

**20 YEARS OF THE BOLOGNA PROCESS –
INFLUENCE ON MEDICAL EDUCATION
OR
THE UNIVERSITY AND THE
DIGITAL TRANSFORMATION OF SOCIETY**

SEBASTIÃO FEYO DE AZEVEDO

EMERITUS PROFESSOR OF THE UNIVERSITY OF PORTO

**FORMER RECTOR, FORMER PORTUGUESE DELEGATE TO THE BOLOGNA FOLLOW-UP
GROUP**

INTERNATIONAL STAFF WEEK 2022

CESPU, CAMPUS OF PENAFIEL, 18 MAY 2022

I HAVE LEARNED TO ORGANIZE MY TALKS IN THREE PARTS

- 👉 **In the First Part**
 - **I say what I am going to say**
- 👉 **In the Second Part**
 - **I say what I have to say**
- 👉 **In the Third and Final Part**
 - **I say what I have said**

TO SAY WHAT I AM GOING TO SAY....

- ① Life Today - the need to adapt to the times
- ② **The Bologna Process - 1999-2022... and beyond**
- ③ The Ongoing Digital (R)evolution - trajectory of development in the Academia
- ④ **The Ongoing Digital (R)evolution - a new period of transformations**
- ⑤ Academic issues - the Learning Process
- ⑥ **Just two short messages for you to take home, with one idea - adapt, reform**

LIFE TODAY

THE NEED TO ADAPT TO THE TIMES

LIFE TODAY

I - DRIVING FORCES FOR CHANGES IN EUROPE... AND IN THE WORLD

- ☞ Last quarter of the 20th Century - Intense search of new routes for Europe and for the role of Europe in the World, driven by
 - Progress observed in Science and Technology, namely
 - in digital systems and communications
 - in health and life sciences
 - Foreseen political changes - that effectively took place in Europe, since the late eighties...
 - Expectations and demands of Society
 - Education for All - mass education policies
 - Quality requirements of a Society of “Comfort”

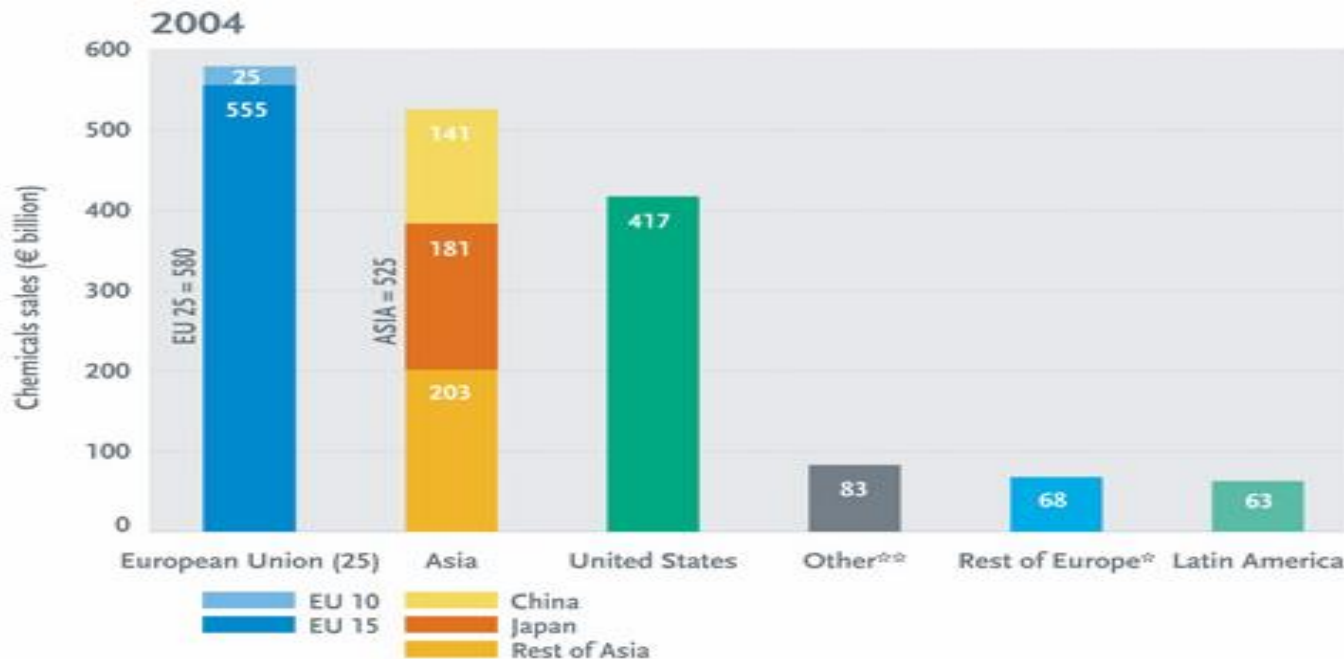
LIFE TODAY

II - A MIX OF CHALLENGES, THREATS AND OPPORTUNITIES

- 👉 The computer and communications era - dramatic changes of the concepts of time and space - globalisation
- 👉 The global market economy - driving today's Societies
 - The increase of Expectation of Life
 - Sharp increase in standards and competition Worldwide
 - Volatility of jobs
 - Job market and opportunities - wider than ever
- 👉 Social sustainability - work longer years
- 👉 The decrease of knowledge half-time - back to School
- 👉 **Significant change in the concepts of individual career management, mainly for Young People**

LIFE TODAY - THE RISE OF THE DRAGON AND OF THE ASIAN TIGERS

GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2004



World chemicals sales in 2004 is estimated at € 1736 billion
 The EU accounts for 33% of the total

Source: Cefic

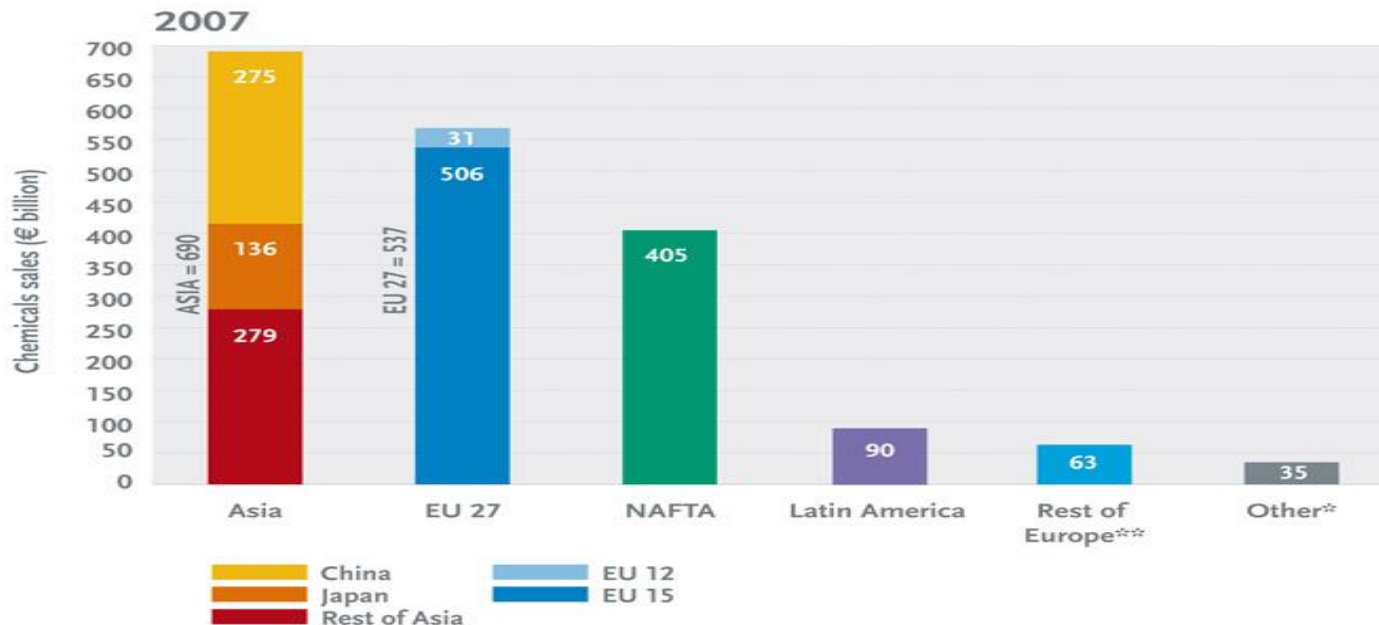
Definition: Rest of Europe* = Switzerland, Norway, and other Central & Eastern Europe (excluding the new EU 10 countries)
 Other** including Canada, Mexico, Africa & Oceania



LIFE TODAY - THE RISE OF THE DRAGON AND OF THE ASIAN TIGERS

GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2007

Chart 1.1: Geographic breakdown of world chemicals sales



World chemicals sales in 2007 are valued at € 1820 billion
 The EU accounts for 29,5% of the total

Source: Cefic Chemdata International

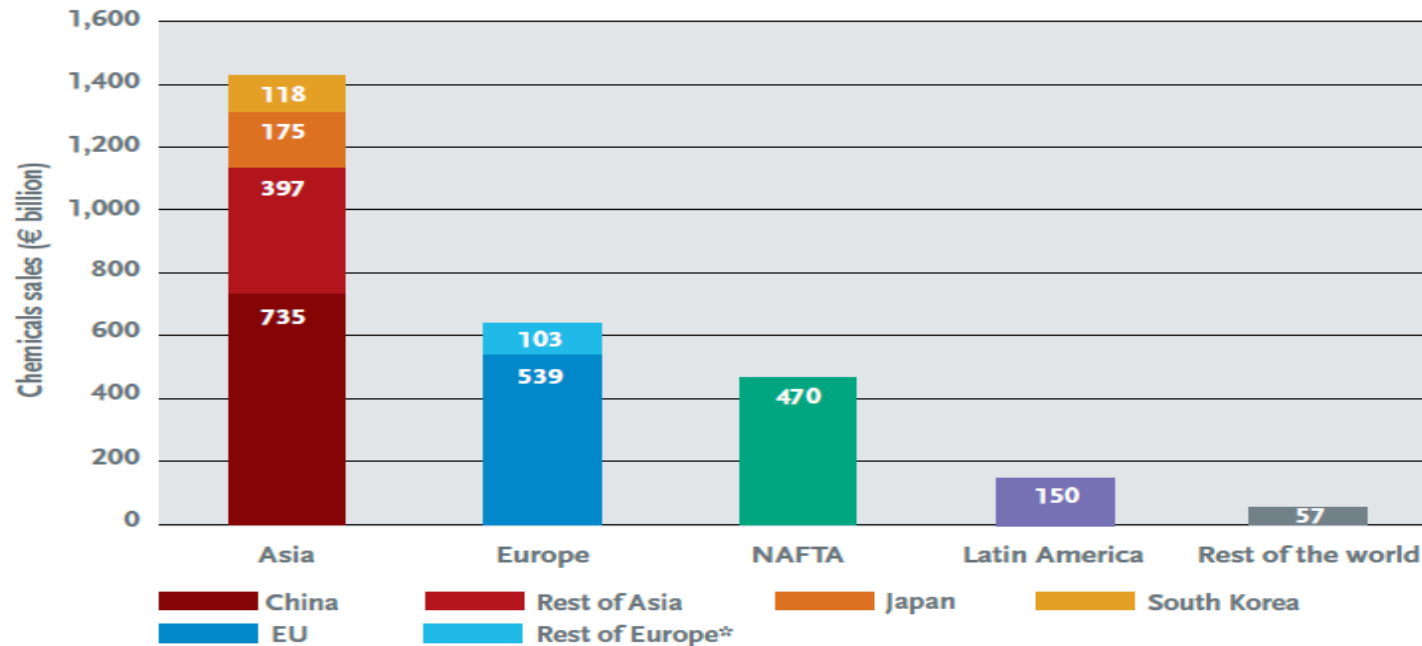
Other* = Oceania and Africa

Rest of Europe** = Switzerland, Norway and other Central & Eastern Europe
 (excluding the new EU 12 countries)



LIFE TODAY - THE RISE OF THE DRAGON AND OF THE ASIAN TIGERS

GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2011



World chemicals sales in 2011 are valued at €2744 billion. The European Union accounts for 19.6% of the total

Source: Cefic Chemdata International

* Rest of Europe – Switzerland, Norway and other Central & Eastern Europe (excluding the new EU-12 countries)

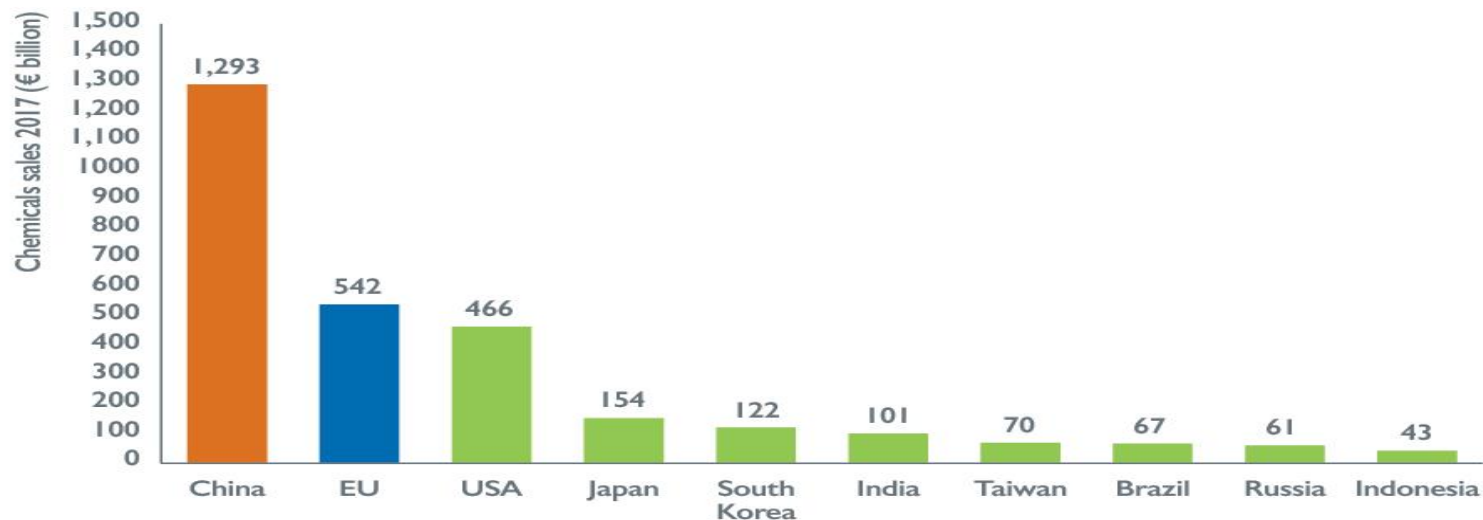
Unless specified, chemicals industry excludes pharmaceuticals
Unless specified, EU refers to EU-27



LIFE TODAY - THE RISE OF THE DRAGON AND OF THE ASIAN TIGERS

GEOGRAPHIC BREAKDOWN OF WORLD CHEMICALS SALES - 2017

Chemical sales by country: top 10



NEW PARADIGMS

- 👉 With the evolution of the digital technology, of computer science and of transports - **FOR ALL PRACTICAL PURPOSES THE WORLD IS SHRINKING**
- 👉 A Global World that lives with and in a new paradigm of coexistence
 - ✓ **COOPETITION = COOPERATION + COMPETITION**
- 👉 The need to understand **other cultures and ways of life**
- 👉 The need to **THINK GLOBAL**, particularly in large companies- **think 24/7** - When Asia goes to sleep, we start work; when we go to sleep, America starts work
- 👉 So, the need to promote Mobility and Cooperation - only achievable by promoting **TRUST**
 - Through recognized Quality Assurance Systems, accepted by all Stakeholders

EDUCATIONAL AND LIFE REQUIREMENTS FOR MILLENIALS AND GEN Z

- ☞ Today, as in the past, the objective is to offer training to, to prepare young people, aiming at opening up the horizons of their thinking
- ☞ **BUT, there are fundamental differences concerning the future, relatively to past generations, in that Millenials and Gen Z:**
 - Will live longer
 - Will have to work longer years
 - Will have to study longer - go back to School (**Whatever School means...**)
 - Will, more and more, have to work further away from Homeland
 - Will, in fact, have **to think GLOBAL**, to the dimension of the **PLANET... or further beyond...!**

EUROPE - HOW TO FACE THE CHALLENGES WITHIN OUR DIVERSITY?

EUROPE



WITHIN THIS CONTEXT

**THE BOLOGNA PROCESS
1999 TILL 2022... AND BEYOND...**

THE BOLOGNA PROCESS

WHAT NEEDS TO BE UNDERSTOOD

- ☞ Understand the Bologna Process as one of the dimensions of the prevailing strategy for European development
- ☞ Understand the Bologna Process as having two main groups of objectives, naturally interlinked
 - ✓ Objectives of political, social, and economical nature
 - ✓ Objectives of a dominant academic nature
- ☞ Understand that indeed these objectives mean, in many countries, a major reform (... a small revolution...) in Higher Education and in Society

SO, THE BOLOGNA PROCESS REVISITED...

(A) SOCIAL, ECONOMICAL AND POLITICAL OBJECTIVES

- ➡ **From a social and economical point of view** - to guarantee development and competitiveness through -
 - ✓ The increment of transnational **cooperation and mobility**, both in higher education and in R&D
- ➡ **From a more political point of view** - to contribute for European cohesion
 - ✓ Again, through **mobility and cooperation**, at all levels, of both students and professionals
- ➡ **Still at political level**
 - ✓ To guarantee the **Social Dimension**
 - ✓ To promote the **External Dimension** of the European model

SO, THE BOLOGNA PROCESS REVISITED...

(B) OBJECTIVES OF A MORE ACADEMIC NATURE

☞ **Bologna - The Structure**

- ✓ **Restructuring the offer of higher education**
 - **More attractive and nearer to the needs and interests of Society**
 - **Serving better the increased demand for higher education**
 - **Allowing comparability**
 - **Promoting mobility**

☞ **Bologna - the Substance, the real academic issues**

- ✓ **An evolution of teaching/learning paradigms - adapted to the concepts and perspectives of the modern society and to the available technical tools, projecting education to more adult phases of life**

FROM BOLOGNA TO BUDAPEST-VIENNA... AND BEYOND

THE STRUCTURE - ACTION LINES AND INSTRUMENTS FOR ACTION

- ✓ A Degree Structure -
 - Based on recognised **QUALIFICATIONS FRAMEWORKS**
- ✓ A System to measure work and **OUTCOMES**
 - The **ECTS credit and accumulation system**
- ✓ A way of documenting qualifications
 - The **DIPLOMA SUPPLEMENT**
- ✓ A System to guarantee transparency
 - Building accepted **QUALITY ASSURANCE** procedures
- ✓ A System for recognition of qualifications
 - **OVERCOMING DIFFICULTIES** posed by the diversity of ‘recognition cultures’

The Core of the Bologna Structural Reforms

Keywords characterizing Structural and Political Objectives



MOBILITY, COOPERATION, TRUST, ACCREDITATION

- ✓ **MOBILITY AND COOPERATION** require both academic and professional recognition
- ✓ Academic and Professional recognition require **TRUST**
- ✓ **TRUST** requires transparency and readability of structures and professional qualifications



All is achieved through:

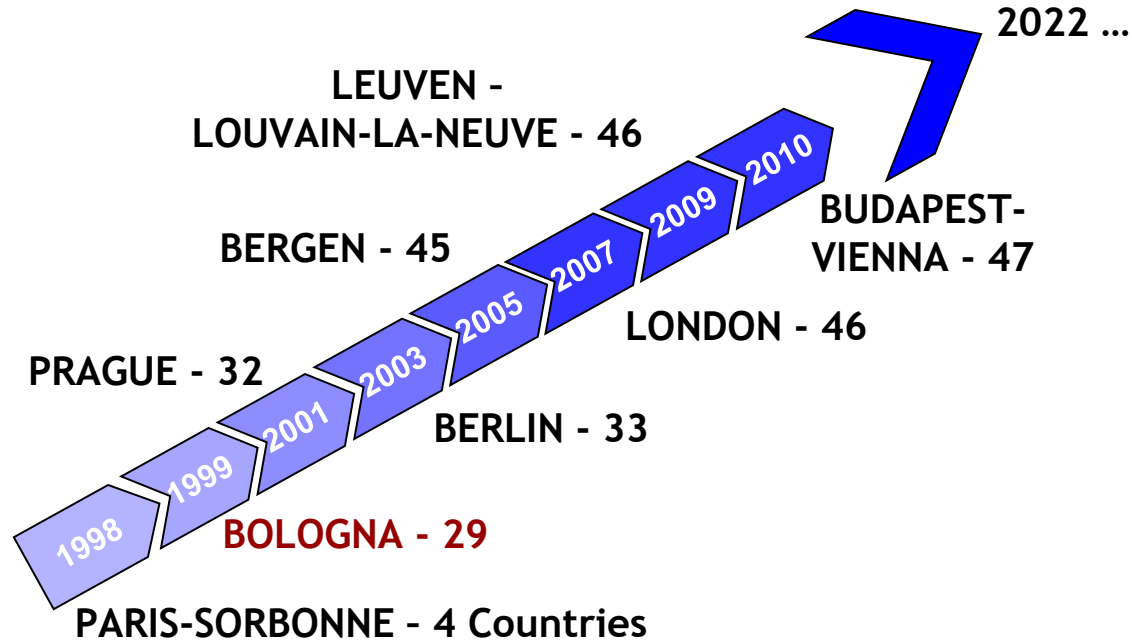
- ✓ **COMPARABLE QUALIFICATIONS FRAMEWORKS**
- And
- ✓ **RECOGNISED QUALITY ASSURANCE PROCEDURES**

FROM BOLOGNA TO BUDAPEST-VIENNA... AND BEYOND

THE SUBSTANCE - THE LATECOMER IN THE BOLOGNA PROCESS...

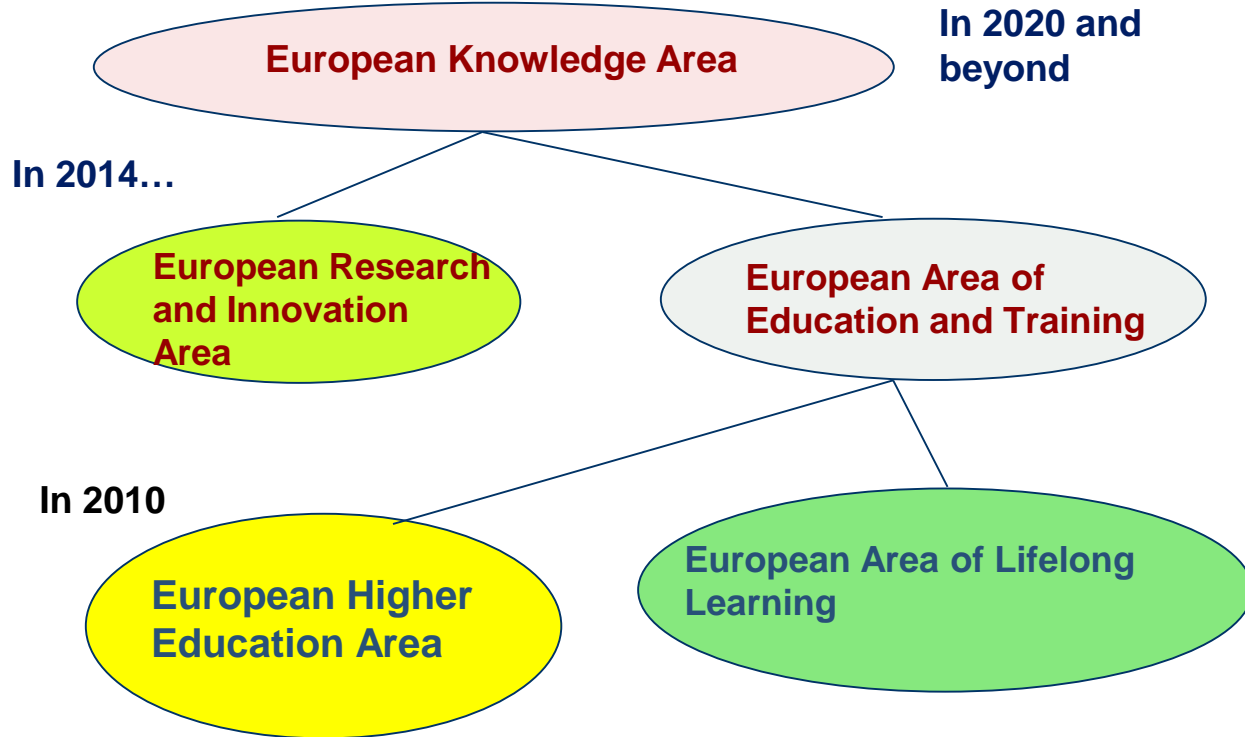
- ✓ **Changes in progress... but to a significant extent still to occur...**
 - **New contents... closer to more immediate Societal concerns**
 - **New programme structures, linked to a concept of lifelong Learning**
 - **New Methods - change from**
 - ✓ **Teacher-Centred to Student-Centred methodologies**
 - ✓ **Teaching based on Teacher Inputs to Learning Centred in well defined objectives - Learning Outcomes**
 - ✓ **Teaching Times to Student Workloads required to achieve desired Learning Outcomes**

BUILDING THE EUROPEAN HIGHER EDUCATION AREA FROM PARIS AND BOLOGNA TILL BUDAPEST-VIENNA, 2010



THE EUROPEAN KNOWLEDGE AREA

...ALWAYS UNDER CONSTRUCTION...



THE ONGOING DIGITAL (R)EVOLUTION

**AN EXTRAORDINARY TRAJECTORY OF DEVELOPMENT, GLOBALLY AND
SPECIFICALLY IN THE ACADEMIA**

INSTRUMENTS FROM THE DAYS OF THE 'PALAEOLITHIC'

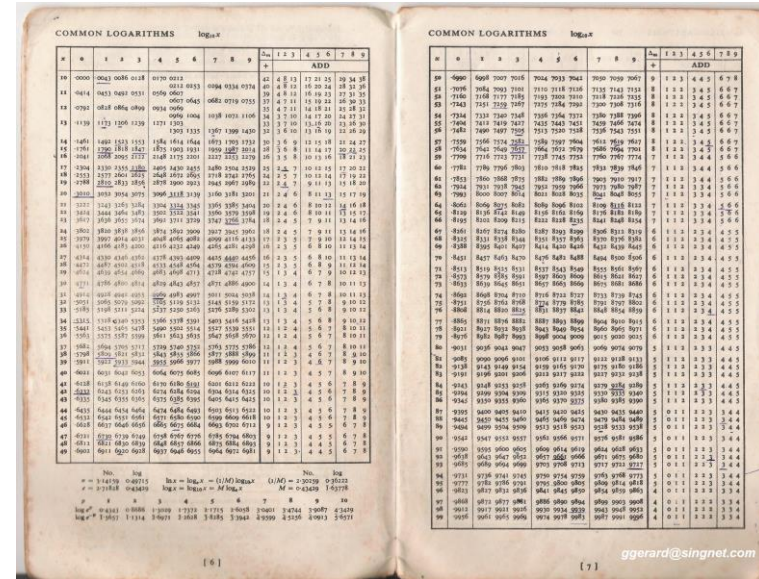
(I) REFERENCE MATHEMATICIANS

- John Napier (1550 - 1617) - proposed the concept of Logarithm
- Henry Briggs (1561 - 1630) - with Napier, further developed this concept - developed the 'common logarithms' (base 10) and published the **Logarithm Tables (?)**
- Edmund Gunter (1581 - 10 December 1626) - created the **Logarithmic Scales**
- William Oughtred (1574 - 1660) - based on Logarithmic Theories and on the Logarithmic Scales, developed the famous and all relevant **SLIDE RULE**

INSTRUMENTS FROM THE DAYS OF THE 'PALAEOLITHIC'

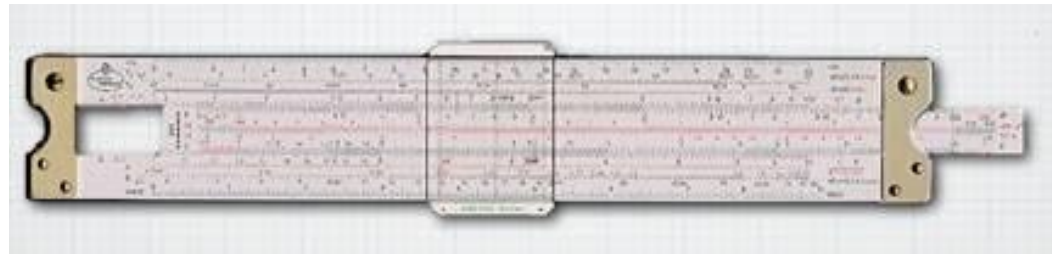
(II) LOGARITHM TABLES AND SLIDE RULES

☞ These are Logarithm Tables



☞ E these are 'Slide Rules'

Fundamental instruments for
Sciences & Engineering
... till the decade of 1970!!!
1970!!!



ggerard@singnet.com

INSTRUMENTS FROM THE DAYS OF THE 'PALAEOLITHIC'

(III) THE 'REVOLUTIONARY' MECHANICAL CALCULATORS FACIT (~1960 -)

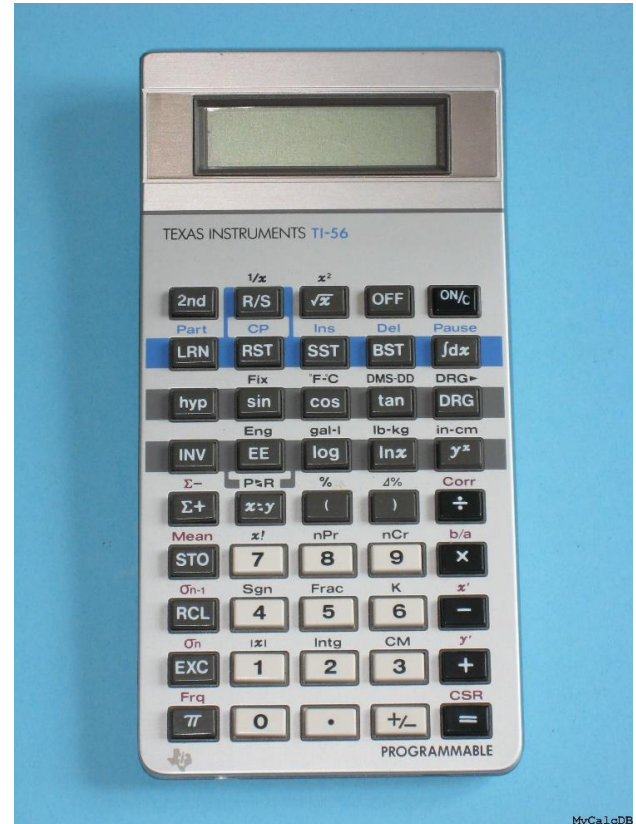
👉 What is (was) a FACIT? ... that I used widely in the University in 1969, 1970...,



INSTRUMENTS FROM THE DAYS OF THE 'PALAEOLITHIC'

(IV) THE FIRST SCIENTIFIC CALCULATORS

- 👉 The first scientific calculators, in 1972 - the HP - Hewlett Packard, far too expensive
- 👉 Followed by the more affordable TEXAS INSTRUMENT
- 👉 Widespread use, only in the late seventies, they finally took the place of the SLIDE RULE



INSTRUMENTS FROM THE DAYS OF THE 'PALAEOLITHIC' (V) COMPUTER PROGRAMMES IN PUNCHED CARDS (!) (~1977 -)

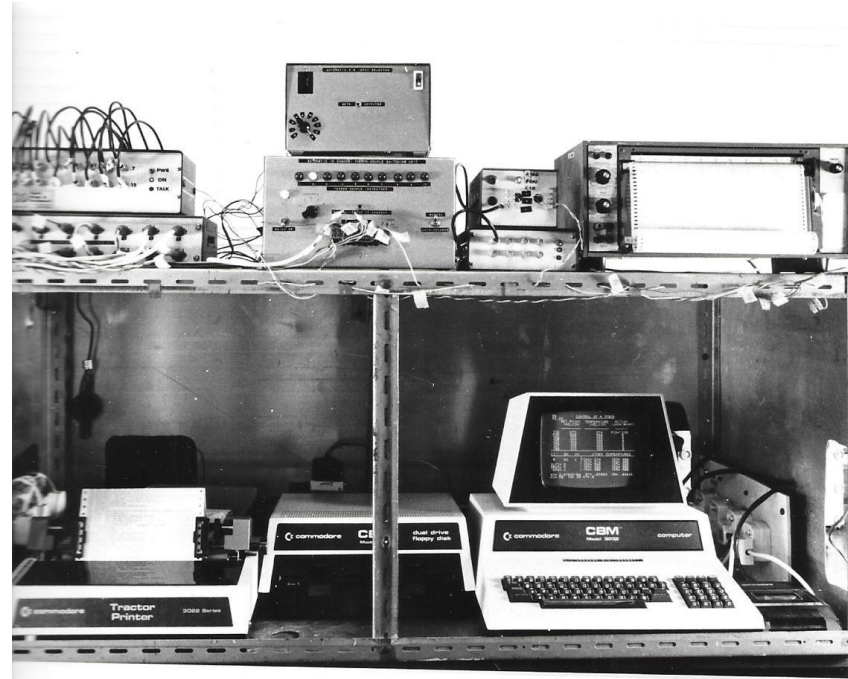
👉 Late in the day, used to take them to the Computer Center...

👉 Early morning, the next day, back to the Computer Center to pick the results up...



INSTRUMENTS FROM THE DAYS OF THE 'PALAEOLÍTHIC' (VI) COMMODORE PET CONTROLLING A PILOT PLANT (~1979)

- ☞ 'Very sophisticated' system at the time, programmed in BASIC,
- ☞ Today, completely archaic... in the face of sensors that communicate with wireless systems... and , of course, the computer itself



A PHOTO FROM THE DAYS OF THE 'PALAEOLITHIC', FAMILIAR TO SOME OF YOU...



Image credit:
Robert
Doisneau

josemmf@usn.no |
17.12.2018

FROM THE 'PALAEOLITHIC' TILL THE PRESENT DAY (2017)



FROM THE 'PALAEOOLITHIC' TILL THE PRESENT DAY... (2018)



UNDERSTAND THE PACE OF DEVELOPMENT (I)

- 👉 **Between ~1600 and 1972 - more than 370 years** - work was developed with Slide Rules, Logarithm Tables, and (already in the 60's of last century, with mechanical calculators
- 👉 **Between 1972 and 1980** - first pocket calculators with capacity of scientific computing
- 👉 **In the 80's** - first desktop computers
- 👉 So, fundamental studies have been developed, **WITHOUT DIGITAL INSTRUMENTS** - no computers, no scientific calculators, no digital communications...
- 👉 **Well, this looks like as being from the 'Palaeolithic' days, but it was less than... 50 years ago....**

UNDERSTAND THE PACE OF DEVELOPMENT (II)



Today

- **Computational Power**
- **The Internet**
- **Mobile phones**
- **Artificial Intelligence, in all areas and dimensions**
- **Children Intuition...**



THE ONGOING DIGITAL (R)EVOLUTION

**A NEW PERIOD OF TRANSFORMATIONS,
OF THE SEVERAL THAT WE ALREADY PERCEIVE IN THE HISTORY OF HUMANITY**

INDUSTRIAL REVOLUTIONS ARE NOT OF TODAY

WHERE'S THE DIFFERENCE? (I)

- 👉 **OVER THE CENTURIES - Areas that drive changes:**
 - Energy, Communications, Liberal financial policies
- 👉 **Similarities - what was said in the past, evolution and advances...**
 - Globalization (!), With locomotives and steamships allowing the 'massive export of goods worldwide' (1780-1820);
 - 'Times of dramatic change in the world, with' rapid changes in social and economic patterns ';
 - Pasteur's advances (1822-1895) 'revolutionized the world as it was known';
 - Thomas Edison's inventions (1847-1931) 'changed the world forever'

INDUSTRIAL REVOLUTIONS ARE NOT OF TODAY

WHERE'S THE DIFFERENCE? (II)

- ➡ The difference is immediately in the dimension, scope and complexity, in the **SPEED OF CHANGE**
 - In the dimension of **OPPORTUNITIES AND THREATS**
 - In the necessary global vision of the world, **IN ITS MULTICULTURALITY**
 - In the relevance of **KNOWLEDGE AND TALENT**
- ➡ **BUT, Today as in the Past**, a profound social and economic impact... a need to fight for a more equitable distribution of wealth

INDUSTRIAL REVOLUTIONS ARE NOT OF TODAY BUT THERE HAS BEEN AN ACCELERATION OVER THE PAST 70 YEARS

☞ **Third Industrial Revolution and its projection Revolution 4.0**

- From about 1950, until today and... for the near future...
- Energy evolution - from post-war nuclear ... to renewables
- Transistors, Microprocessors, Computers, Automata, the Internet, Wireless Communications, Transport ...
- Robots, Genome Edition, the Internet of Things, Augmented Reality, 3D Printing, the New Business Model ...

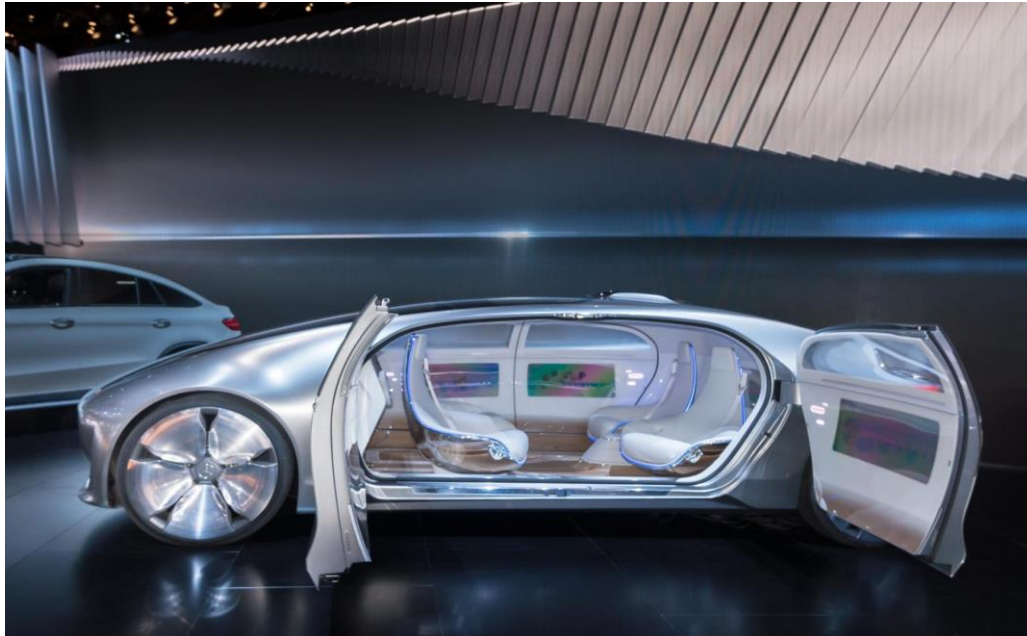
SO, THE FUTURE TODAY - THE ONGOING DIGITAL (R)EVOLUTION

- 👉 Products and Instruments of **AI** are entering at great speed all areas of life, as result of this exponential **increase of the capacity of data treatment, of computing and of communications of present digital equipment**
 - With unequivocal impact on methods and on our way of life
- 👉 In Industry, we head for (we are already in..) **the Industry 4.0** - the 4th Revolution
- 👉 In Academia, it brings in the need for major **pedagogical changes**

Unmanned Vehicle,
USN - University South-Eastern
Kongsberg, Norway, September 2019

VEHICLES OF THE... PRESENT

... planned to be shortly in the market, fully equipped (so the makers claim) with an autonomous control system...



VEHICLES OF THE... FUTURE???

3.5 MILLIONS OF 'EX- LORRY DRIVERS' IN THE USA...



FROM THE 'PALAEOOLITHIC' TILL THE FUTURE... ??? 2050... ??? FICTION? OR, IS IT NOT? !!!



Photograph: Tetra Images, LLC/Alamy Stock Photo, Guardian, 6 September 2019

ACADEMIC ISSUES

THE LEARNING PROCESS - THE GREAT CHALLENGES FOR THE NEAR FUTURE

- 👉 The opportunity of education without boundaries and without walls
- 👉 Learning outcomes - knowledge, skills and competences
- 👉 The challenge of “Don’t Lecture!”
- 👉 Challenges and requirements concerning the academic activity
- 👉 Challenges and requirements concerning political action

Towards Education without Walls and without Borders (I)

☞ It has always been a major duty of academics to (try to) think ahead.

I take, **not 2030, but Tomorrow...** as an adequate horizon for us to anticipate the dimension and the challenges of the transformations on our way of life that are under progress...

☞ **The *Learning Process*** - the main face of the polyhedron of HE, indeed the main subject at stake when we speak of the need for urgent reforms in HE.

☞ **The *Digital Transformation of society*** brings in the need for a ***deep pedagogical innovation attitude***, requiring and calling for institutional vision and investment and for individual participation and commitment

☞ **COVID-19** has dramatically made it crystal clear that the **Digital Transformation** embraces tremendous opportunities for development

Towards Education without Walls and without Borders (II)

Such transformation requires and includes several interrelated initiatives, namely

- i. strengthening the concept of *Education without walls and without borders*, by consolidating a new concept of *classroom* and of *lecture*, **indeed a *don't lecture* concept**;
 - ii. Developing a wide academic offer - *on-campus; hybrid; distance*; integrated *on-campus and online* training - making wide use of digital platforms in a framework of continuous education;
- and
- iii. **teaching in an era where information**, valid and invalid, is abundant and within immediate reach.

KNOWLEDGE, SKILLS AND COMPETENCES AS I SEE IT... TODAY... (II)

➡ Irrespective of the degree structure, skills, competences and attitudes, further to those more directly associated to the discipline, that are recognized today as absolutely relevant for the student global education:

- a multidisciplinary sense and vision of the phenomena;
- critical thinking for both academic and social issues;
- a social sense of multiculturalism;
- a vision of sustainability;
- ethical judgement;
- team versus independent work;
- self-study capacity;
- communications ability.

KNOWLEDGE, SKILLS AND COMPETENCES FOR LIFELONG LEARNING AS PERCEIVED AT EUROPEAN LEVEL

Eight essential transversal competences:

- Literacy competence
- Multilingual competence
- Mathematical competence and competence in science, technology and engineering
- Digital competence
- Personal, social and learning to learn competence
- Citizenship competence
- Entrepreneurship competence
- Cultural awareness and expression competence

(In Council Recommendations of 22 May 2018 on key competences for lifelong learning, Official Journal of the European Union, 4 June, 2018/C 189)

AND SPECIFIC TRANSVERSAL TOPICS IN EDUCATION TODAY AND FOR THE FUTURE, WE HAVE TO...

Speak of

- **Life sciences** and of biology as one of the four basic sciences,
- Environmental issues and **sustainability**
- **(Nano)structures** and material science issues
- **Energy** - An economy based on alternative energy resources

Strengthen **Cultural, Ethical and Humanistic values**

- ## Give an answer to the **demand of Society for specificity and quality**
- New products - competencies in product design

AND... WHAT ABOUT SPECIFICITIES OF MEDICAL EDUCATION?

- ☞ *First - Remember the greek painter, Apelles of Cos (~350 B.C.)*
 - *Ne supra crepidam sutor judicaret - a shoemaker should not go beyond his sandal..*
- ☞ So, I shall not speak about or ask if Bologna has in any form helped in developing innovative treatments of the 'rotator cuff' rupture....!!!
- ☞ But, I serve you some 'food for thought' - how valuable is for the students:
 - Comparability of studies... Competences... Mobility... Feeling other cultures?
 - Personal skills associated to the final thesis work?
 - The 'slow but steady' movement towards the two-cycle system?
 - **And, last, but not least - in developing and transmitting feelings of humanization?**

IMPACT OF THE DIGITAL DISRUPTION IN ACADEMIA

THE CHALLENGE OF “DON’T LECTURE” (JM FERREIRA, USN, 2019)

- What is a ‘lecture’?
- What is a classroom? Any **physical or digital space** where we promote the discussion and transfer of knowledge and where (or through which) competences and skills are developed?
- Where is the Classroom? *On Campus; Online*; everywhere?
- New requirements of **competences and skills of professors** in this age of AI?
- Professors without classrooms? Classrooms without professor?

IMPACT OF THE DIGITAL DISRUPTION IN ACADEMIA...

THE OPPORTUNITY OF EDUCATION WITHOUT BORDERS AND WITHOUT WALLS

- ➡ **Adopt the existing (and those to come) collaborative tools** (e.g. Google Apps), in a process of promoting student emancipation and student centred learning, particularly in terms of self-learning between peers - they **'open Windows'** and **'break down' classroom walls**
- ➡ Make use of the growing offer of **platforms for education** through the Web, with MOOCs - Massive Open Online Courses; most well known examples of such platforms are [Coursera](#) and [edX](#).
- ➡ Adopt (and adapt to) existing (and those to come) tools such as the *digital assistants* or the *chatbots*;

IMPACT OF THE DIGITAL DISRUPTION IN ACADEMIA...

COOPERATIVE ACTIVITY IN EDUCATION WITHOUT WALLS

- Promotes the share of information by providing content and support materials
- Enables teacher-student interaction in virtual tutorials and between students (forums, for example)
- Reinforces autonomous learning and self-assessment of learning
- Promotes group work, critical analysis and debate

I - NEW WORKING ENVIRONMENT

“Emily and Veet attended the class from the main campus garden. The fluidity of communications will lead to the elimination of rooms specifically designed for this purpose.”

HBX Live in Action

<https://youtu.be/W8lf9piApe0>



(0m39s)

II - OLIVIA'S DIGITAL ASSISTANT SUPPORTING HER WORK

“Olivia’s Assistant alerted her for the fact that she still had to finish some learning activities for...”

Deakin Genie

<https://youtu.be/zsRPuU53E74>



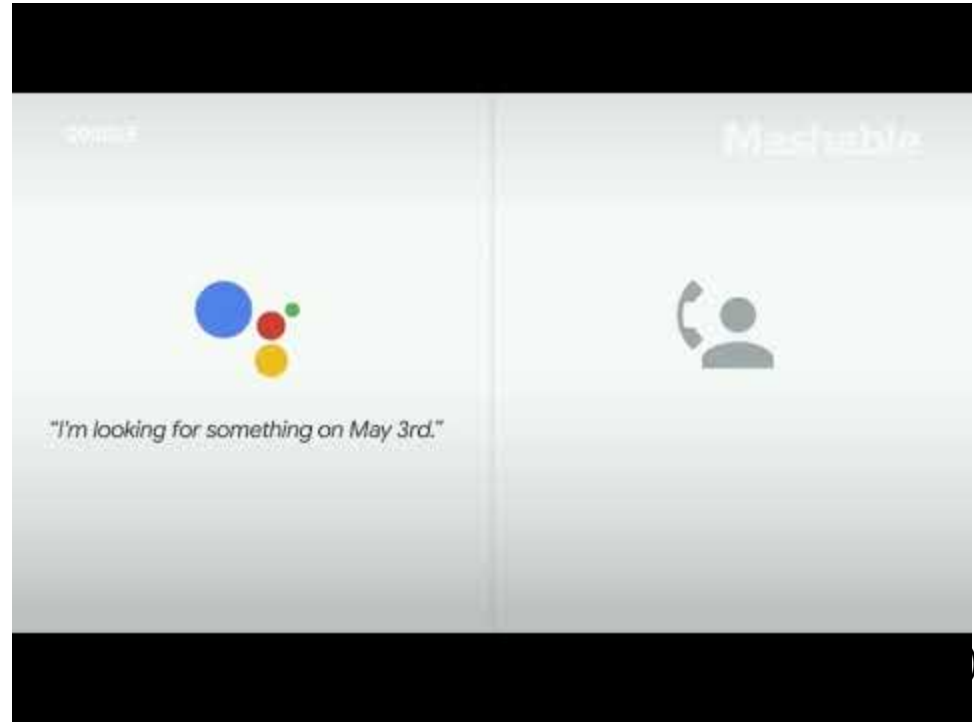
(01:26 S)

III - LISA INDIVIDUAL ASSISTANT

“LISA WAS WOKEN UP BY HER INDIVIDUAL ASSISTANT AT 7:45AM... [THAT]CONSULTED THE SPACE MANAGEMENT SYSTEM AND ORGANIZED THE AGENDA FOR THE 3RD OF MAY...”

Google I/O May 08-10, 2018

https://youtu.be/JvbHu_bVa_g



IMPACT OF THE DIGITAL DISRUPTION IN ACADEMIA...

ISSUES TO GIVE/FIND AN ANSWER OR A SOLUTION

- ☞ Will **Digital Transformation be relatively behind** in the core area of the University's activity - the Academic Area?
- ☞ Or is it already a partial reality, in which it is necessary to coordinate solutions on the ground and **overcome resistance to change**?
- ☞ What risk of **CRITICAL THINKING** being affected?
- ☞ What is the **role of teachers** in this future?
- ☞ How to **preserve academic ethics**?
 - ☞ How to combine learning with assessment?
 - ☞ How to fight plagiarism and other frauds?
- ☞ What implications on the **organizational model of Universities**?

IMPACT OF THE DIGITAL DISRUPTION IN ACADEMIA...

ACADEMIC ACTION REQUIREMENT

- 👉 **Teacher training** requires continuous interaction, but also **material means and incentives**
- 👉 The design of the spaces, **the architecture of the Campi**, must reflect the new reality
- 👉 **Socialization initiatives in the community must be adapted**, strengthening group activities, namely in culture and sport
- 👉 **Institutional organization and governance must reflect changing relationships in fulfilling the mission** - academic, research and third mission

IMPACT OF THE DIGITAL DISRUPTION IN ACADEMIA...

POLITICAL ACTION REQUIREMENT

- 👉 Covering the GAP between political discourse and public policy practice, **investing in strategic domains** for the future
- 👉 Decide decisively **the trajectory of underfunding** in Higher Education... while **requiring more rational organization and greater productivity** to institutions
- 👉 University World News news.... February 21, 2019....

UNITED KINGDOM - Universities funded to train next generation of AI talent
[Brendan O'Malley](#) 21 February 2019

Thousands of graduates are to become qualified experts in artificial intelligence (AI) as part of a new joint government-industry package to drive up skills in the AI sector. It is supported by industry funding and up to £110 million (US\$143 million) in government investment.

**JUST TWO SHORT MESSAGES
FOR YOU TO TAKE HOME**

Portugal in the XVI Century: Euro-Atlantic Hub



Cantino Planisphere (1502): The oldest known map from the days of the Portuguese discoveries

**PORTUGAL TODAY: WEST OF EUROPE, CENTRE OF THE WORLD
ACT LOCAL, THINK GLOBAL**



IT IS IMPORTANT TO UNDERSTAND THE NECESSARY REFORM PATH

- 👉 **Grab the opportunities that the digital transformation offers**
- 👉 **Assess the consequences of hesitations**
- 👉 **Assess the consequences of delays in the adoption of methods of organization generally adopted at international level, particularly in Europe**
- 👉 **Assess the consequences of (non) reform**

**Answer the question -
If we don't change... what will happen?**