The Role of Universities in the Emerging ICT World

Karl Aberer	EPFL
Adrienne Corboud Fumagalli	EPFL
Georges Gielen	KU Leuven
Marco Gilli	Politecnico di Torino
Steve Kang	KAIST
Donatella Sciuto	Politecnico di Milano

Chair: Martin Vetterli, Swiss National Science Foundation

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Karl Aberer

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EPFL
Universities and the Digital Revolution
Karl Aberer
Vice-President for Information Systems
Symposium on Emerging Trends in
Electronics, Montreux, 2014
EPFL | 2014

The Digital Revolution – Big Data

Trends

- Big Data is pervading almost every field of science and engineering
- Innovation is happening at the boundary of disciplines
    - in particular at the boundary of IT and its applications
- Innovation in IT is driven by Big Data

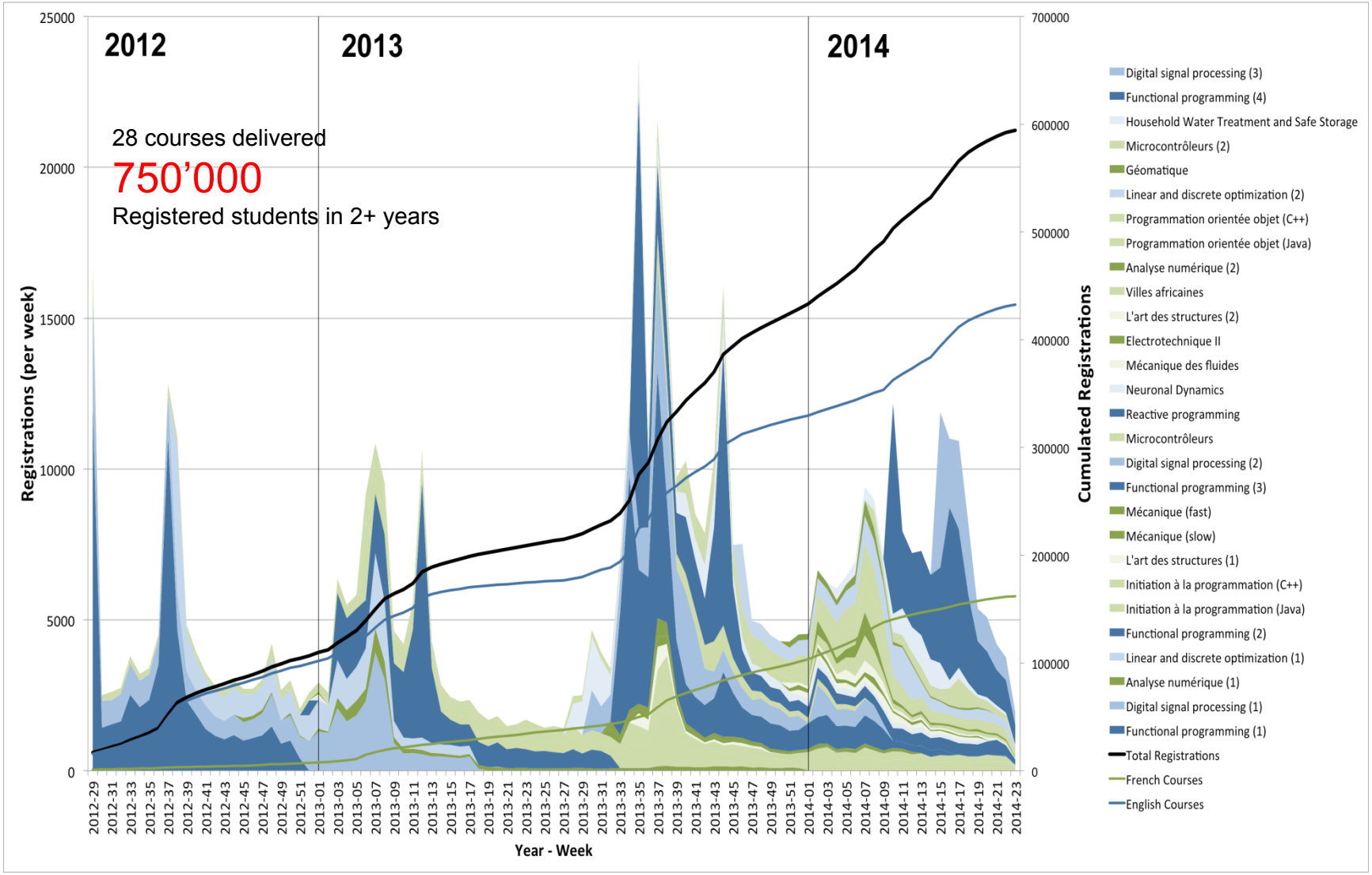
	IT?	Big Data?	Interdisciplinary?
Genome Editing	yes	pot.*	Life science
Agile Robots	yes	pot.**	Robotics
Ultraprivate Smartphones	yes	yes	CS – Big Data related issue
Microscale 3-D Printing	yes	pot.***	Materials
Mobile Collaboration	yes	yes	CS – Big Data related issue
Smart Wind and Solar Power	yes	yes	Energy - CS
Oculus Rift	yes	pot.****	CS – Big Data related issue
Neuromorphic Chips	yes	yes	CS - Life science
Brain Mapping	yes	yes	Life science - CS
Agricultural Drones	yes	yes	Environment – Robotics - CS

2014 breakthrough innovations,
MIT technology review – May-June 2014

* Genomic data is the basis
** Google bought the company
*** 3D model data
**** data visualization

Job Postings mentioning Big Data
Similar for data scientist, social media, MongoDB

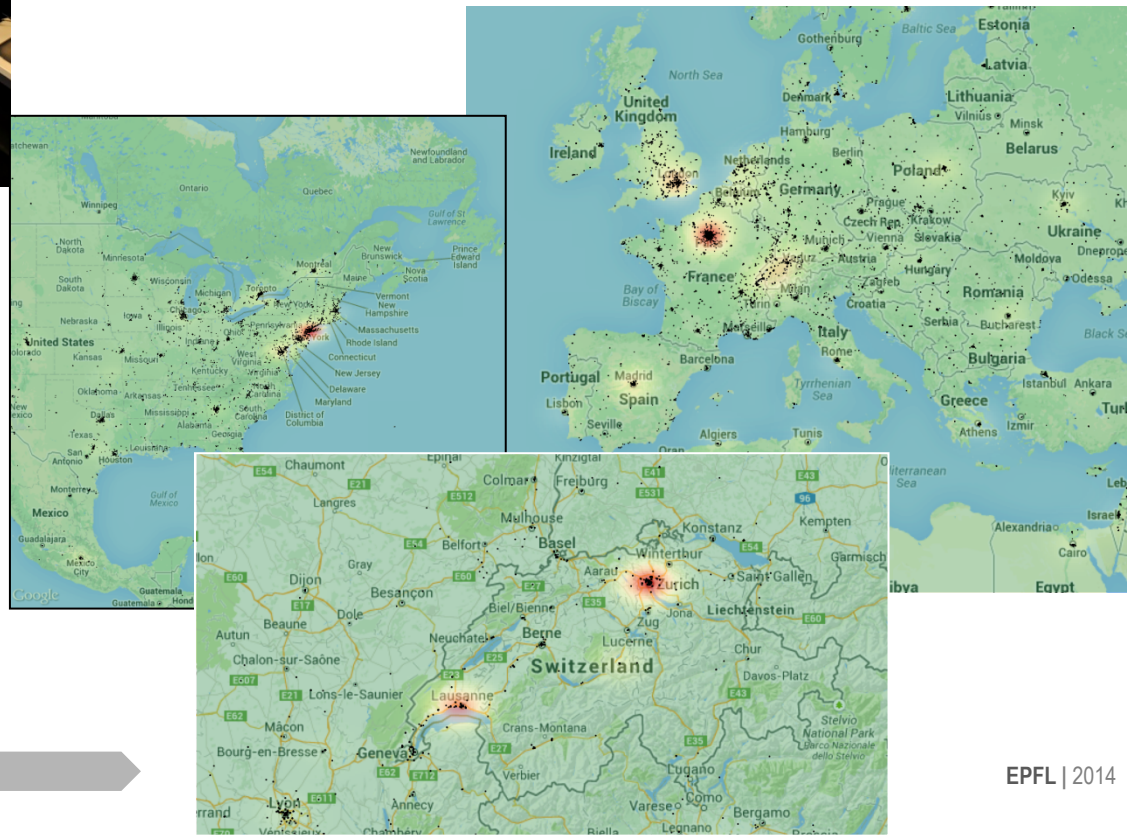
MOOCs at EPFL



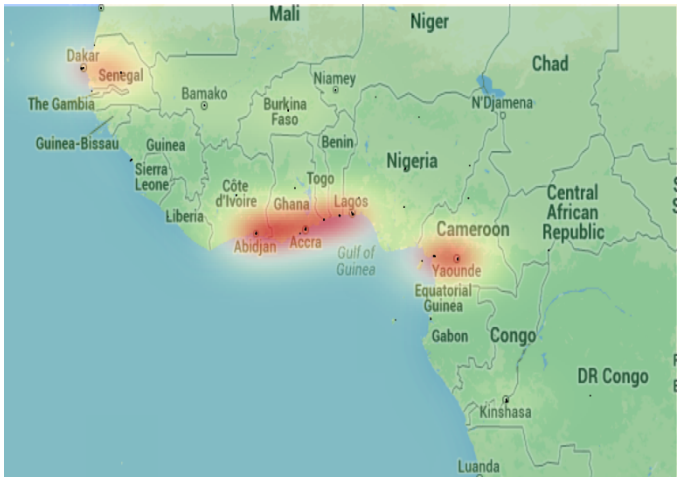
Impact of MOOCs at EPFL

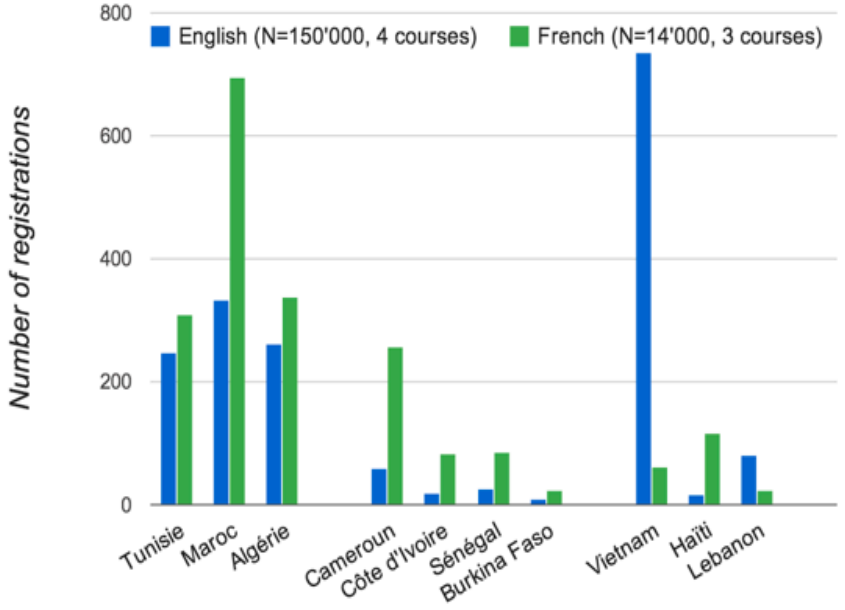
MOOCs Studio

- Gobal visibility
- Improving campus teaching
  - learning data
- Outreach
  - continuous education
  - developing countries



MOOCs for Africa





Digital Humanities

Venice Time Machine

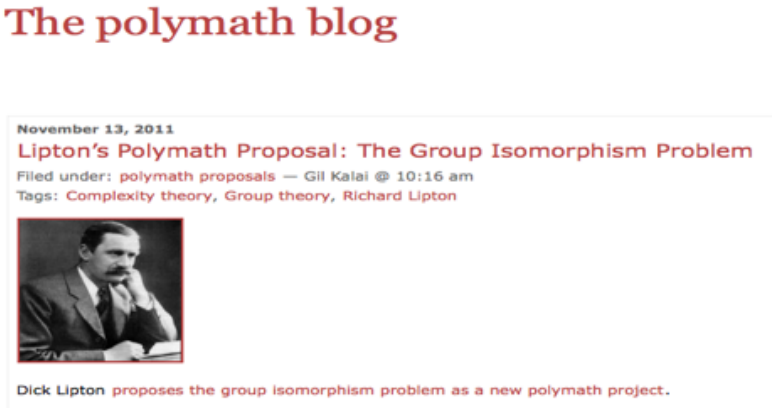
Venice – State Archive : 73 km library!

Montreux Jazz Archive

The Fifth Paradigm in Research

- Fourth paradigm: data-driven science
  - Simulation-based research (e.g. Human Brain Project)
  - Data-Driven research (e.g. Venice project)

- Fifth paradigm: networked science
  - Collaborative research (new ways to do science)
  - Crowd-sourced research (involving citizens)


The polymath blog

November 13, 2011

Lipton's Polymath Proposal: The Group Isomorphism Problem

Filed under: polymath proposals — Gil Kalai @ 10:16 am

Tags: Complexity theory, Group theory, Richard Lipton

Dick Lipton proposes the group isomorphism problem as a new polymath project.

Challenges

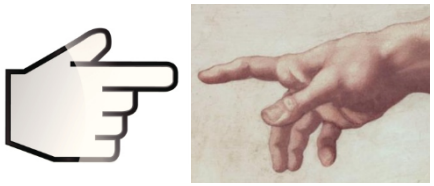
The digital revolution implies an educational challenge for Universities

- Rapidly increasing demand in Big Data Scientists and Digital Scientists
- Engineers and researchers have to become Big-Data savy and open to other fields

Objectives

- Digital Science **Research** implies convergence among disciplines
- **Education** for future Digital Science needs of science, economy and society!
- **Innovation** in Digital Science to create new jobs and companies

- Promote **Convergence** of technological and humanistic thinking in novel ways



Mega-Trend: Dissolution of existing structures!

Change in organization

- Closed organization ➔ Open organization
- Hierarchical organization ➔ Networked organization
- Raises questions of boundaries, identity, attribution

Examples

- Education
  - Who are the students of a university? On campus only, all online?
  - Who grants degrees to students having courses from different universities/platforms?
  - Dissolving distinction between education and professional life
- Research
  - Who claims the result of collaborative research? Who played which role?
  - Where are the boundaries between disciplines after the bio-nano-info-cogno convergence?
  - How to share scientific data resources?

Adrienne Corboud Fumagalli

EPFL

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Entourage d'Antoine Le Moiturier:

***saint Denis**, 1460/1470*

Prof Silvestro Micera, Bionic arm
Restoring sensory and motor functions after arm or hand amputation

Georges Gielen

KU Leuven

KU LEUVEN

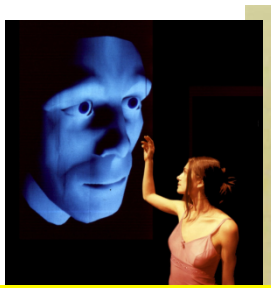
The role of universities in the emerging ICT world

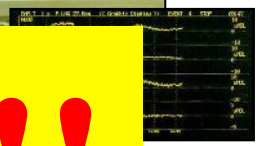
Prof. Georges Gielen
Vice-rector Science & Engineering
KU Leuven, Belgium

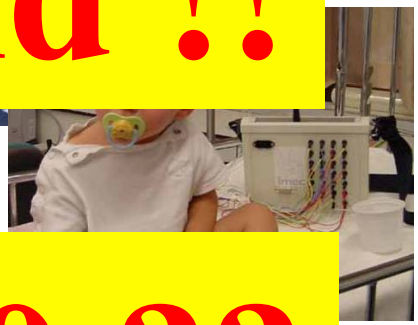
Evolution in mankind

KU LEUVEN

Ubiquitous role of electronics





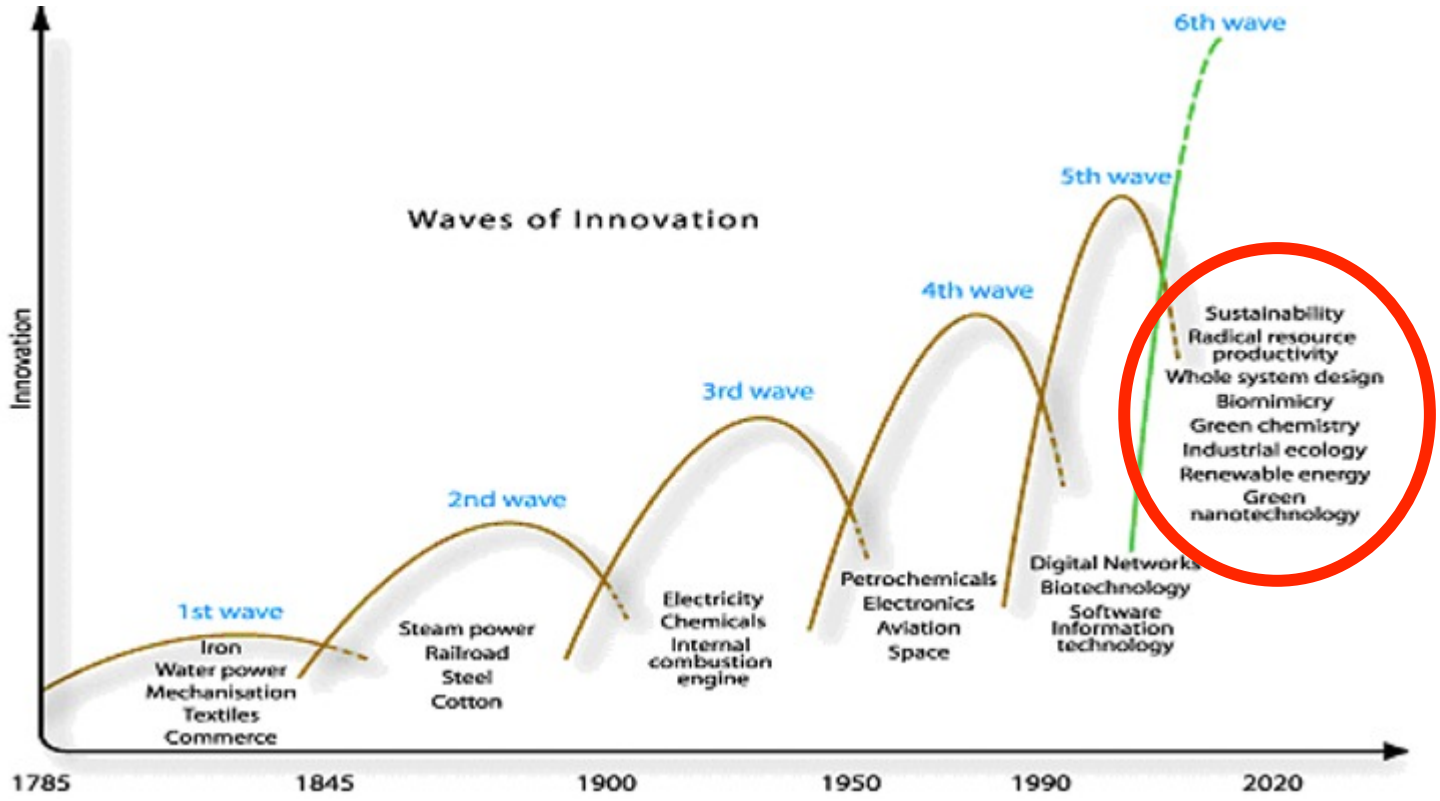


The smart world !!

How about 2050 ??

KU LEUVEN

Waves of innovation



[Kondratieff – Schumpeter – Smihula]

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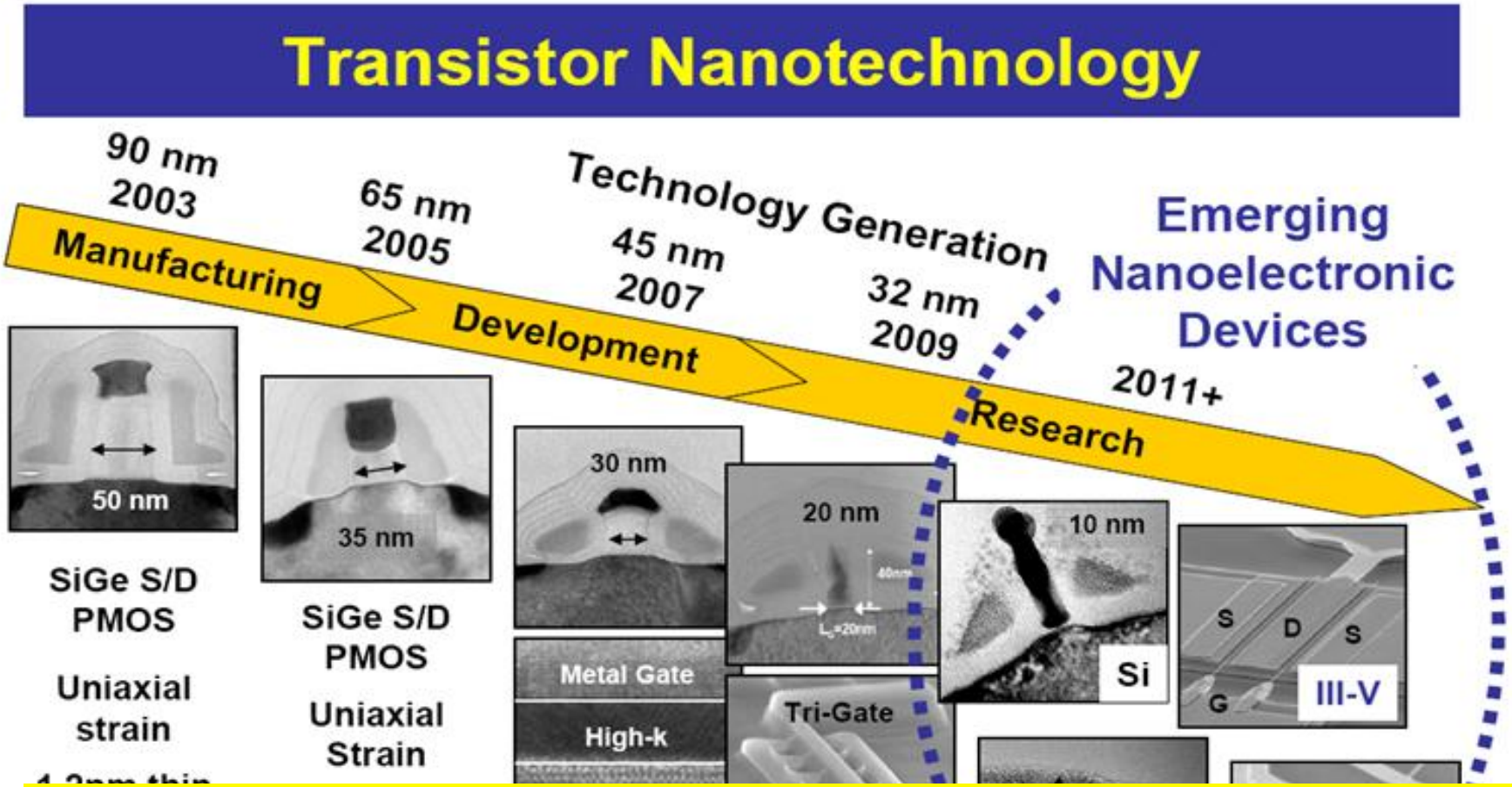


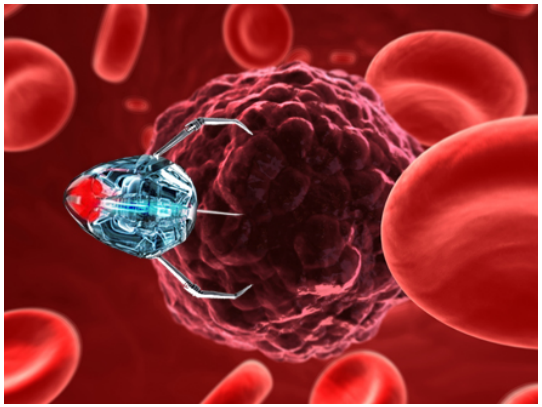
which device(s) to use and study in 2020 – 2030 – 2040 ?

Note: Future options subject to change

Academic education

How to educate our youngsters for their future career ?

- stimulate their interest to address societal problems by means of technological innovation
- growing complexity of systems
  - learn system thinking
    - teach principles of “engineering design”
  - interdisciplinary :
    - connect electronics / ICT to the biological
- which technology to use ?
  - technologies continue to evolve and to emerge
  - need to learn basic principles
    - regardless of the SoA implementation device

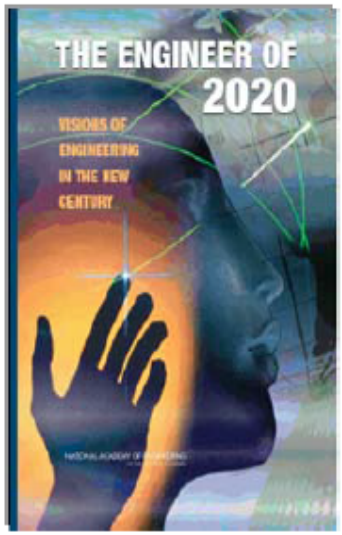


Rapport 'The engineer 2020'

A Vision of the Contexts for Engineering in 2020

Emergence of new fields, tools, and contexts

Examples: bio-tech, digital systems; computer systems/tools; sustainable technology; **multidisciplinarity and interdisciplinarity**, social, political & economic, diversity; **global markets & contexts;** interaction of engineering and public policy



Attributes of the Engineer of 2020

- Strong analytical skills
- Practical ingenuity
- Creativity
- Communication competencies (oral, written, and cultural)
- Business, management, and leadership skills
- High ethical standards and professionalism
- Agility, resilience, flexibility

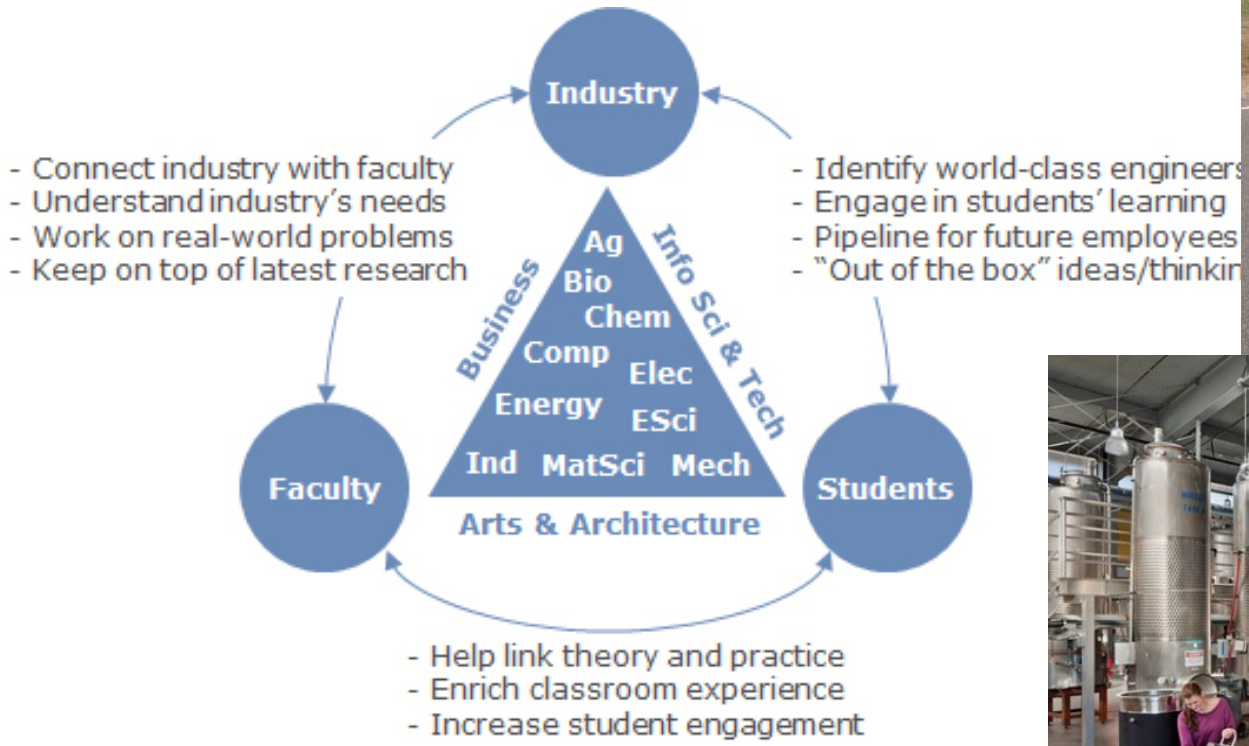
http://www.nap.edu/download.php?record_id=10999

Role of ICT in education

- exponential growth in science and publications
- change teaching paradigm
  - from teaching everything to teaching basic principles
  - each student specializes in limited field(s)
  - use “database” on the internet for finding all information
- use ICT for :
  - preparation courses
  - individualized learning
    - focusing on each student’s weaknesses
  - support continuous learning after graduation
- large emphasis on hands-on design projects
  - learning engineering principles hands-on

The Learning Factory concept

- bring the real world into the classroom



[Penn State University]

KU LEUVEN

Marco Gilli

Politecnico di Torino

Symposium on Emerging Trends in Electronics - Montreux
1st December 2014

The Role of Universities in the Emerging ICT World

Marco Gilli
Rector of Politecnico di Torino - Italy

POLITECNICO DI TORINO

The Evolution of the University Model

POLITECNICO DI TORINO

Education oriented university

Research oriented university

Technology transfer/ knowledge sharing

Entrepreneurial oriented university

21° Century university

all models combined

A New Strategic Role for Technical Universities

POLITECNICO DI TORINO

The Role of Universities in the Emerging ICT World

POLITECNICO DI TORINO

Research and Technology Transfer

To promote a collaborative and interdisciplinary approach

To foster the creation of inter-department Labs/Centers, possibly in partnership with industry, where IT technology and methodologies are developed in multidisciplinary fields, like energy, transports, health care and others;

Collaboration with Industry

Strategic partnership agreement with Executive Board Meeting

Common research infrastructures and joint laboratories with industries in the campus

Joint research projects (European National Regional level)

Extensive PhD programs and joint master programs

Job opportunities for talented students and researchers

Education

A Bachelor/First level degree in IT subjects with a fundamental background in mathematics and basic sciences

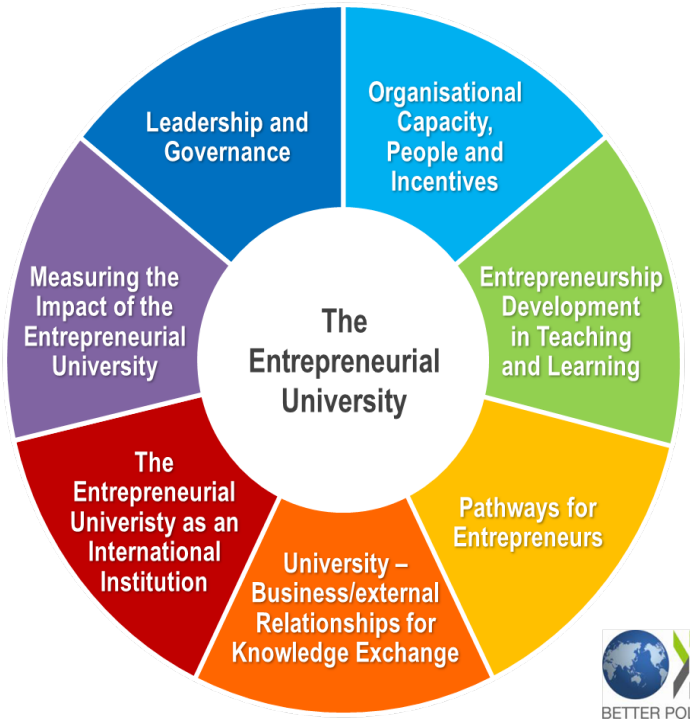
Some Masters of Science/ Second level degrees, focused on IT application to interdisciplinary subjects, possibly co-designed by Academy and Industry

In particular the potentiality of MOOCs for regular and continuing education should be exploited

Entrepreneurial Approach

POLITECNICO DI TORINO

To develop an **entrepreneurial approach** for both research and teaching, by promoting **incubators**, with a section devoted to interdisciplinary IT businesses, and **proper policies** for exploiting the most significant outcomes in IT research and applications.



WHY PROMOTING INCUBATORS

To support the creation of knowledge-based start-ups with high-growth potential

To provide consultancy services along the process from Idea to Company

To manage a high-profile marketplace and network linking entrepreneurs, professionals, managers and investors

To Offer high-quality logistics services to host start-ups and foster motivation and collaboration.

European Commission

OECD
BETTER POLICIES FOR BETTER LIVES

Steve Kang

KAIST

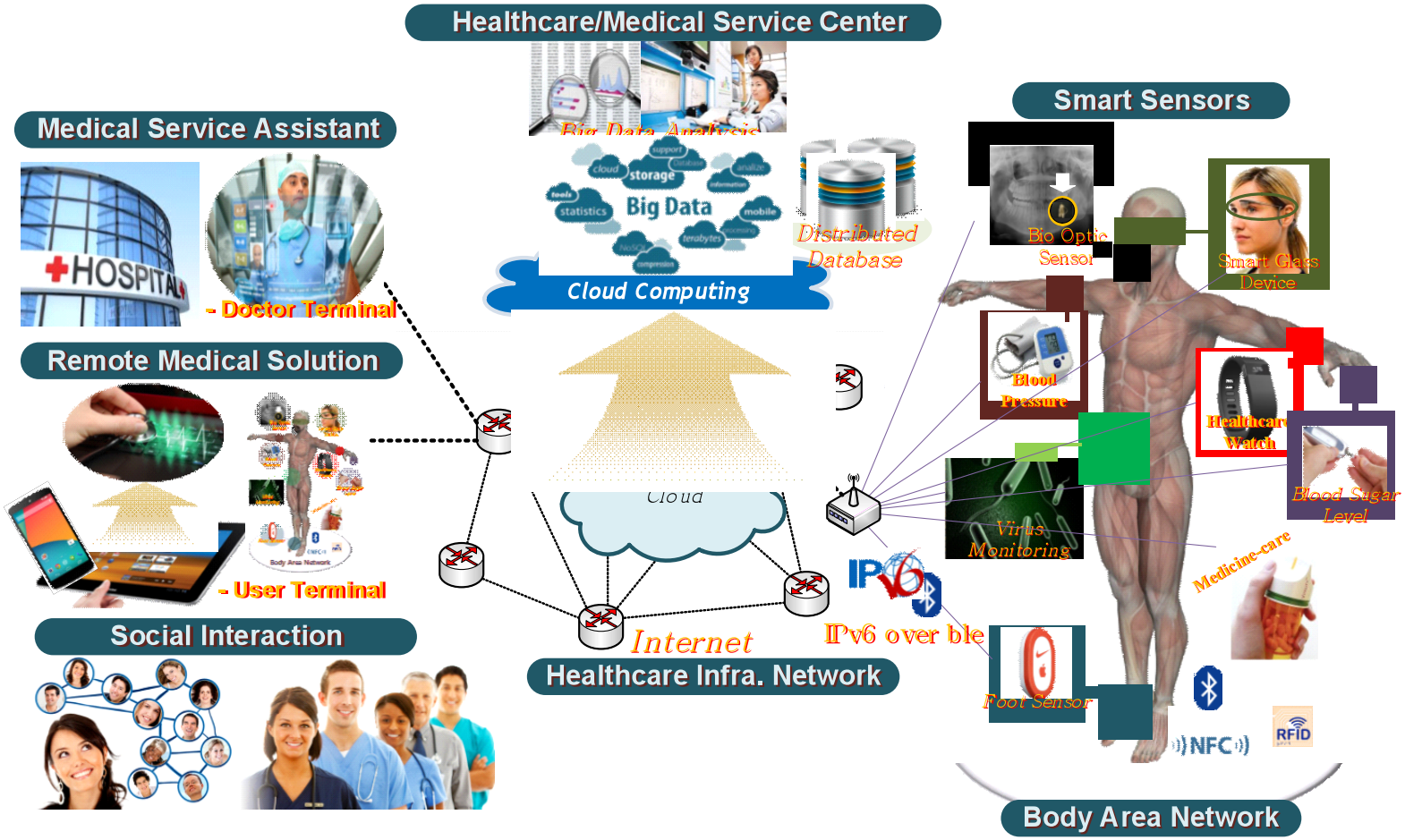
Role of Universities in the Emerging ICT World: University Social Responsibility(USR)

Sung-Mo "Steve" Kang
President
KAIST (Korea Advanced Institute of Science and Technology)

HES with ICT (Healthcare, Education, Safety)

Dr. M (Technologies Bridging the Gap between Hospitals & IT Industry)

- Mar. 2014 ~ Feb. 2015 (1.8M US$ / 1 year)
- 28 faculty from College of Information Science and Technology of KAIST and MDs from Sun Medical Center



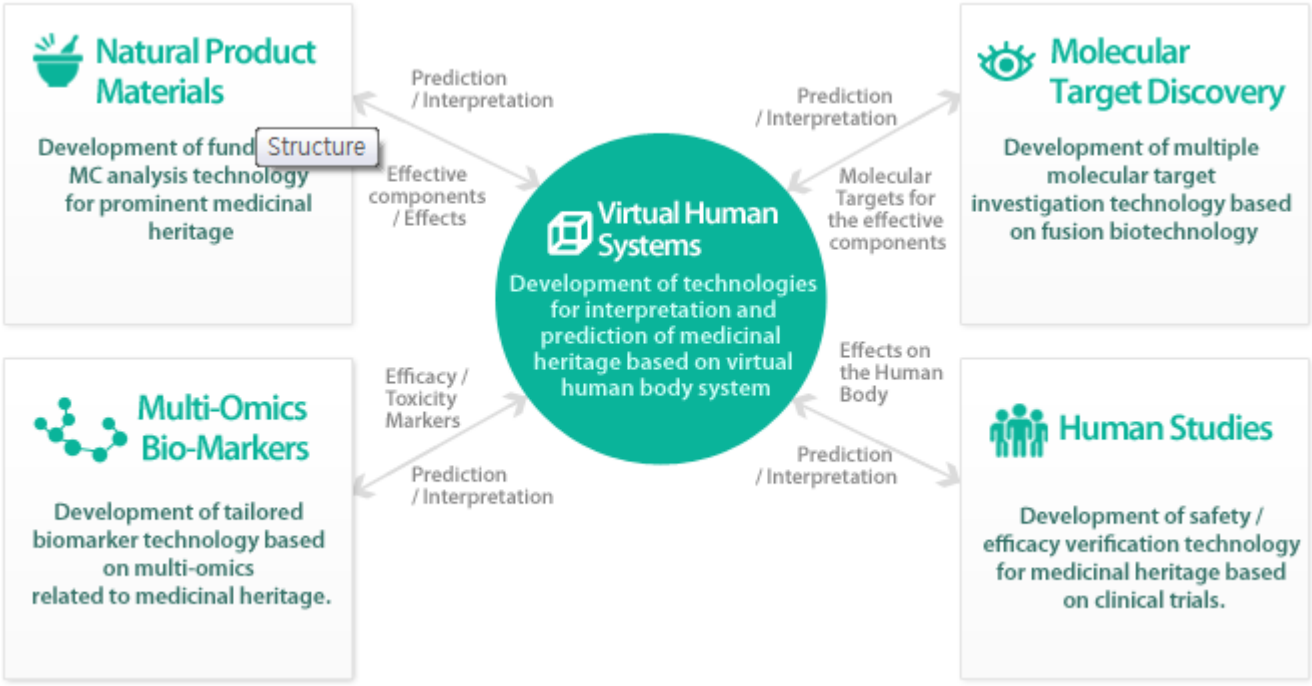
KAIST

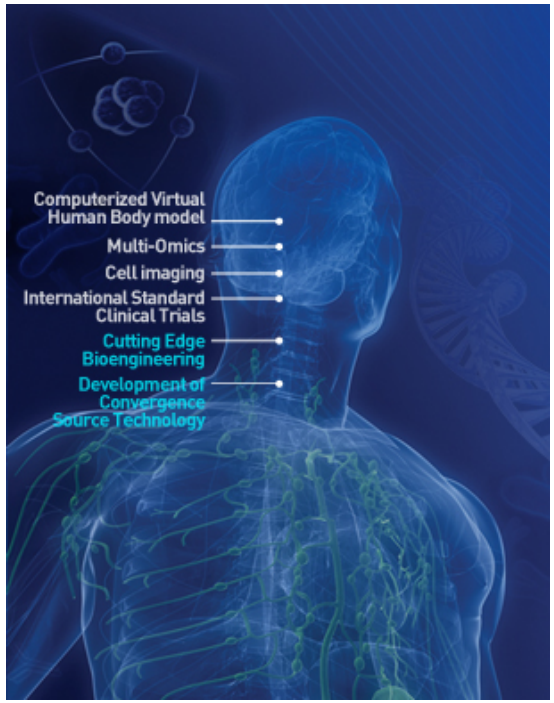
Bio-Synergy Research Center

Sep. 1. 2012 ~ Aug. 31. 2022(10yrs)
150M US$ Project

BSRC

- **To develop fusion source technology of IT and BT that can be utilized in investigating system-level MCMT(Multi-Component, Multi-Target) activation principles of natural materials empirically proven by traditional knowledge including the Dongeuibogam(1596~1610).**





Education 3.0 (KAIST Open Online Course, KOOC)

Interactive Class

No Lecturing

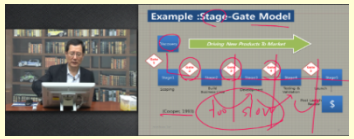
Problem-Based, Collaborative, Active

Team Learning + TA Support

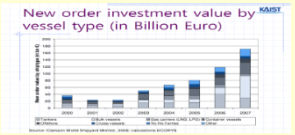
Flipped

Online Self-Learning

Lecture Video



Lecture Slides

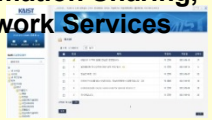


Textbook

Quiz & HW

Virtual Lab

Q&A, Information Sharing, Social Network Services



MOOC or e-Learning

Forbes — Google Classroom Offers Assignment Center for Students and Teachers

KAIST Doesn't Wait For Change In Korea, Pioneers 'Education 3.0'

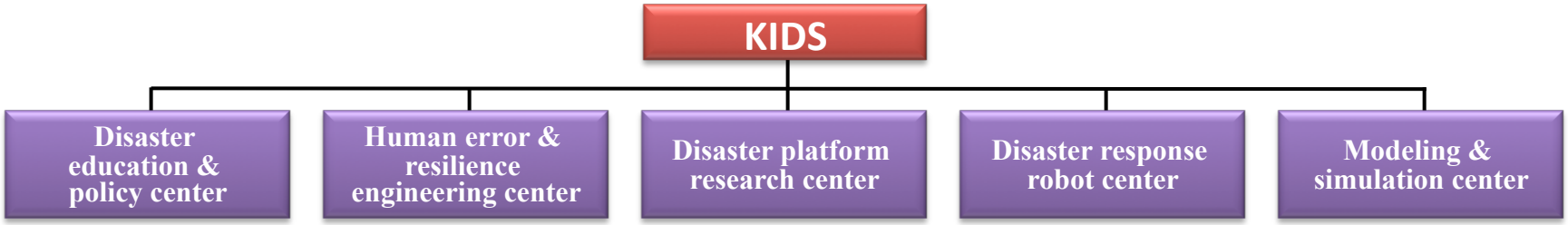
Michael Horn
Contributor
FOLLOW
I write about transforming education through digital learning

As South Korea struggles to escape the downsides of centuries of a Confucian emphasis on rote learning while retaining the positives from that Confucian legacy, at least a couple institutions in the country aren't waiting for permission to move forward.

KAIST, the Korean Advanced Institute of Science and Technology, a top public research university located 150 km south of Seoul in the city of Daejeon, is trying not only to spark innovation in research and the creation of new products, services, and companies, but also in how it educates.

KIDS (KI for Disaster Studies)

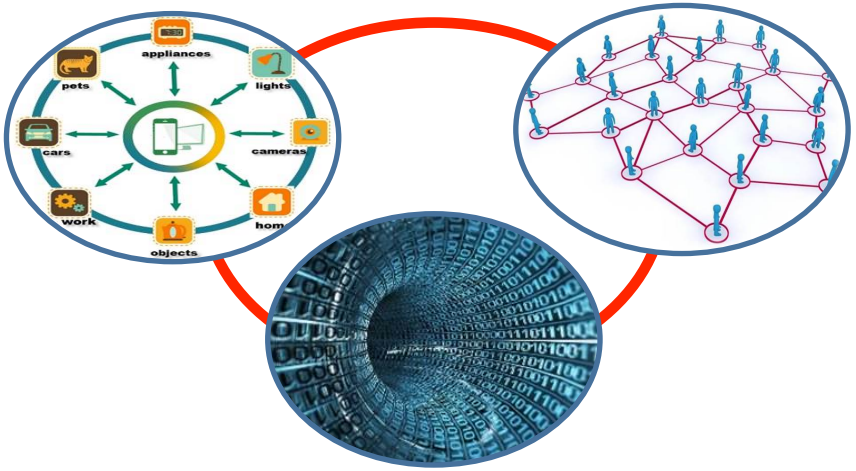
- Fusion research in the disaster sciences, with the goal reducing the hazard.
- About 70 faculty members, researchers and graduate students with specialties exte nding from natural science, engineering, and informatics, to social sciences.



Prediction, Detection & Containment

IoT (Internet of Things)

Social Computing Platform



Big Data Technology

Source: https://www.linkedin.com/today/post/article/20141024184519-69416-how-big-is-big-data
shahnawazkhan.wordpress.com
blog.smartthings.com

Donatella Sciuto

Politecnico di Milano

POLITECNICO DI MILANO





The role of universities in the emerging ICT world

Donatella Sciuto

The challenge

1. The way we shape the future of our universities research and education will also shape the future of society

2. The trouble with our times is that the future is not what it used to be (Paul Valery)

3. In today's complex rapidly changing world the only certainty is that we are facing uncertainty

The evolving mission of university

- Technology, creativity and culture
- Provide opportunities of developing skills and competences complementary to the specific course curriculum
  - Transdisciplinarity
  - Entrepreneurship
  - Intercultural knowledge
  - Soft skills
  - Social responsibility

Action lines

- ICT technologies provide new ways of teaching
- Students are digital native

BUT

Big ships turn slowly

- Increase the use of ICT based tools for blended learning
- Experiment with MOOCs to bridge the gaps
- Increase the opportunities to work on social challenges in interdisciplinary teams

MOOCs to bridge the gaps

MOOCs TO BRIDGE THE GAPS ...

... BEFORE

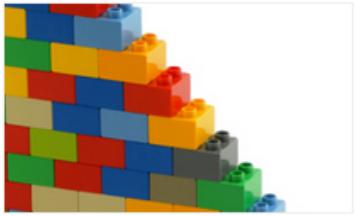
from ***High school***
to ***University***

Improve and consolidate your **high school skills** before you start your courses at Politecnico di Milano.

... DURING

from ***Bachelor of science***
to ***Master of science***

Align your **acquired skills** to the ones of Politecnico di Milano Master of Science if you come from another educational path.



... AFTER

from ***University***
to ***job***

Strengthen and enhance your **soft skills** to smooth your step into the job scene.

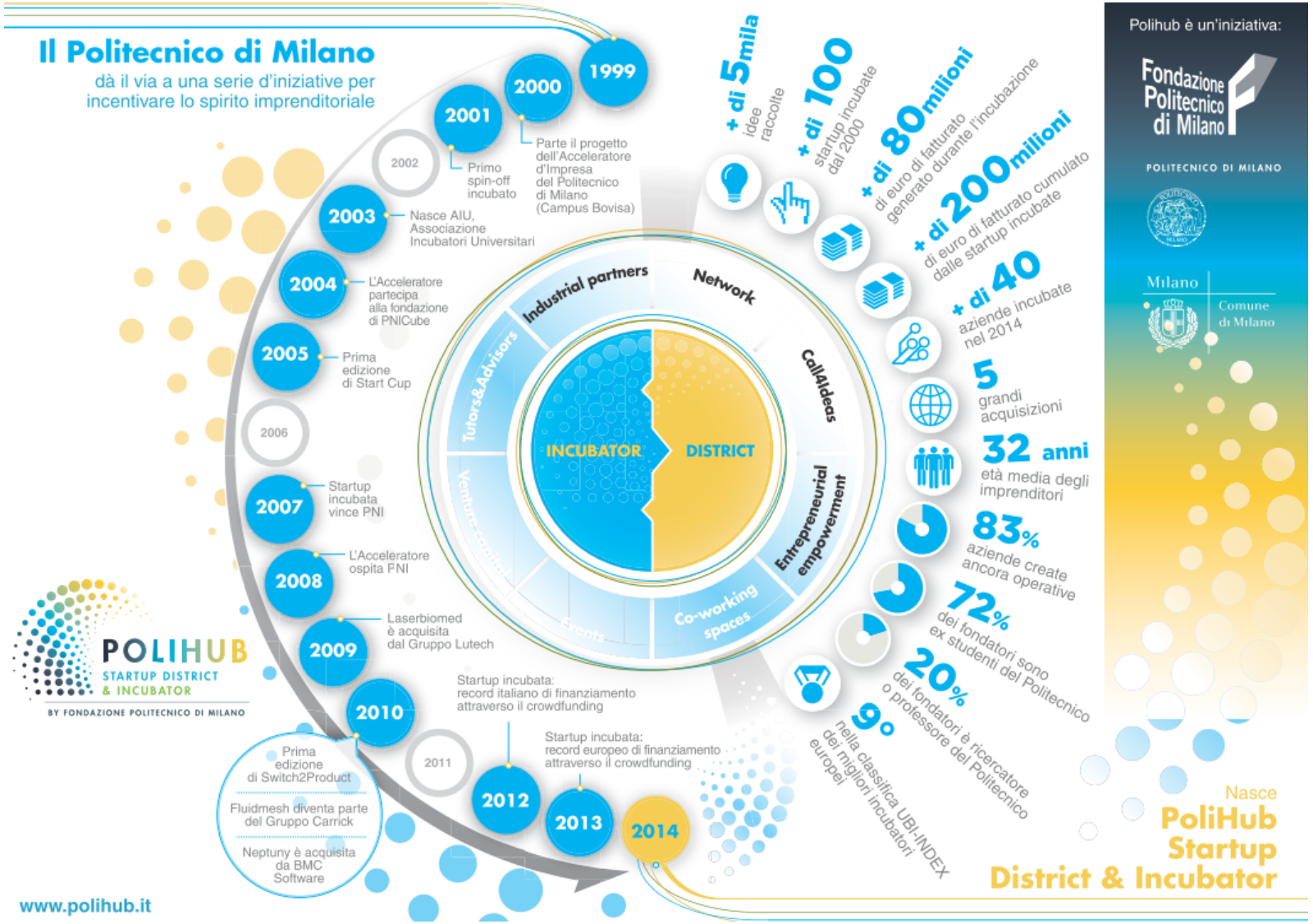
- **MOOCs for teachers: How to design blended learning courses**
- **MOOCs for all: Bet on math, Code for all**

Concluding remarks

- Universities need to continue imagine the future of education to empower students to make meaningful and lasting contributions to society
- ICT plays a role as key enabling technology today in education, research, service and entrepreneurship

We cannot predict the future
but we can help in shaping it

Polihub


Il Politecnico di Milano
dà il via a una serie d'iniziative per incentivare lo spirito imprenditoriale
1999
2000
2001
Parte il progetto dell'Acceleratore d'Impresa del Politecnico di Milano (Campus Bovisa)
Primo spin-off incubato
2002
2003
Nasce AIU, Associazione Incubatori Universitari
2004
L'Acceleratore partecipa alla fondazione di PNICube
2005
Prima edizione di Start Cup
2006
2007
Startup incubata vince PNI
2008
L'Acceleratore ospita PNI
2009
Laserbiomed è acquisita dal Gruppo Lutech
2010
Startup incubata: record italiano di finanziamento attraverso il crowdfunding
2011
Prima edizione di Switch2Product
Fluidmesh diventa parte del Gruppo Carrick
Neptuny è acquisita da BMC Software
2012
Startup incubata: record europeo di finanziamento attraverso il crowdfunding
2013
2014
Industrial partners
Network
Call4Ideas
Entrepreneurial empowerment
Co-working spaces
Events
Venture-capital
Tutors&Advisors
INCUBATOR
DISTRICT
+ di 5mila idee raccolte
+ di 100 startup incubate dal 2000
+ di 80milioni di euro di fatturato generato durante l'incubazione
+ di 200milioni di euro di fatturato cumulato dalle startup incubate
+ di 40 aziende incubate nel 2014
5 grandi acquisizioni
32 anni età media degli imprenditori
83% aziende create ancora operative
72% dei fondatori sono ex studenti del Politecnico
20% dei fondatori è ricercatore o professore del Politecnico
9° nella classifica UBI-INDEX dei migliori incubatori europei
POLIHUB
STARTUP DISTRICT & INCUBATOR
BY FONDAZIONE POLITECNICO DI MILANO
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Polihub è un'iniziativa:
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Milano
Comune di Milano
Nasce
PoliHub
Startup
District & Incubator

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