

Educating for a changing World: New challenges for Engineering Schools

Giovanni Azzone, Politecnico di Milano

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POLITECNICO
MILANO 1863

SCHOOL OF MANAGEMENT

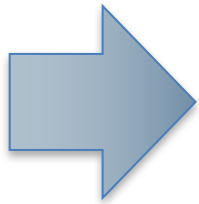
Agenda

- The competitive landscape: the role of megacity regions and competitive ecosystems
- A new challenge for Universities:
 - Mission
 - Outputs
 - Inputs
- Redesign engineering education:
 - Context
 - Methods
 - Infrastructures
 - Partnerships
- Finding the Balance

1. The competitive landscape

Driving forces in the competitive landscape

- Globalization
- Urbanization
- Digitalization



Companies and People move to attractive cities

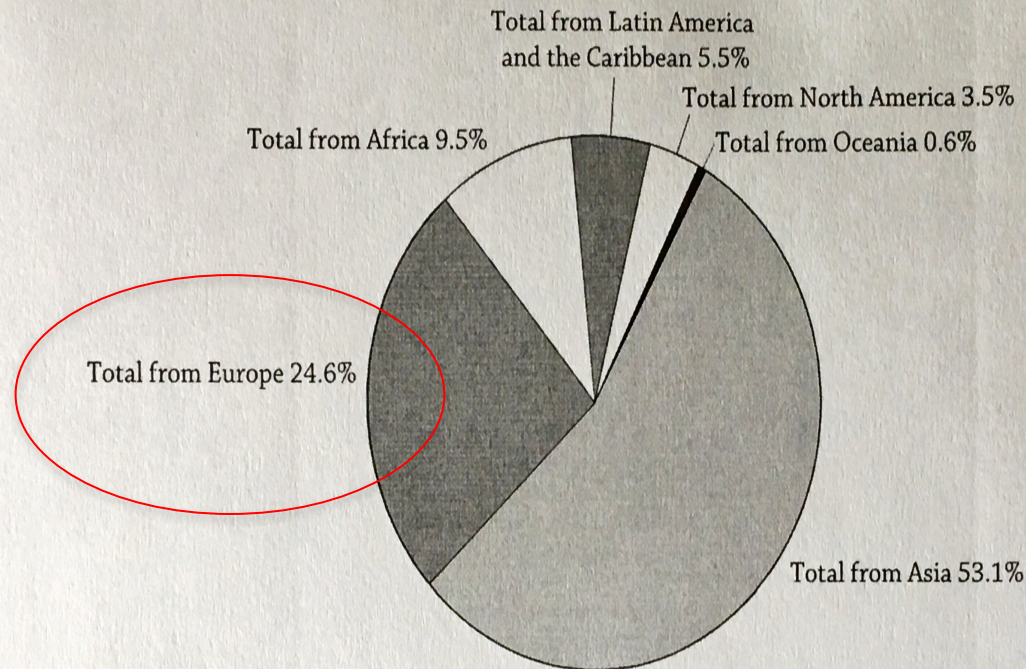
Students are moving

- From 2005 and 2012, the number of foreign students enrolled abroad increased by 50%
- The number of mobile students increased by 5% from 2013 and 2014
- Within OECD Countries, 27% of PHD students and 12% of Master students are international


Students are moving

Figure C4.3. **Distribution of internationally mobile students studying in OECD countries at the master's and doctoral or equivalent levels, by region of origin (2014)**

Percentage of mobile students enrolled in OECD countries



Source: OECD. Table C4.4. See Annex 3 for notes (www.oecd.org/education/education-at-a-glance-19991487.htm).

StatLink  <http://dx.doi.org/10.1787/888933398558>

1900



2007



2030

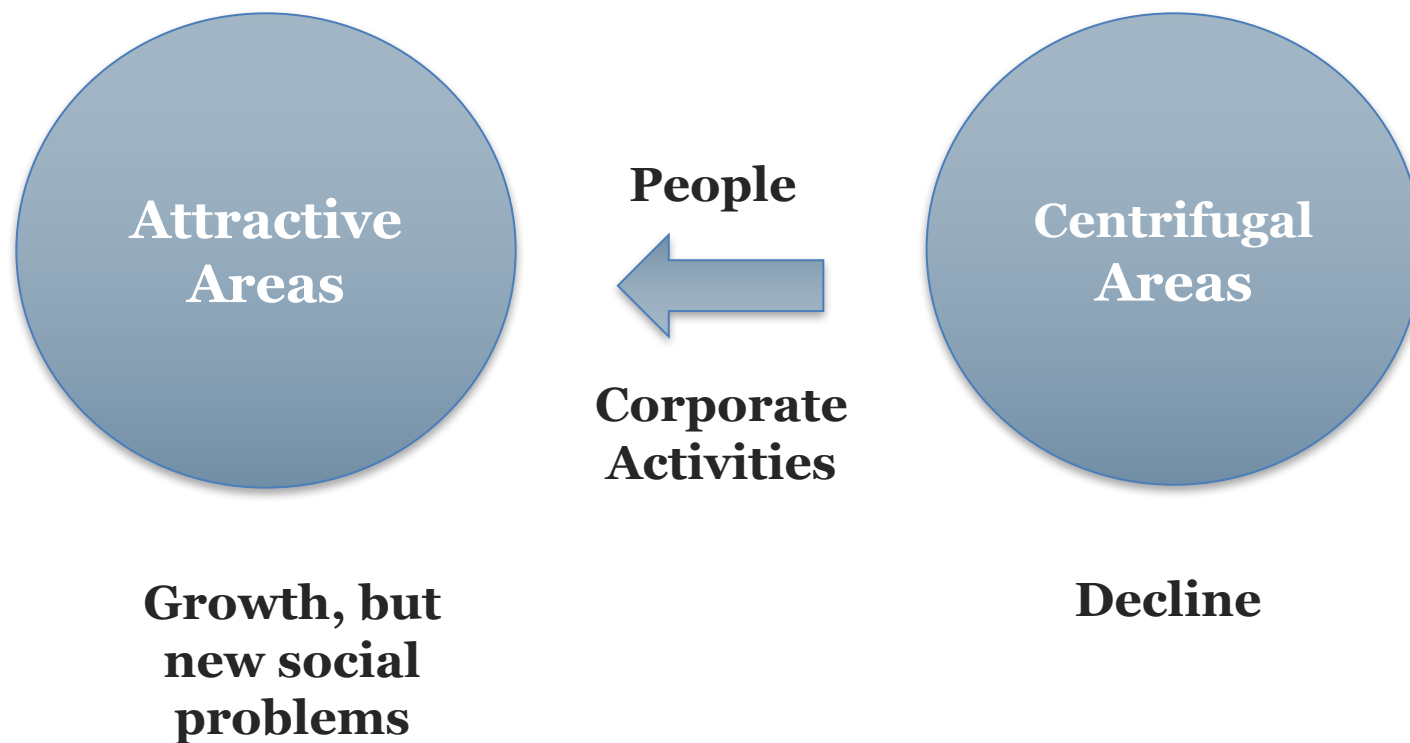


2050





As a result:



The megacity regions



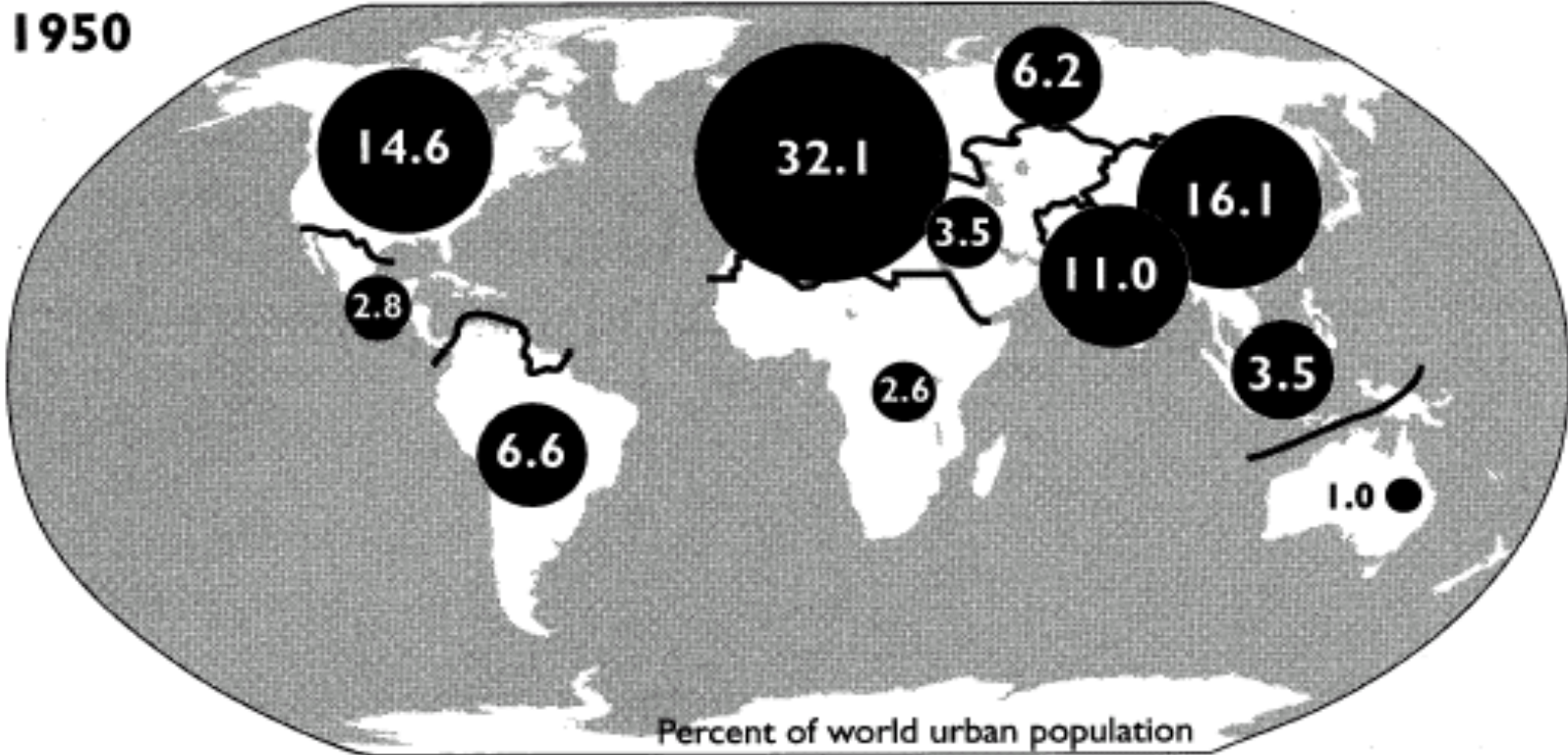
These movements are creating a few «megacity regions»:

- attracting companies and talented people
- creating/integrated globally oriented ecosystems
- becoming centers of innovation and cultural life

Nations by number of inhabitants: the declining role of Europe

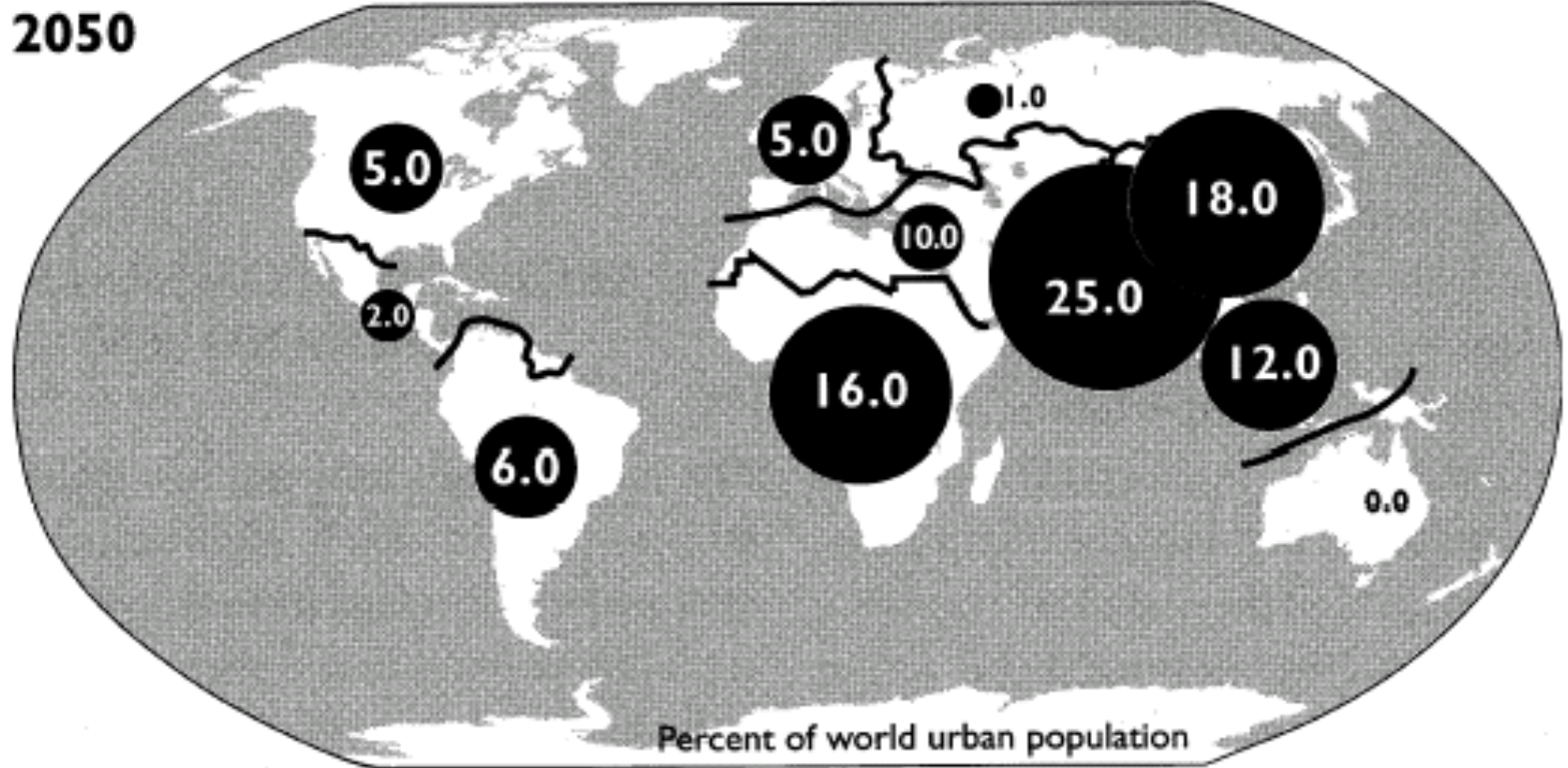
1950		2012		2050	
1. China	551	1. China	1354	1. India	1692
2. India	372	2. India	1258	2. China	1296
3. USA	158	3. USA	316	3. USA	403
4. Russia	103	4. Indonesia	245	4. Nigeria	390
5. Japan	82	5. Brasile	198	5. Indonesia	293
6. Indonesia	75	6. Russia	147	6. Pakistan	275
7. Germany	68	7. Pakistan	145	7. Brazil	223
8. Brazil	54	8. Bangladesh	130	8. Bangladesh	194
9. United Kingdom	51	9. Japan	126	9. Philippines	155
10. Italy	46	10. Mexico	100	10. Corea	149
11. France	42				

From European Cities (World urban population (%): 1950)



Source: Data from United Nations, World Urbanization Prospects, 2001 Revision (New York: United Nations Population Division, 2002), www.unpopulation.org. Brunn et al (2003).

...To the rest of the world (World urban population (%): 2050)



Source: Data from United Nations, World Urbanization Prospects, 2001 Revision (New York: United Nations Population Division, 2002), www.unpopulation.org. Brunn et al (2003).

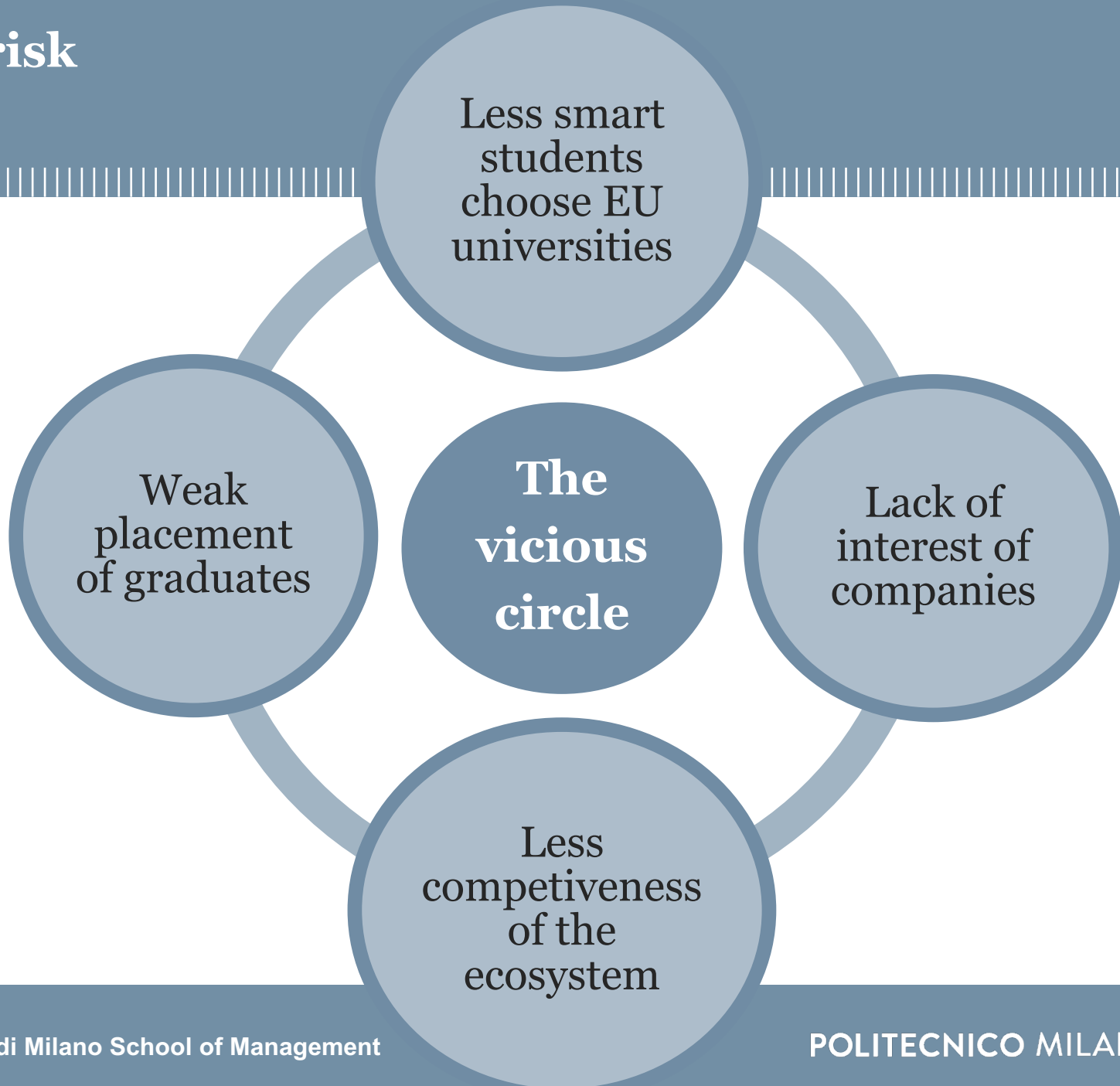
R&D is moving

Share of Total Global R&D Spending

	2014	2015	2016
North America	29,1%	28,5%	28,4%
U.S.	26,9%	26,4%	26,4%
Asia	40,2%	41,2%	41,8%
China	19,1%	19,8%	20,4%
• Europe	21,5%	21,3%	21,0%

India is the 6° global R&D spender, and is planned to surpass Germany (4°) and South Korea (5°) by 2018

The risk



2. A new Challenge for Universities

New missions for engineering schools



At a «**local**» level, Universities (and especially Engineering Schools) «must» be part of the competitive capacity of an ecosystem:

- attracting smart students
- educating them consistently with the new context

At a «**global**» level, they must contribute, through education and research, to global challenges, reducing the gaps between regions and within a single area

An example...

A Creative Economy for Seoul

by fostering promising industries



An example....

R&D

No.1

In R&D ratio of investment to GDP

**World ranking*

1	KOREA	4.15%
2	ISRAEL	3.93%
3	FINLAND	3.55%
4	SWEDEN	3.41%

65 universities
are in Seoul

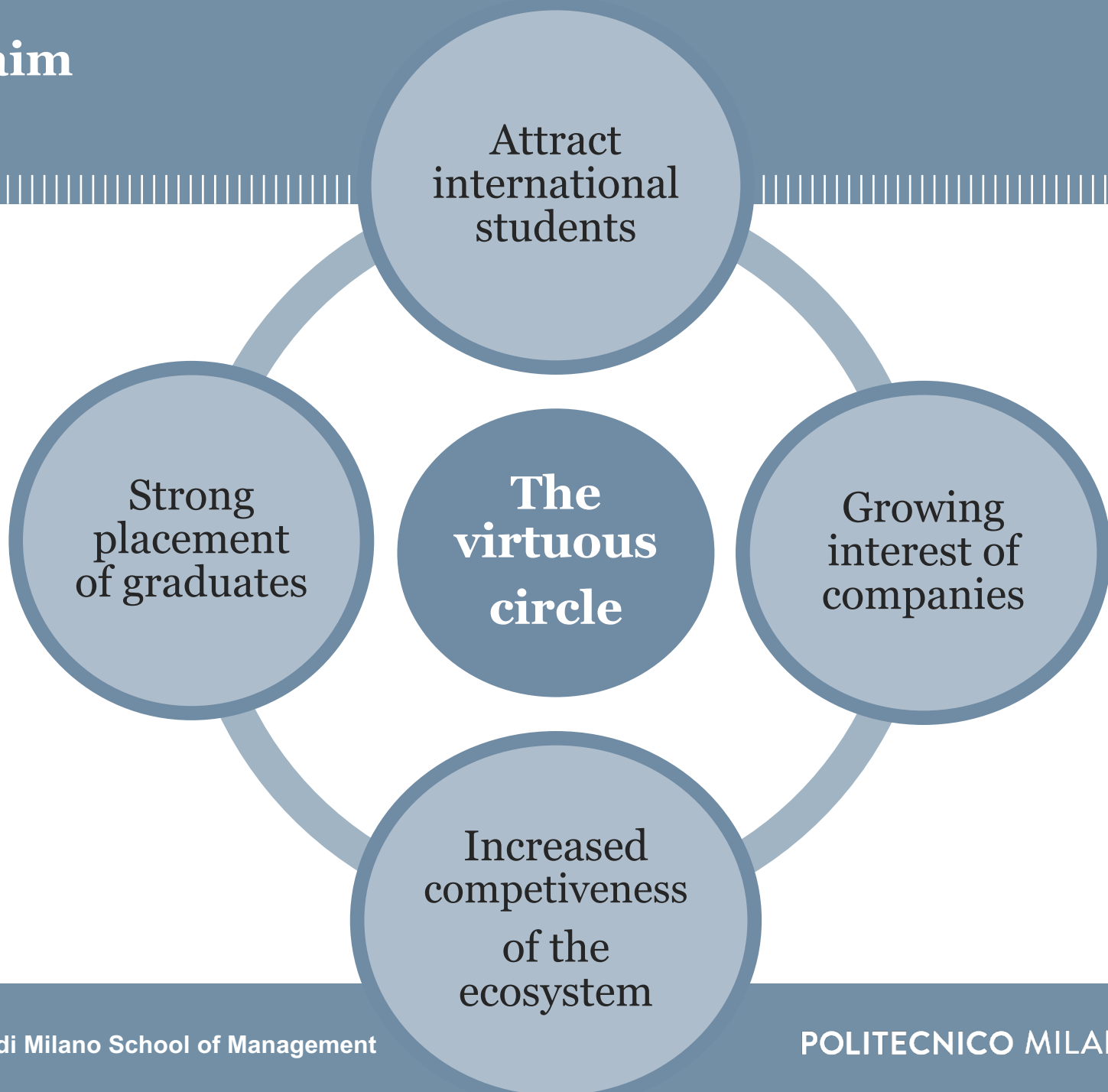
28.5%
of national research institutes
are in Seoul

R&D Centers
are
concentrated
in Seoul

Ideal location
for R&D



The aim



A new output...

An example: energy consumption per capita (world average = 100)

Canada = 539




USA = 473

Europe = 185

India = 24

An new output...

Some consequences:

- The gap will be reduced  Most engineering work outside Europe
- We can not afford just to increase total consumption  Need for sustainable technologies and processes
- We can not just reply «western models»  Need for innovation and Cross cultural sensibility

- Technical skills
- Crosscultural skills
- Innovation and inter-disciplinarity
- Socially responsible

Input: The «new students»



- Born in a World of redundant information
- With different expectations from education

Students' skills


	A World of scarce information	A World of redundant information
Problem modeling	High	Low
Capacity to access to information	Low	High
Avarage quality of sources	High	Low

Students' values and expectations (adapted from Osborne (2017))

- Meet the social or the economic needs of students
- Improve the quality of their life experience
- Create capacity to change in the future
- Make «a better society»

3. Redesigning Engineering Schools

Redesigning Engineering education: What do we have to change?



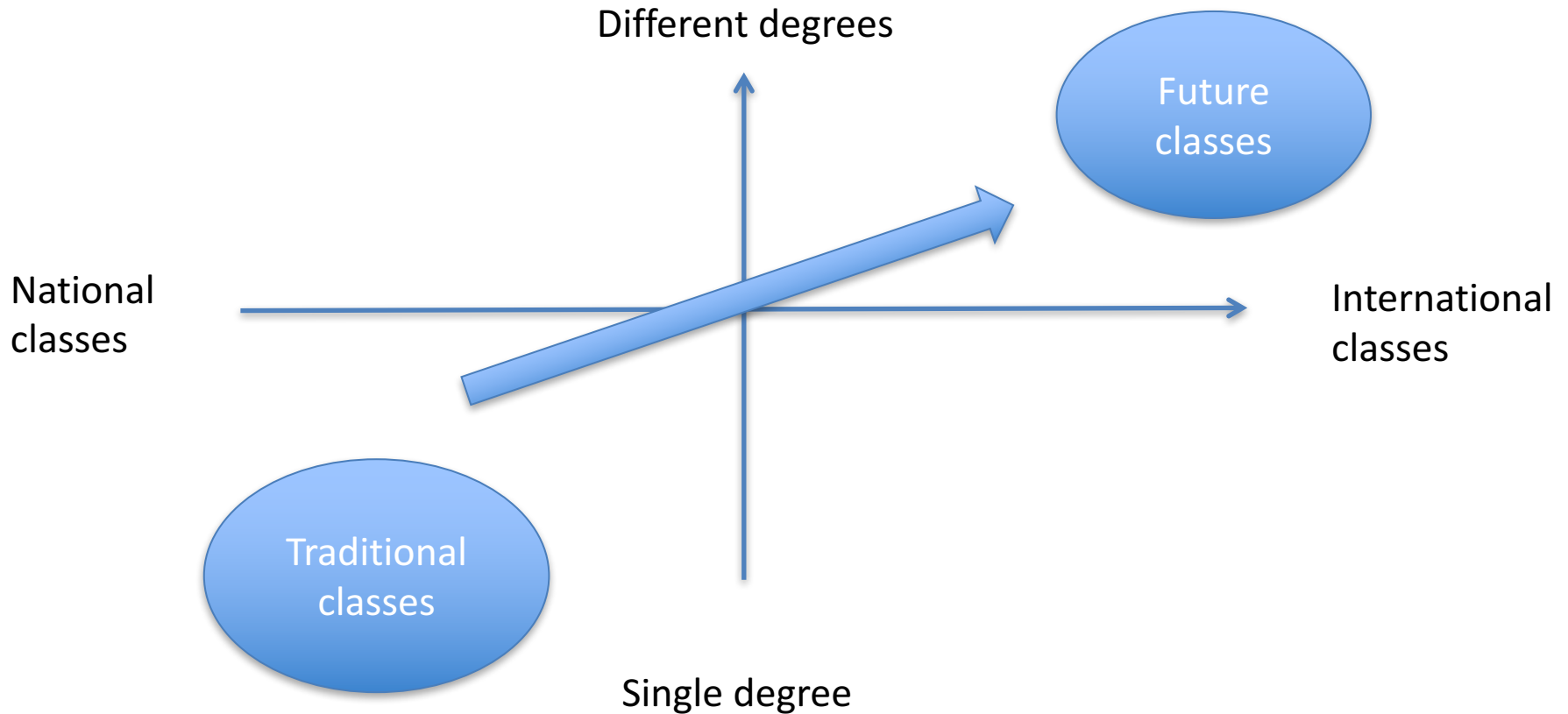
Learning environment

Educational methods

Infrastructures

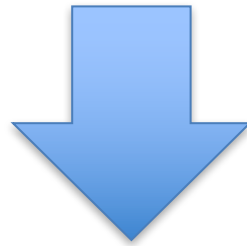
Human resources

Learning environment: the evolution



Learning environments: the problems

- From MSc classes where all students have a same background and similar knowledge....
- ...to MSc classes where students do not know the same things



- Need to manage diversity!

Learning environment: how to balance?

- We must find a right balance between homogeneity and diversity....
 - Selection of the students
 - MOOCs as a way to fill the gaps

Teaching methods

«Ex cathedra
lectures»



Project based

The Olin
College
Revolution

Which is the best mix between

- Learning «fundamentals» and
- Problem solving through «projects»

to be ready for a changing World?

Infrastructures: New classrooms



- Multimedia classroom to facilitate project activities on real problems proposed by companies**
- Flexible layout to support both standard classes and group work activities
 - Wi-Fi and Bluetooth video beamers and screens to show multimedia contents of both teacher and students at the same time through computers, tablets, smartphones...
 - Writable walls all over the room from floor to ceiling to stimulate creativity and expression



Multimedia classroom to facilitate project activities on real problems proposed by companies

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- The new environment requires a change in the competences of both Academic and non Academic staff:
 - Teaching methods and tools
 - Managing diversity in classes
 - Dealing with different cultures in administrative processes

Finding the balance

- How to define the right balance between different requirements?



- Again, we must design our education «with» our ecosystem
 - Provide competences we are lacking
 - Support our strategies

ASSESSMENT CENTER

Assessment with companies:

- Teamwork
- Communication
- Problem solving
- Decision making
- Leadership



PERIODO:

17 marzo 2017 - 13 giugno 2017

CAMPIONE:

- incontri svolti: 20
- studenti che hanno partecipato ad oggi: 196
- risposte al questionario di feedback: 75,5%
- Esperienza di grande successo: feedback molto positivi

Corporate partners as source of projects



Cultural life as part of the educational experience



Linking theatres, museums, art and design centers with universities