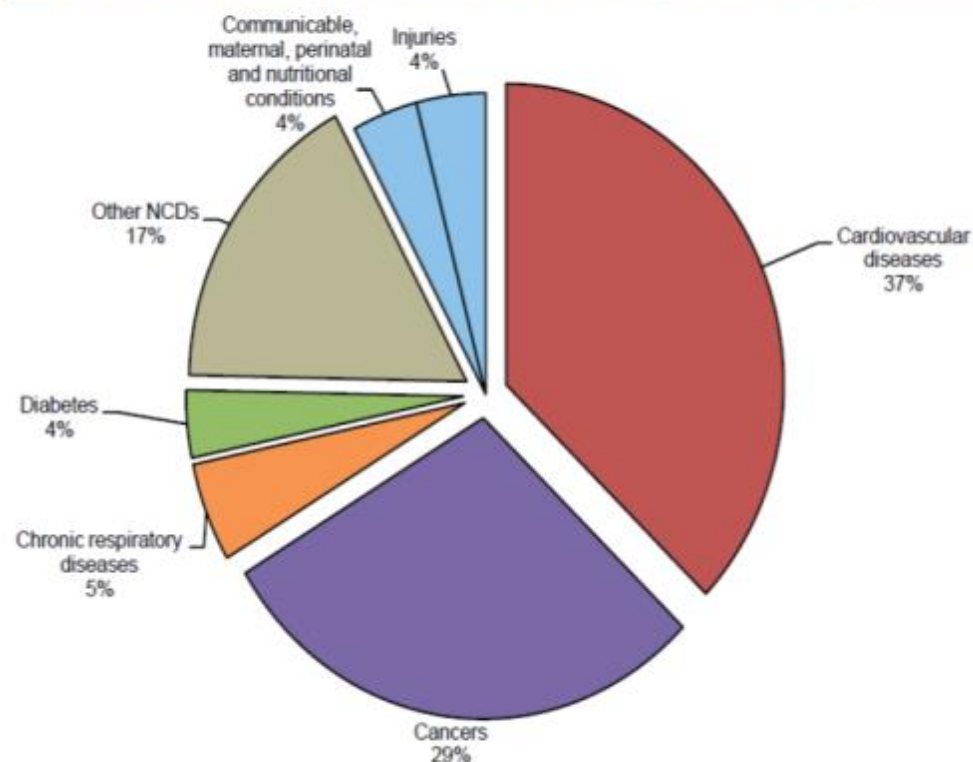


## Noncommunicable Diseases Country Profiles 2014

Age-standardized death rates



Proportional mortality (% of total deaths, all ages, both sexes)



Total deaths: 573,000  
NCDs are estimated to account for 92% of total deaths.



If the actual 5% of the population with poly-chronic diseases would become 20%, the cost of the health expenditure would double



# Kaiser Permanente (USA): Great Healthcare ICT (HIT) Investments Enabled Quality Improvements on 10 mln people and it reduced costs of chronic diseases



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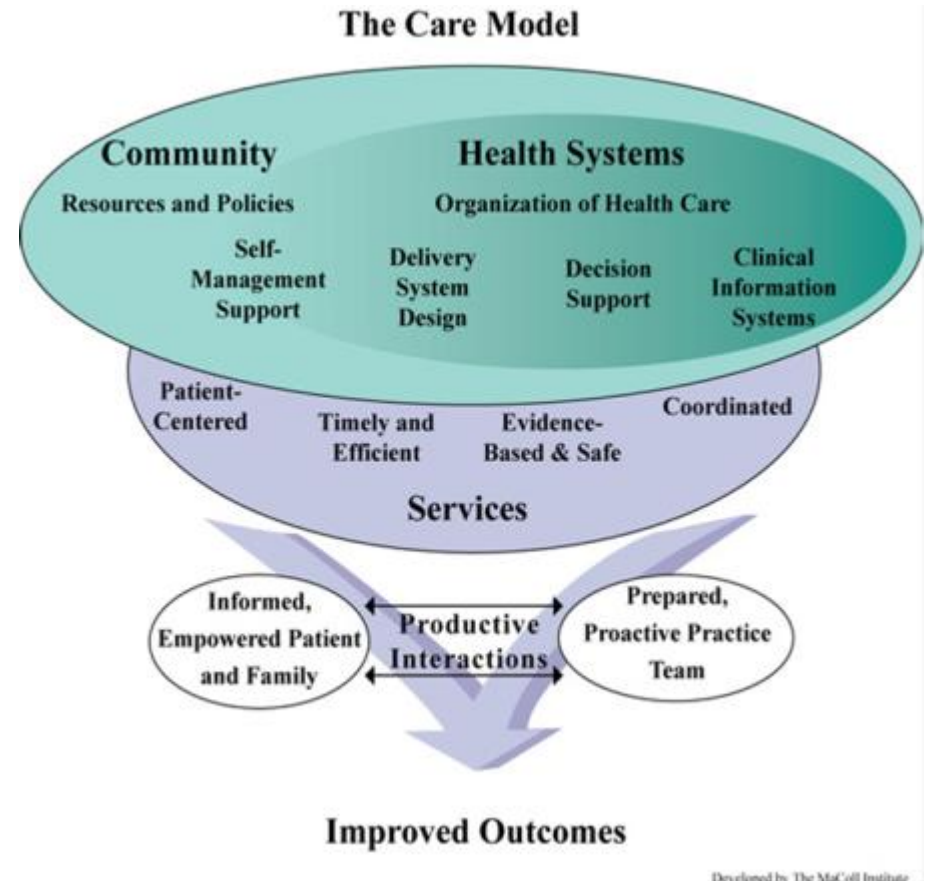
- **HIT-Enabled Diabetes Care**<sup>1</sup>
  - 44% lower failure rate of metformin treatment for type 2 diabetes
- **HIT-Enabled Cholesterol Management**<sup>2</sup>
  - 40% more very high risk patients achieve national cholesterol guidelines
- **HIT-Enabled Screening**<sup>3</sup>
  - Best breast cancer screening rates in US
  - Best HIV/AIDS screening rates in US
- **HIT-Enabled Cardiac Care**<sup>4</sup>
  - 24% lower probability of death from heart attack
  - 62% lower probability of serious heart attacks doing permanent damage
  - 90% lower mortality from second heart attacks
  - 89% lower all-cause cardiac mortality
- **HIT-Enabled Patient Satisfaction**<sup>5</sup>
  - Higher patient involvement in care
  - Over 800% more scheduled e-visits
  - Almost 600% more secure messaging with doctors
  - 24% fewer office visits

## Enabling factors for the reduction of costs chronic diseases with Health 4.0

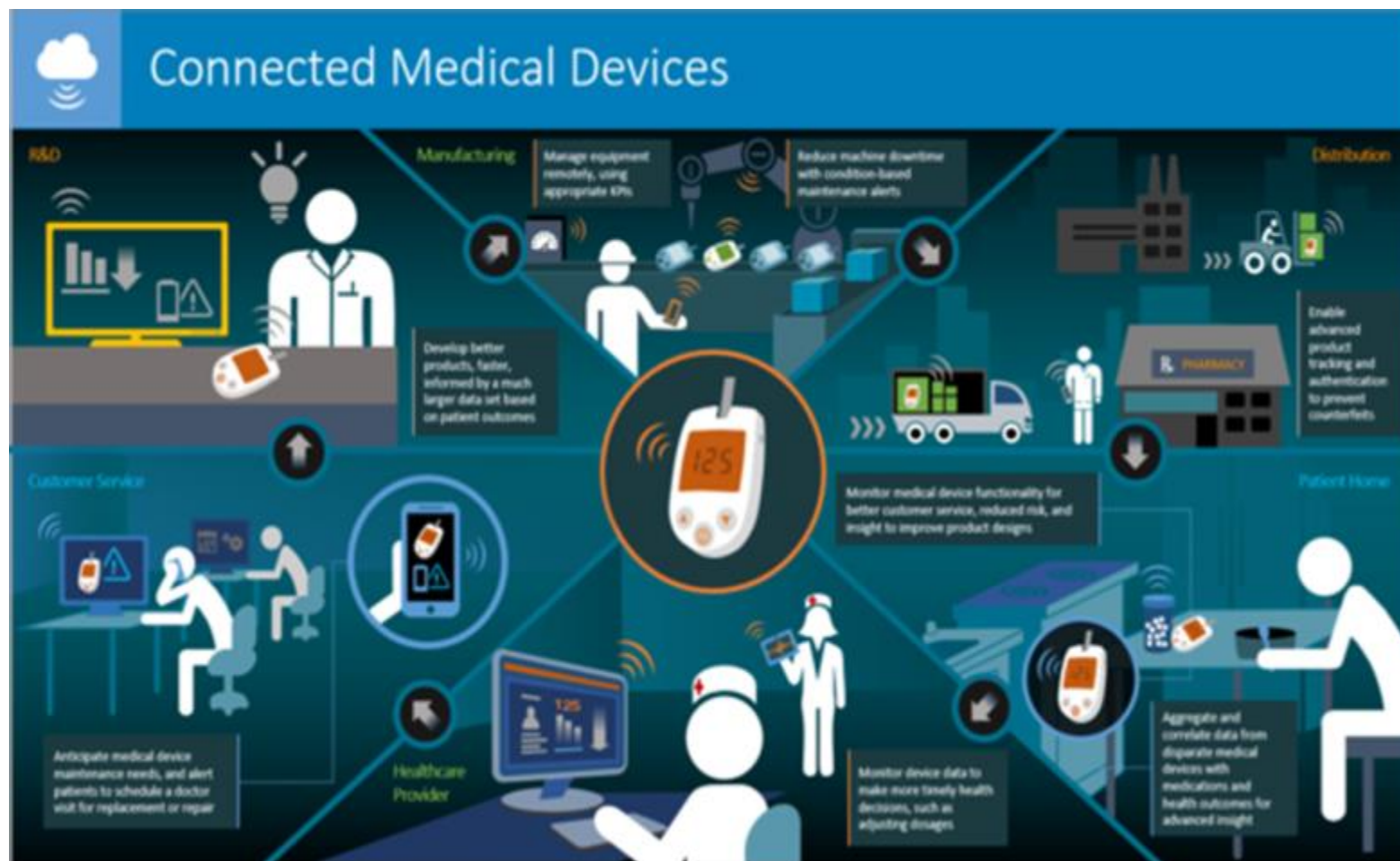


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**Enabling factor** for the transition from the «reactive medicine», structured to answer to the expressed needs of the patient, towards the «**proactive medicine**» whose purpose is to answer to the needs not yet expressed **of the healthy people** and to **optimize** the management of **the chronicity** according to the chronic care model.



# Healthcare 4.0 Role: BioHighTech Enabling Factors



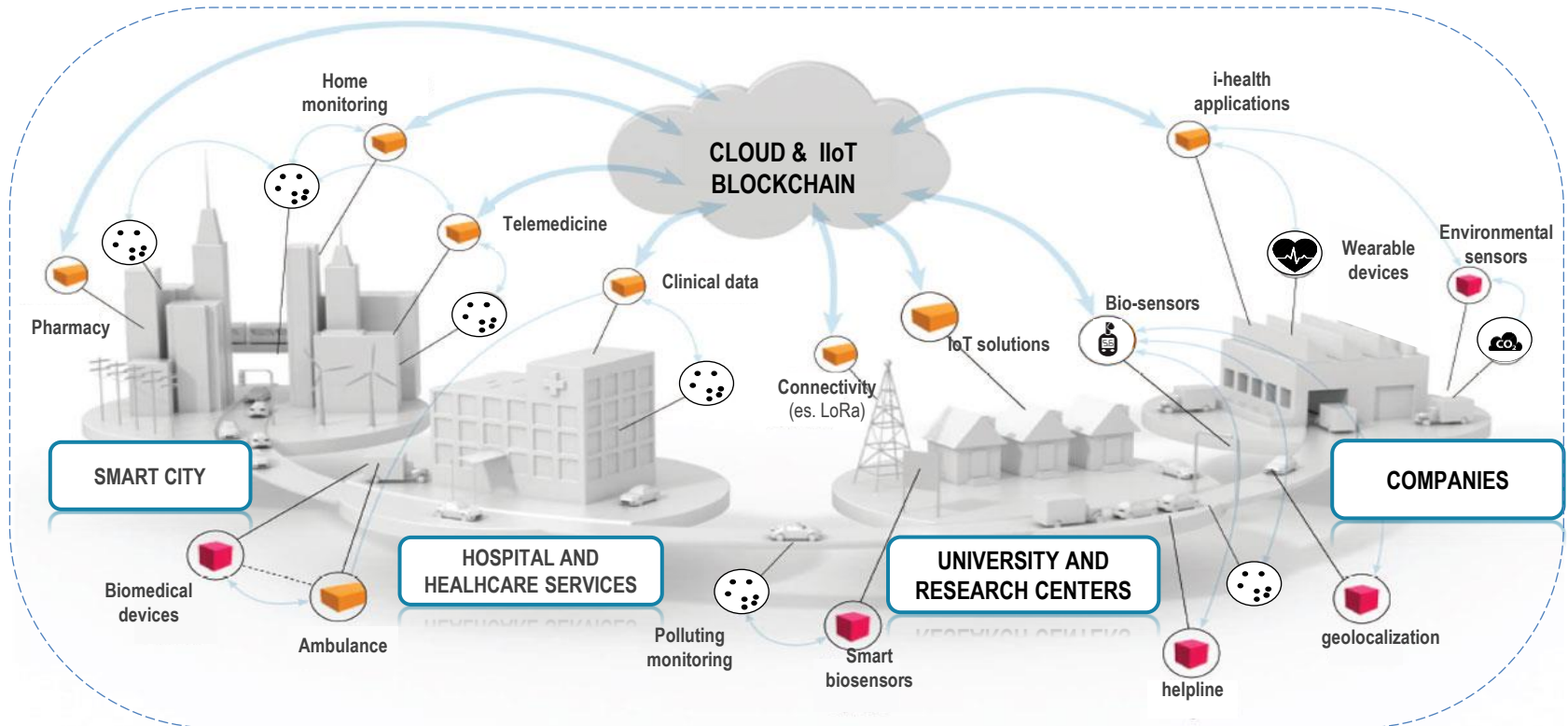
To integrate the BioHighTech technology with the Internet of Things technologies (es. Gateway, Clouds, Mobile Phone) to start the population health management processes. Therefore we could manage the health whenever and wherever it is needed with the proactive medicine, avoiding the healthcare expenditure cuts with economically a more sustainable model



# SMART CITIES: HEALTHCARE 4.0 WITH BIOHIGHTECH DEVICES



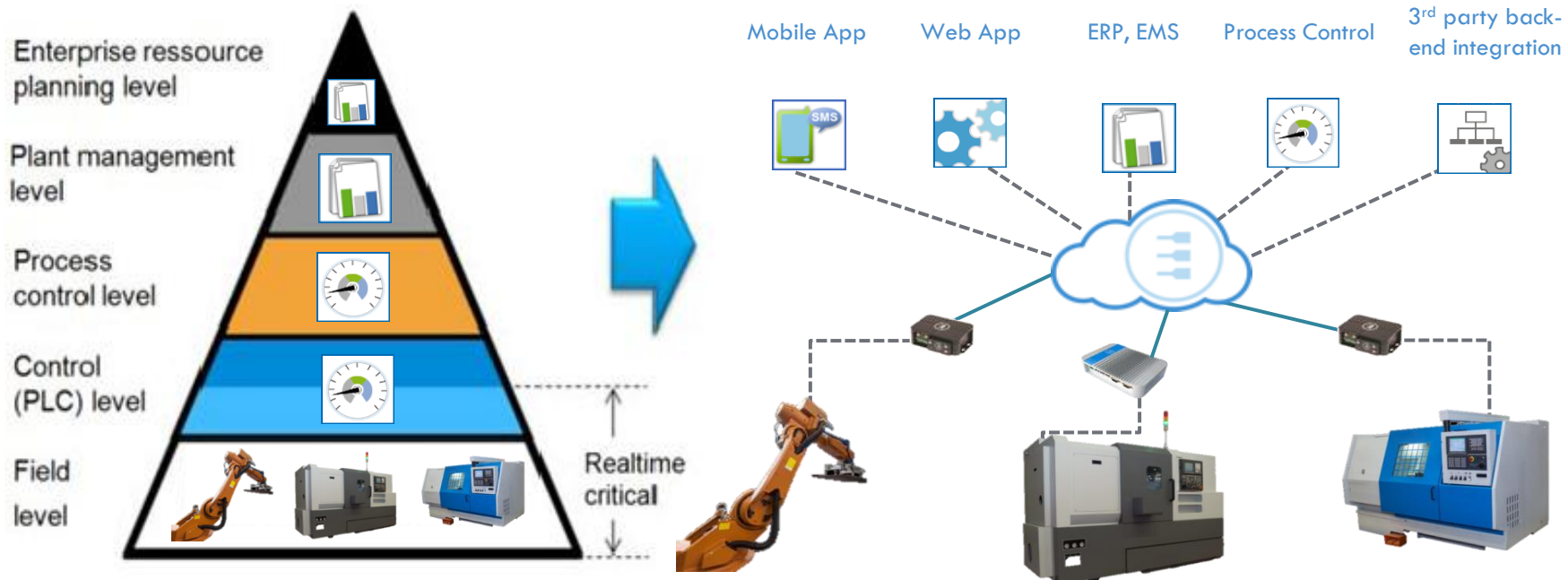
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# THE DATA LAKE: THE DAWN OF HEALTH 4.0



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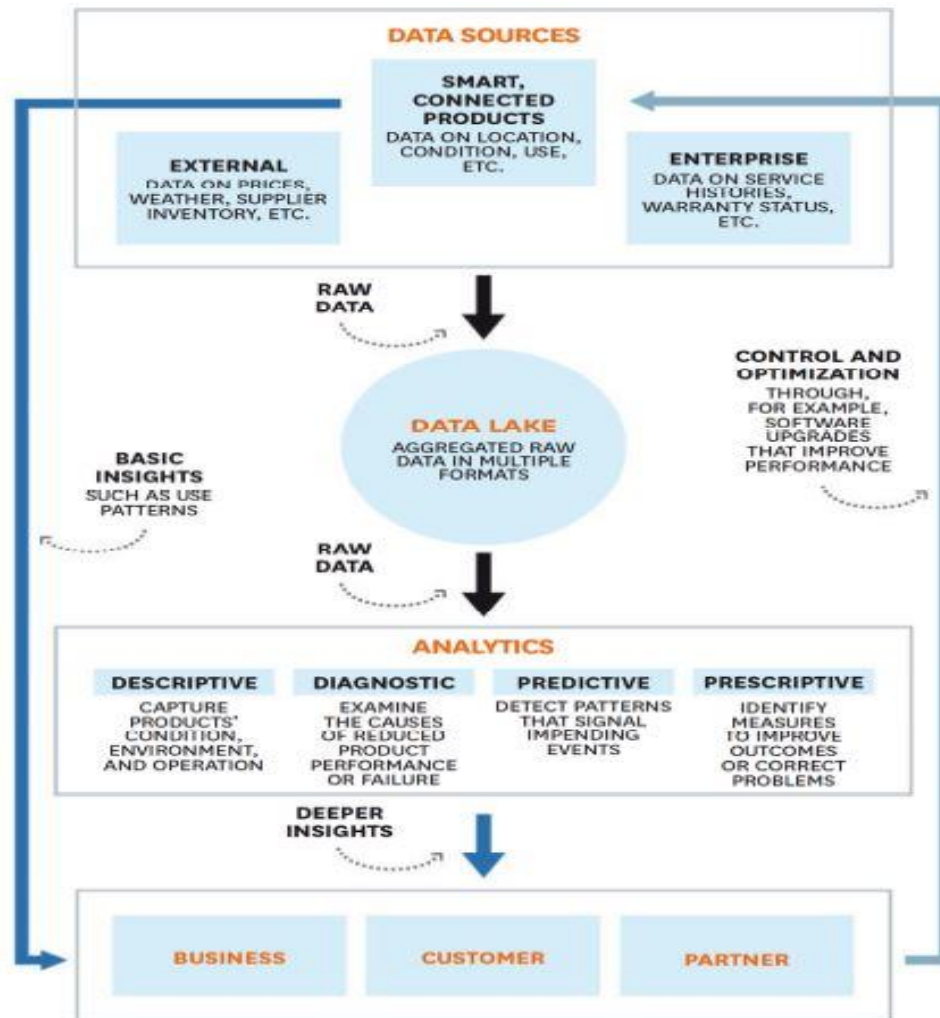


*IIoMT is instrumental to the generation of the Data Lake*





# THE DATA LAKE: PRODUCTS AND ADDED VALUE FOR HEALTH 4.0



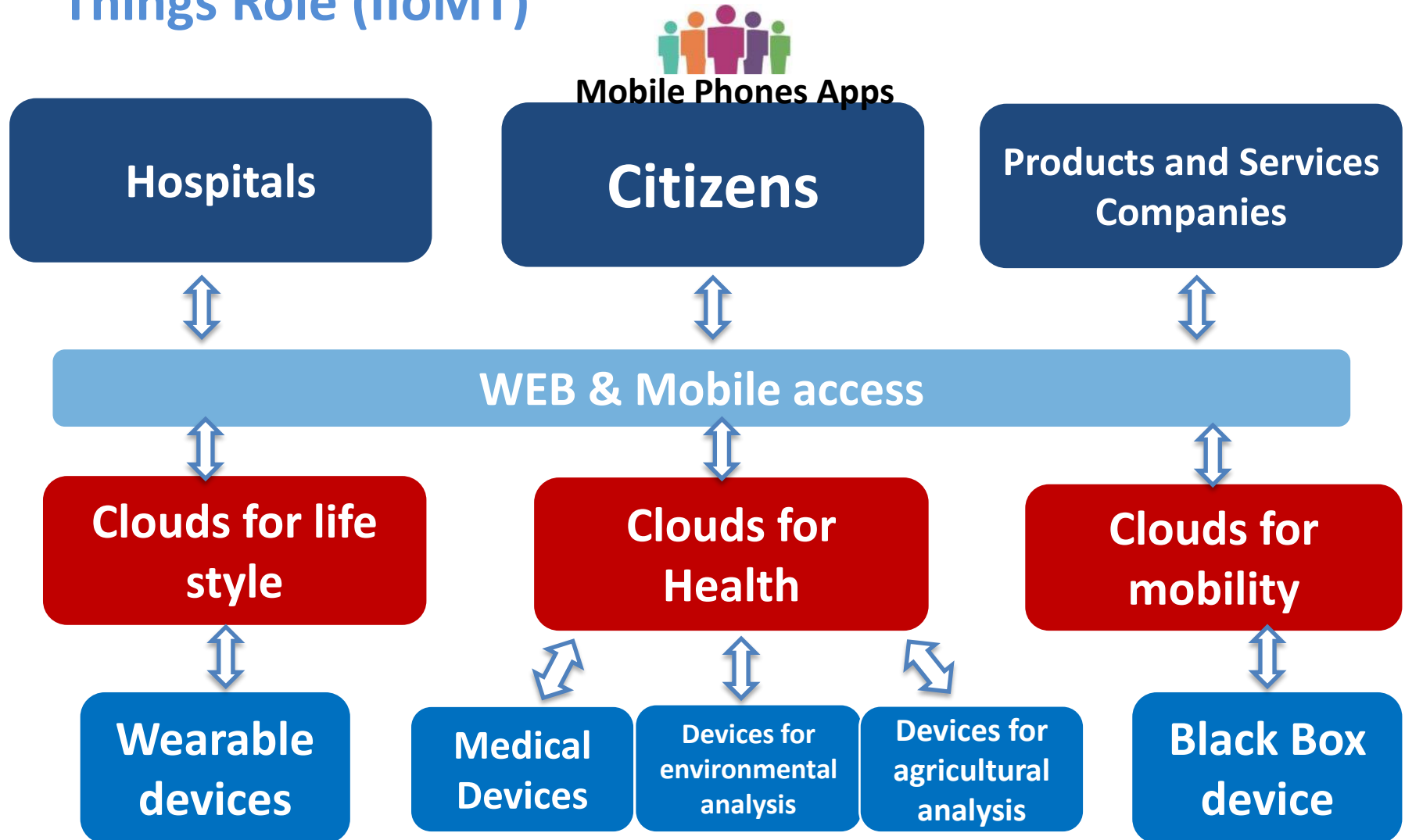
# HEALTHCARE 4.0: CLOUD HPC DATA CENTER ROLE



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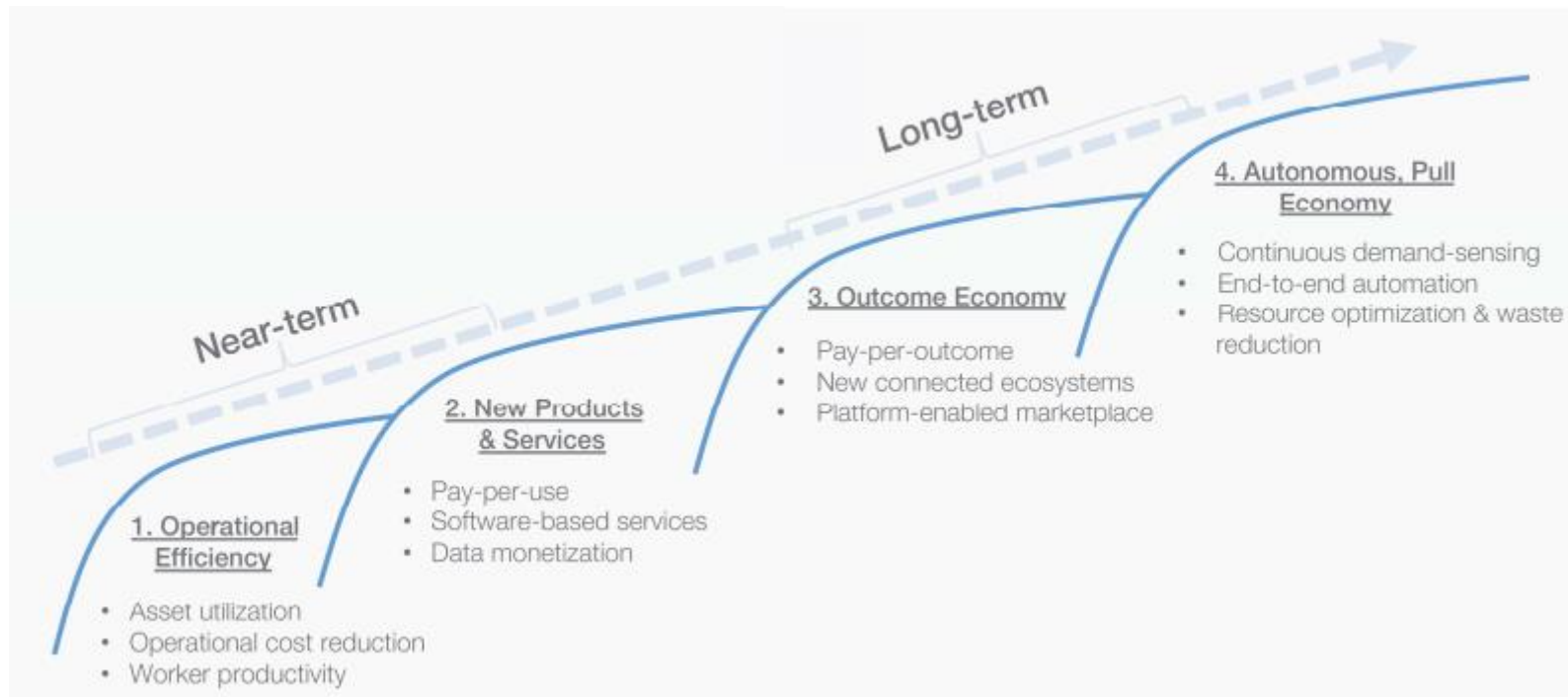


# HEALTHCARE 4.0: Industrial Internet of Medical Things Role (IIoMT)





# HEALTHCARE 4.0: NEAR AND LONG-TERM IMPACT OF BIG DATA ON THE BUSINESS MODEL



WEF – Industrial Internet Report 2016

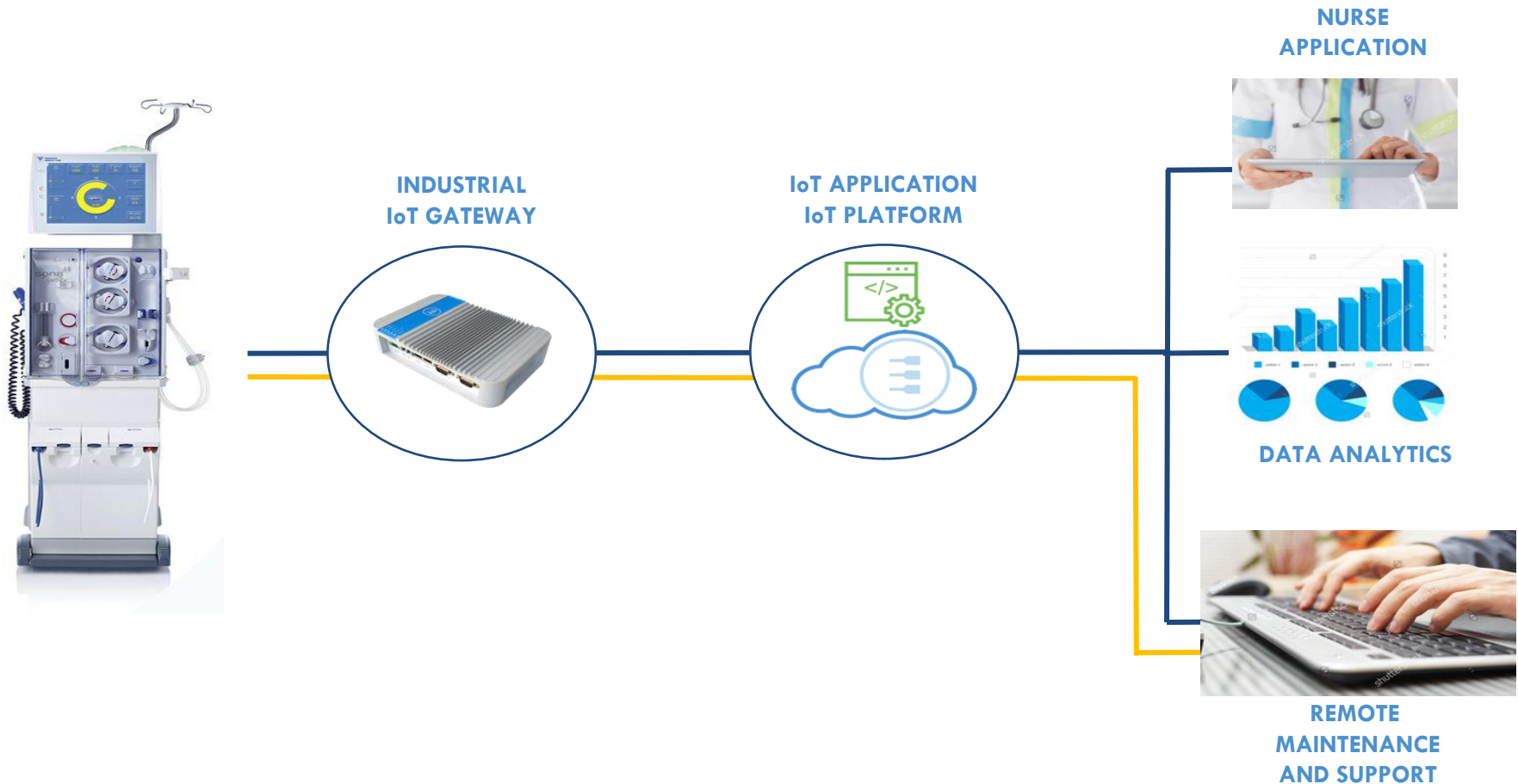


## HEALTHCARE 4.0: INDUSTRIAL COST MAINTENANCE ADVANTAGES



- Saving on scheduled repairs → **~12%**
- Reduced maintenance costs → **~ 30%**
- Fewer breakdowns → **~ 70%**

# HEALTHCARE 4.0: EXAMPLE OF OPERATIONAL AND CLINICAL APPLICATIONS



# BIOVALLEY GROUP COMPANY: VISION

Biovalley Group is set as a “Family and Friends Office” by Diego Bravar (founder of TBS Group) for investing in the BioHighTech industrial field and for accelerating the development of the equity value of the target innovative companies in a disruptive entrepreneurial ecosystem also with clinical Engineering outsourcing services.

Alpe Adria geographical regions for target companies:

- Friuli-Venezia Giulia Region in Italy
- Bordering Regions in Italy (Veneto, Trentino-Alto Adige)
- Bordering Countries (Austria, Slovenia, Croatia)

BioHighTech industrial fields:

- MEDICAL TECHNOLOGY
- BIO TECHNOLOGY
- BIOINFORMATIC & MEDICAL INFORMATIC

Size of BioHighTech Target companies:

- TBS Group (Large Company) and other Micro, Small and Medium Size BioHighTech Companies





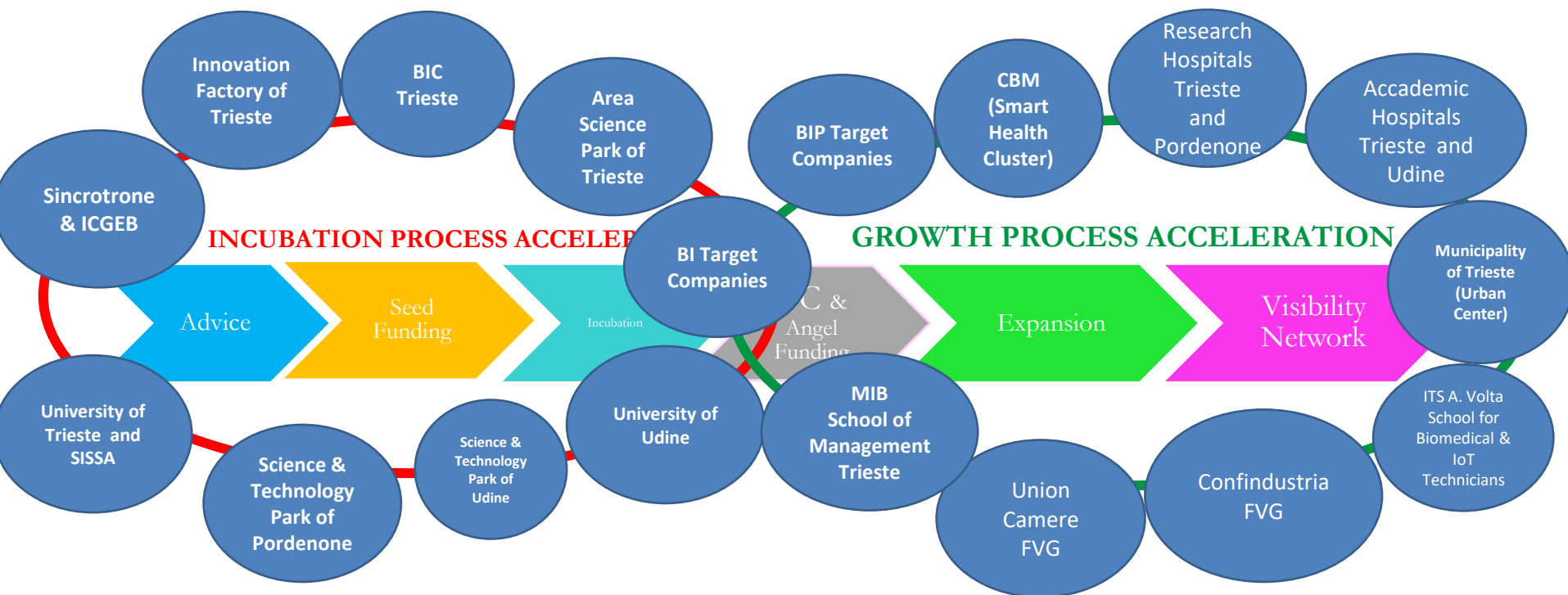
# BIOVALLEY GROUP COMPANY: MISSION



- Develop a **disruptive entrepreneurial ecosystem** in FVG Region and other Alpe Adria Regions **accelerating the incubation process of BioHighTech companies** from a network of universities, health & social research centers and science & technology parks
- Develop a **disruptive entrepreneurial ecosystem** starting from FVG Region investing minority equity in micro, small, medium size BioHighTech companies for **accelerating the development of their equity value** and for supporting the stable development and the equity value growth of a large size BioHighTech company (TBS Group – Althea Group)
- Develop a **disruptive entrepreneurial ecosystem** starting from FVG Region accelerating the growth of BioHighTech companies **improving research & innovation** activities between the BioHighTech companies networks and the Research Centers and Hospitals networks for developing innovative products and services

# Activity of Biovalley Group from 2017 until 2022: To accelerate the incubation and the industrial growth of the regional BioHighTech sector in order to develop a “disruptive” entrepreneurial ecosystem

## ROADMAP 2017-2022



## Activity of Biovalley Group from 2017 until 2022: Business Network Mentoring

- Follow up and management of the BioHighTech Net 4.0 companies network (more than 30 regional – Friuli Venezia Giulia - companies) in order to facilitate the identification of the «Target» companies for equity investments.
- Follow up and management of the BioHighTech Net 4.0 also in order to facilitate the companies' networking and their collaboration with the Research Institutions and Hospitals for attending the research tenders related to the Smart Health Specialization Programs of FVG Region financed by European funds and to other specific regional European research programs.
- Organization of yearly events devoted to biomedical, biotechnology and bioinformatic sector, but also to digital and energy in 2022.



# OPEN INNOVATION IN FRIULI VENEZIA GIULIA REGION: FROM RESEARCH ECOSYSTEM TO INNOVATION COMPANIES' NETWORK (BIOHIGHTECH NET 4.0)



biovalley  
investments



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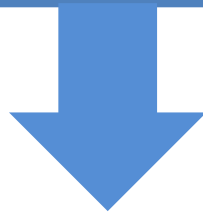
Tinti snc  
LIVOLI

transactiva  
MOLECULAR FARMING



OPEN INNOVATION in Friuli Venezia Giulia Region: BIG Group SpA  
will enhance BioHighTech Net 4.0 companies business  
development with IoT & Cloud HPC Computing

BIG Group SpA strongly focuses on IoT, Cloud and  
Industry 4.0 to increase innovation in healthcare sector  
for supporting BioHighTech companies growth.



Trieste Valley Srl is a Company of the Big Group SpA  
that acquired a High Performance Computing by  
Eurotech in 2020.



## OPEN INNOVATION in Friuli Venezia Giulia Region: a regional example of connections between entrepreneurial and research ecosystems

### TRIESTE SHOWS ONE OF THE HIGHEST RESEARCHERS DENSITY IN ITALY AND IN EUROPE...

- 37 researchers out of 1,000 workers (Italian average 4.9; European average 7.9)
- 10,400 researchers and academics in scientific institutions and universities (out of 204,000 inhabitants - 5% of the population)
- The number of foreign researchers in Trieste institutions exceeds 5,200 units (50% of the total)

### ...TRIESTE ALSO HAS THE HIGHEST ENTREPRENEURS DENSITY IN INNOVATIVE START-UPS IN ITALY

- They work in **58 Innovative High-Tech Start-Ups**
- **Trieste is the first Italian city for innovative start-ups density, equal to 1.42% of the total number of companies**

**Friuli Venezia Giulia (FVG)** is the third Italian region in terms of innovative start-ups incidence (more than 200 innovative start-ups), thanks to its excellent research, innovation and educational system and is the Region where the activities of the main european clinical engineering outsourcing services company started in 1987. (TBS Group now Althea Group)



# OPEN INNOVATION: example of Healthcare 4.0 international industrial synergies among BioHighTech Net 4.0 companies and TBS Group (now Althea Group)

## SALES & TECHNICAL NETWORK



SINERGY

## NETWORK OF MICRO, SMALL AND MEDIUM SIZE BIOHIGHTECH COMPANIES





## Open Innovation in Friuli Venezia Giulia Region : Smart Health Cluster

FVG Region (Italy) has the "real" possibility of transforming the knowledge ("oil") that is in many research institutions and regional Hospitals with innovation, accelerating the incubation and growth of regional BioHighTech companies (about 5.000 employees in this sector) having adopted a Smart Specialization strategy on "Smart Health" for European Region Research Program (2015-2020).

Trieste as a regional capital with a potential high GEI index could become the potential Capital of innovation in the BioHighTech sector with an "immediate" use of the huge "national" and "international" investments made with the support of Italian Government in this city during the last 30 years (about 300mln of Euro per year – 1.500 Euro per capita) to develop the innovation from the research activity of various Universities and Research Centers even in the Smart Health field (i.e. 2 Universities, 2 Academic Hospitals, Sincrotrone Elettra, International Center for Genetic Engineering and Biotechnology, International Center for Theoretical Physics, etc.).

Indeed Euroscience selected Trieste as European Capital of Science from 2018 to 2020 for organizing the ESOE2020 and the Health Care has become one of the main topic treated from different perspectives (science to science, science to citizen, science to policy and science to business).

# TRIESTE ENCOUNTERS ABOUT SCIENCE AND OPEN INNOVATION (TESI)



With **PROESOF 2018-2020** programmes (**TESI**: Trieste Encounters about Science and Innovation), **Trieste International Foundation and other research institutions aim** to start the cooperation among universities, research Institutions and innovative enterprises operating in Italy and in Central, Eastern and Balkan Europe.

# Trieste Valley Innovation Hub Project (2022-2025)

The aim of the project “TRIeste valley innovaTION hub”, acronym TRITION, is to create a technological infrastructure for innovation to strengthen the collaboration and connection between scientific bodies and SMEs operating in the fields of life sciences, artificial intelligence and energy transition. The project is promoted by OGS with an international outlook and will be implemented with the participation of the Business Innovation Center of Trieste, which can boast more than twenty years of experience in services for the establishment, growth and consolidation of innovative companies. The main infrastructure output of the project will consist of three new laboratories specialized respectively in life sciences (named BioHighTech), artificial intelligence (DigitalHighTech) and energy transition (EnergyHighTech), obtained from the expansion and modernization of some existing buildings. The labs will be made available to scientific entities and private companies to foster shared projects benefiting services offered by Trieste Business Innovation Center.

# Trieste Valley Innovation Hub Project (2022-2025)

In the energy transition area, projects will be focused on Green Hydrogen Innovation, Electrical and Thermic Energy Coproduction in a Circular Economy contest, Innovative Energy Storage Solutions. In the life science area, focus will be on Chemical, Biochemical, Cellular and Molecular Biology, Sensors and Biomaterials while in the artificial intelligence area will be on High Performance Computing (HPC), High Throughput Computing (HTC), and High Performance Data Analysis (HPDA).

The topics to be developed with the project of this proposal have been selected considering the scientific and academic know-how localized in Friuli Venezia Giulia Region represented by OGS (project promoter) and the specialization of the SMEs of FVG and bordering Countries and Regions (Slovenia, Croatia, Carinthia, Styria, Hungary, Veneto). The project basilar assumption is that a strong connection element between the OGS competences and SMEs execution attitude is needed and a technological infrastructure for innovation will be the right answer.



Biovalley  
Group

THANK YOU