EuroTech Universities Event : Opening up Science and Advancing Innovation

Report by Marc GOOSSENS, Executive Officer of SEII [1], Member of the Council of IACEE [2]
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1. The Event itself

On the evening of Wednesday 21st September 2016, EuroTech Universities organized a special event in the impressive Gallery of the Dinosaurs of the Royal Belgian Institute of Natural Sciences in Brussels (*Figure 1*). There were 249 registered participants but, as participation was free, about one half of them were not present.

EuroTech Universities is a <u>strategic partnership</u> of four leading [footnote 4] European Universities of Science and Technology (*Figure 2*) :

1. **DTU** (Technical University of Denmark, in Copenhagen).

2. **TU/e** (Eindhoven University of Technology, in the Netherlands).

3. **TUM** (Technical University of Munich, in Germany).

4. **EPFL** (Ecole Polytechnique Fédérale de Lausanne, in Switzerland)

Figure 1   **Figure 2**

Through this partnership, these universities commit themselves to finding technical solutions that <u>address the grand societal challenges</u>, by building on their in-depth collaboration across research, education, innovation and entrepreneurship. This requires, they say, new ambitious models of research and innovation that are increasingly collaborative, interdisciplinary and enabled by data and digital technologies.

With Open Science and the Horizon 2020 European Programme, they believe that it is vital to ensure an adequate policy framework and sufficient long-term financial commitment for these models of research to prepare the ground for the innovations of tomorrow. Their approach and some of their figures are presented on *Figures 3 and 4* [footnote 5].

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[1] European Society for Engineers and Industrialists

[2] International Association for Continuing Engineering Education

[3] European Society for Engineering Education

[4] As they define themselves, but not to be taken in an exclusive way !

[5] I have slightly – but not fundamentally – simplified and modified the original figures, so that they could better fit into this report.
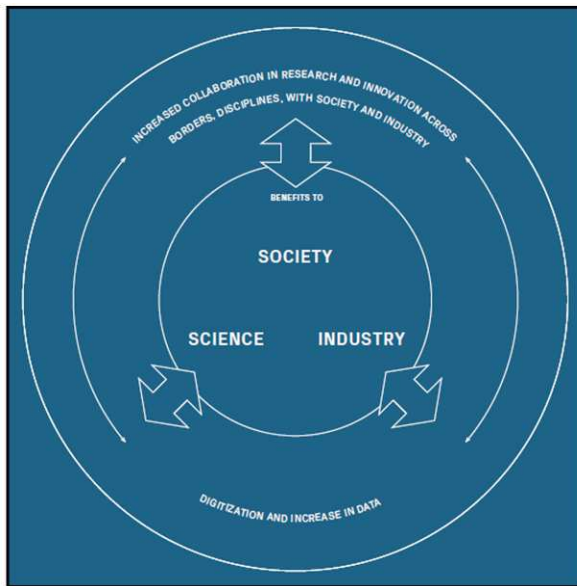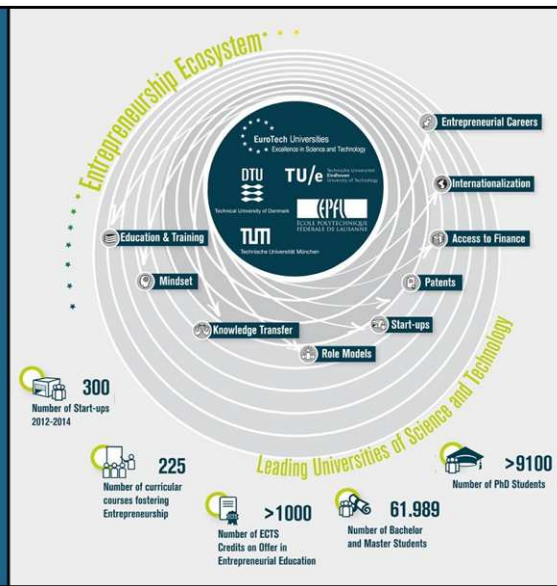
Figure 3   **Figure 4**

The event, which was moderated by Jacki DAVIS [footnote 6], was composed of two parts :

➤ In the first part, four speakers – each from one EuroTech University – briefly presented an innovative development that can benefit to society, science or industry [footnote 7] :

    (1) Fredric KAPLAN, from EPFL, presented the *"Venice Time Machine"*, an international collaborative project aiming to model the evolution and history of Venice over a 1000-year period.

    (2) Sune LEHMANN, from DTU, presented *"Sensible DTU"*, the development of mathematical frameworks for understanding and predicting human behaviour based on the digital traces we leave behind when we use electronic means of communication.

    (3) Claudiu LEVERENZ, from TUM, presented *"Glasschair"*, the spin-off he co-founded in order to develop a new steering solution for electric wheelchairs to help people that cannot move their hands.

    (4) Yuan LU, from TU/e, presented research projects related to design for healthy and active ageing people, including the EuroTech Universities Horizon 2020 project REACH.

➤ The second part consisted of a high level panel discussion that gathered Wolfgang BURTSCHER (Deputy Director-General for Open Innovation, Open Science and Open to the World of the DG for Research and Innovation of the European Commission), Jan MENGELERS (Chairman of the Executive Board of TU/e), Nicola BREUGST (Professor of entrepreneurial behaviour at the Entrepreneurship Research Institute of TUM) and two of the previous presenters (Frederic KAPLAN and Sune LEHMANN). The discussion, of course, dealt with the object of the event : "Opening up Science and Advancing Innovation". Here is a reconstruction from the notes I jotted down during the discussion :

    ▪ One of the key challenges in a global world consists in **building collaboration**. No organization working on a global perspective can survive without collaborating through one or various forms of partnership. However, collaboration is more difficult to build for SMEs and other small organizations. There are three conditions for building a fruitful and sustainable collaboration :

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6 She is an experienced journalist, speaker and moderator of high-level events in Brussels and in EU national capitals, the editor of many publications, a regular broadcaster on television and radio, and a Senior Adviser to the European Policy think tank. She is presently Managing Director of Meade Davis Communications.

7 Three other innovative developments were not presented, but exposed with the four other ones on the mezzanine overhanging the Gallery of the Dinosaurs : (5) A smartphone brain scanner (by DTU) – (6) Smart Mobility : how to make cooperative driving a reality (by TU/e) – (7) Celonis, a software capable of identifying, recognizing and analyzing business process logs in real time (by TUM).

1. Partners must share the same values
2. Partners must have complementary expertise
3. Collaboration between two partners must develop in a win-win situation.

▪ **Opening up** is also a key challenge. It requires from all parties, not only a paradigmatic **change of mindset**, but also the acquisition of a number of skills that were not absolutely necessary when organizations were operating both at a slower pace and with a limited scope. Among these skills, **entrepreneurship** is particularly important, because opening up requires the will, or motivation, and the capacity to face what is different (other people, other disciplines, …) and what is unknown (the future) [footnote 8]. Of course, opening up is of little use if it is not followed by action.

▪ We must not underestimate the **power of the young generations** : most students are ready for open science and well-disposed towards collaboration.

▪ Open science (together with big data) contributes to making a huge amount of data easily available. But, "available" does not necessarily mean either "trustworthy" or "relevant for the sought-after solution". Another problem is that data constitute a patrimony, which in the past was stored in various libraries ; but, now that they are stored in the 'cloud', who will assume the responsibility of taking charge of this patrimony ?

2. Correlated comments

Technologist.eu

Technologist is an excellent magazine that is published four times a year by EuroTech Universities. I may say that it is excellent because each participant received a copy of the October 2016 issue (N° 10) and so I had the opportunity to appreciate the quality of its articles and infographics.

Each issue focuses on two core topics. In this 10th issue, these core topics were *"Open Science"* and *"When technology imitates nature"*. See *Figure 5* for the core topics of the first 9 issues. But there are also plenty of other shorter articles or brief news.

Figure 5

For more information : http://www.technologist.eu

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8 This is my personal explanation of the importance of entrepreneurship in the context of "opening up". Other aspects could also be considered in different contexts.

Open Science

There is much to say about Open Science : the article in Technologist is eleven pages long and is far from exhausting the subject !

Open Science can be defined as a movement to make scientific research, data and dissemination accessible to all levels of an inquiring society, amateur or professional. It began in the 17th century, as a result of both the first scientific revolution and the invention of the printing press in Europe, with the advent of the Academic Journal. But, the privatization of publishing houses, which were looking for significant profits, progressively eroded the possibility of having free access to shared scientific resources. Even with the birth of the Web 2.0, such a free access remained difficult and limited. This is why the movement for Open Science, like the Phoenix, has risen from the ashes.

The CORDIS European funded project FOSTER (Facilitate Open Science Training for European Research) has defined the six principles of Open Science (*Figure 6*) and developed an Open Science Taxonomy (*Figure 7*).
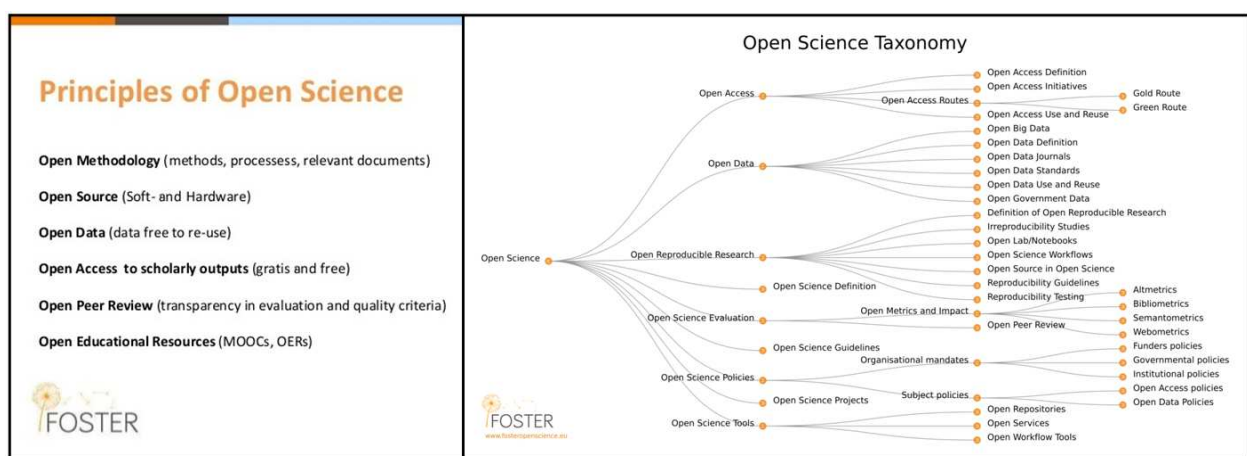

| **Figure 6** | **Figure 7** |

Of course, in the matter of Open Science (OS) as in other matters, there are the pros and the antis. The first ones say that :

➢ OS makes Science more reproducible and transparent.

➢ OS has more impact than the 'traditional' way.

➢ What is publicly funded should be publicly available.

➢ OS allows for more rigorous peer-review.

While the second ones retort that, with OS :

➢ There will be too much unsorted information, which will overwhelm scientists.

➢ It will become more and more difficult to verify the veracity and the quality of the data.

➢ There could be potential misuses (e.g. biological weapons, or disclosure of data of a private nature).

➢ Some scientific data could very likely be misunderstood by the public.

It appears therefore that Open Science is an emerging phenomenon, in the process of getting organized.

Other Associations of Technical Universities

EuroTech Universities is of course not the only partnership gathering together **European Universities of Science and Technology** (often called "Technical University", "Technical Institute", "University of Technology", "Institute of Technology" or "Polytechnic University") and/or of **"Polytechnic Schools"** (or "Faculties of Applied Sciences") that form part of **European Universities**.

I think that, in order to emphasize that trend towards forming partnerships between European Universities of Science and Technology, it is worth mentioning most of these other partnerships :

- ➢ The **IDEA League** brings together the following 5 Technical Universities : TU Delft (the Netherlands) – ETH Zürich (Switzerland) – RWTH Aachen (Germany) – Chalmers UT (Sweden) – and Politécnico di Milano (Italy).

- ➢ The **Nordic Five Tech** brings together : NTNU (Norwegian University of Science and Technology) – Aalto University (Finland) – KTH (Sweden) – Chalmers UT (Sweden) – and the Technical University of Denmark.

- ➢ **CLUSTER** (Consortium Linking Universities of Science and Technology for Education and Research) brings together 12 European Universities of Technology or Polytechnic Schools of Universities :

  - Aalto University (Finland)
  - EPF Lausanne (Switzerland)
  - INP Grenoble (France)
  - ITS Lisbon (Portugal)
  - Karlsruhe IT (Germany)
  - KU Leuven (Belgium)
  - Politécnico di Torino (Italy)
  - Trinity College Dublin (Ireland)
  - TU Darmstadt (Germany)
  - TU Eindhoven (the Netherlands)
  - UC Louvain (Belgium)
  - UP Catalunya (Spain)

  The originality of CLUSTER is to have also six Associate Member Universities outside Europe :

  - Georgia IT (USA)
  - Polytech Montréal (Canada)
  - Technion (Israel)
  - Tomsk Polytechnic University (Russia)
  - Tsinghua University (China)
  - University of Saõ Paulo (Brazil)

- ➢ And, finally [footnote 9], we have **CESAE²R** (Conference of European Schools for Advanced Engineering Education & Research), which brings together 51 European Universities from 26 countries (including Russia, Turkey and Israel) : 8 from Germany – 4 from France – 3 from Belgium, Poland, Spain, Sweden and the Netherlands – 2 from the Czech Republic, Denmark, Italy, Portugal and Switzerland – 1 from Austria, Estonia, Finland, Greece, Hungary, Ireland, Israel, Latvia, Lithuania, Norway, Romania, Russia, Turkey and the UK – and none from Slovakia, Bulgaria, Cyprus, Albania, Malta, Luxembourg, nor from the Republics of the former Yugoslavia.

  It has to be noted that all the universities or schools of engineering that are full members of EuroTech, IDEA League, the Nordic Five Tech and/or CLUSTER are also members of CESAE²R (with the exception of Trinity College Dublin). Six universities are a member of three partnerships (Technical University of Denmark, Aalto University, Chalmers, KTH, EPF Lausanne and TU Eindhoven), while 13 universities are a member of two partnerships.

3. Conclusive remarks

Our world, in its present state, can be characterized by three specific features, which are situated in three different dimensions :

1. In the spatial dimensions, the specific feature is **globalization** : many 'events' have consequences that can affect the whole world.

2. In the dimension of time, the specific feature is **acceleration** : the pace at which 'events' that can change our way of living appear is quickening.

3. In the dimension of complexity level, the specific feature is a **growing complexity** : many problems that we are faced with are more complex than they were in the past.

I think that EuroTech Universities, and other similar partnerships, are a form of adaptive reaction to this changing world and that, as such, it is a very good thing. Nevertheless, I would like to point out some potential lacks or risks that could be linked with the topics of this event :

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9 Te be complete, I must also mention : (1) **LERU** (League of European Research Universities) and **ECIU** (European Consortium of Innovative Universities), which are groups of respectively 21 and 12 multi-faculty universities – (2) **EUC** (European Universities Consortium), a smaller group of mainly private universities – and of course (3) **EUA**, the European University Association, with a larger scope. It must be reminded that there are more than 2660 accredited 'universities' in Europe (including Belarus, Moldova, Russia and Ukraine).

- A **change of mindset** is something that has been wanted and called for at many events and conferences in which I have taken part. All well and good, but what does 'mindset' mean ? Even if most people have a vague idea of what it could be, few of them really know what it is and, above all, how it changes ? Without having to appeal to the concept of *'Weltanschauung'*, or worldview, which was popularized by HEGEL (and which is akin to KORZYBSKI's concept of "Map of the World"), to ERIKSON's theories of stages of psychosocial development and of collective mindsets, or to Carol DWECK's approach, opposing fixed mindset to growth mindset, it is quite clear that any mindset includes many assumptions and prejudices that, being essentially subconscious, cannot be changed by one's will. On the other hand, it is obvious that we don't have nowadays exactly the same mindsets as our ancestors had : mindsets change with the succession of generations because the world also changes, and both changes are influencing each other. But, in the past, the rhythm of change of the world was slower than the succession of generations, so adaptation was relatively easy. However, it appears that today's world is changing so fast that a change of mindset is becoming necessary within one single generation, and that is the problem.

- Through the experience I gained during the last few years by reading and writing articles linked with Engineering Education, I have got the impression that Innovation and Technology, particularly when they are considered together, constitute the new 'God' of our society, the 'God' who is going to save humanity from the doom predicted by some prophets. As both an Engineer and a Physicist, I acknowledge and support the view that innovation and technology are important for our future well-being, and I am sure that most scientists do not think they are saving the world, but simply contributing to making it better. My concern is the excessive confidence that most people have in the ability of technology to solve our problems : when you worship any 'God' [10], you believe that salvation can only come from 'Him' and you stop considering all what lies outside 'his' dictates, as for instance ethical questions, the responsibility of managing knowledge on the cloud [11], algorithmic governance, ...

- As far as I can remember, nothing was said about [(Continuing) Engineering] **Education** [12] during the presentations and the debate on the occasion of the event I am reporting. I understand very well that this was not the subject of the event and I am convinced that these four partnering Universities of Technology deliver high level education and training to their students. But, should not have been first an efficient educational process, all the wonderful innovative solutions that were presented during the event would not have been developed and all the views and projects that were discussed during the debate would be fruitless. Claiming more funding for research is very well – and in most cases justified. However, education at large (not only Higher Education, but also primary and secondary education) needs more financial support from governments. In many countries, faced with the 'diktat' of austerity, education is the poor relation of governmental budgets.

- The economist and journalist Pierre GROSJEAN [13] writes, in the editorial of the October issue of 'Technologist' : *"Caving in to populist pressure, politicians simplify issues and vilify experts, depicting them as technocrats or even imposters"*. Surfing on the same wave and combining the essence of my last two previous remarks, I would say that most politicians have a monolithic and unchanging view of education and that they do not understand that education is not just a question of content and material means, but that is it up to teachers, starting from primary school, to bring their pupils and students the 'virtual bricks' (a mixture of information, projections, reflection and discernment) with which they will build up their mindset.

I shall come back to that in further discussions and publications (as for instance in a book – e-book ? – I am in the process of writing about innovation in engineering education).

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[10] This is not a condemnation of whatever religious belief, but simply the conviction that such beliefs should not interfere with the development of science and technology, and that, unfortunately, it actually happens at subconscious level with many of us.

[11] A problem raised by Frédéric KAPLAN.

[12] Except the interesting contribution of Nicola BREUGST about entrepreneurship : I totally agree with her that entrepreneurship is an important skill, but it represents only a small part of the competencies that can be acquired through education.

[13] Co-founder, with Gabriel SIGRIST, of the press agency LargeNetwork-Largeur.com, in Geneva.