


# Aligning Faculty-led programs with institutional and strategic priorities to create programs of impact: The "Wicked Problems" approach


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What are "wicked problems"?  
How do we design faculty-led programs that address  
them?

Let's consider  
what "wicked  
problems"  
are...


Very large, hard to define as a  
simple issue to resolve




Complex, socially-driven challenges  
with changing requirements and  
parameters



Contradictory, often incomplete  
information that makes finding  
solutions nearly impossible



Interconnected issues that overlap  
and cause more confusion in finding  
answers



Let's identify some wicked problems  
that are particularly relevant in your  
own cultural context...

# How do we "teach" engineering students how to address wicked problems?

A wicked problem should be thought about in a broad, global, comparative context

Consider what your faculty can offer in terms of expertise – who can handle a wicked problem?

How do we involve students in learning about a particular wicked problem – what approaches do we take as educators?

# University of Pittsburgh - "Clean Energy Grid Engineering: Scandinavia"

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Wicked problem – sustaining a safe power grid – how can it be done?

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Example of the Scandinavian approach to integration of renewable forms of energy into the traditional power grid – vs. U.S. approach of maintaining the grid

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Professor is a national U.S. expert in grid technology and is regularly in the news

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Bring students first to U.S. energy companies, then to Denmark and Sweden, to compare the contexts of the grid and various forms of energy feeding into it

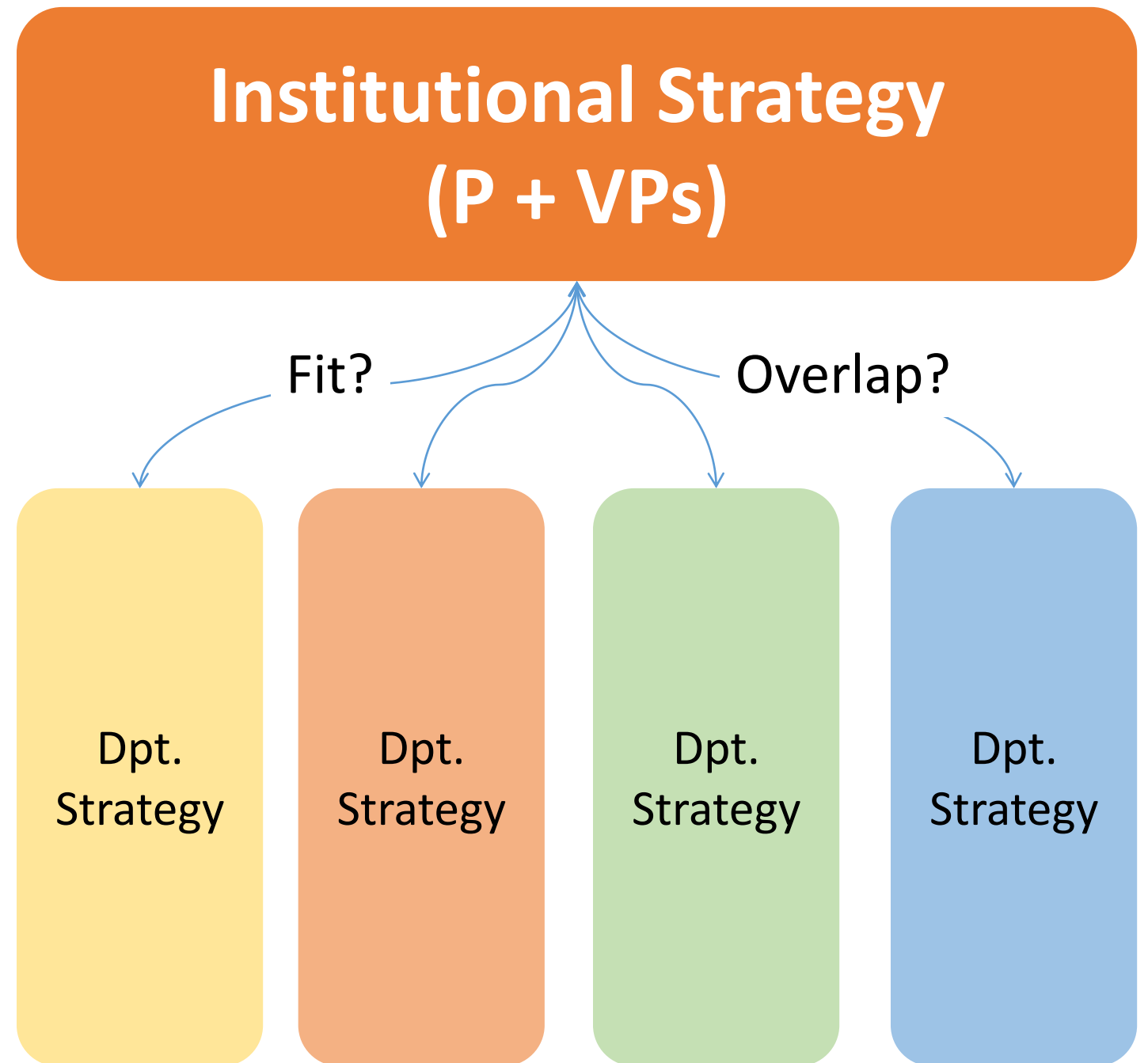
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Challenge students to figure out benefits and limitations of various forms of energy and the feasibility of integration in different cultural and geographic contexts

# Wicked problems of the internal type...#1



Wicked  
problems of  
the internal  
type...#2







# MUAS – GESS (Global Entrepreneur- ship Summer School)



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Global wicked problem: Consumption (2018)

The yearly GESS topic is based on the United Nations Sustainable Development Goals (2017 Food, 2016 Migration, 2015 Youth Unemployment, 2014 Waste)

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Organized by Social Entrepreneurship Akademie (SEA) with the entrepreneurship centers based at the universities in Munich (LMU, MUAS, TUM), Shanghai (Tongji University), Mexico City (Tecnológico de Monterrey) and Cape Town (LifeCo UnLtd SA).

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- 1) pre-course (MOOC), including activities for reflection
  - 2) 7-day course which takes place on-site at four different locations; students have the choice to join one of the them
  - 3) taught by entrepreneurship professors from the dpts. (of the co-operating universities (MUAS: Mech. Engineering) plus SEA staff
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Brings together students from the co-operating universities (and else) that develop high-growth and impact-driven social business models in teams

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Students understand the „wickedness“ of a problem from a multi-disciplinary and intercultural perspective „on the job“ and learn how to apply an social entrepreneurial approach to find answers





# MUAS – Engineering for Sustainability

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The wicked engineering problems: smart vehicles, sustainable energy systems, smart environments and more (2018)

The label “Engineering for Sustainability” allows for different but always engineering topics

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Organized by the International Office; each year the coordinator addresses faculty / departments, together they develop ideas for new or adapted courses; OR individual professors come up with ideas and tandem partners and address IO

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5-week-programm in Munich, one week German language and culture, 2\*2 weeks engineering courses plus one intra-/ entrepreneurship course at the end building on the learnings of the technical classes; field trips

Taught by tandems with international partners (MUAS plus California Polytechnic State University, US; Massey University, NZ)

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50 to 60 participants (engineering students) from all over the world, >60% US, India, Mainland China, Hongkong; less Europe

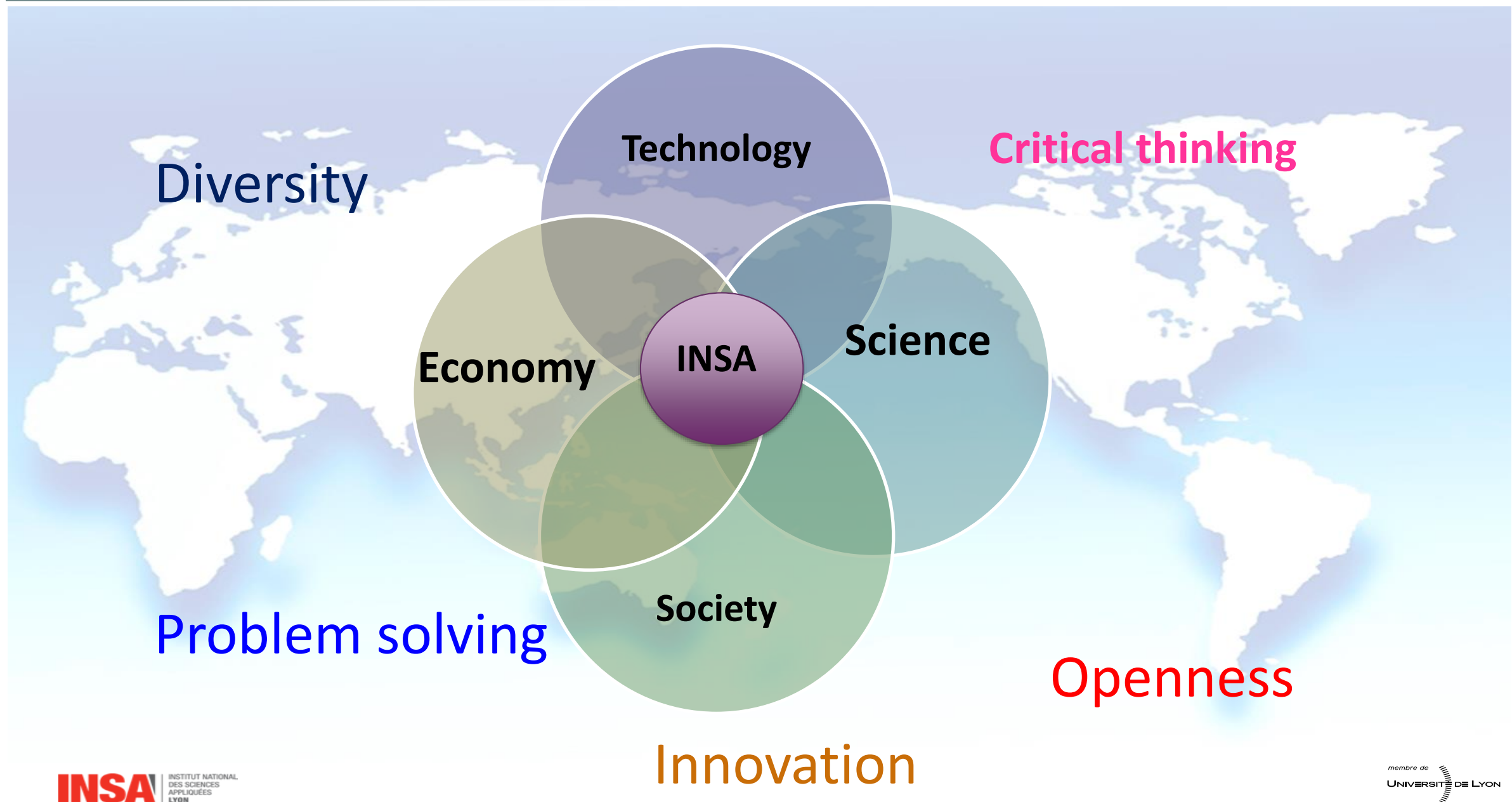
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Students get an overview on latest technological developments in a certain engineering field and how this makes their challenges more “wicked”; the final entrepreneurship class leads them towards finding innovative and if applicable more societal relevant solutions

## Research Challenges for Societal Issues:

- Engineering for a Sustainable Development
- Global Health and bioengineering
- Information and Digital Society
- Environment : Natural, Industrial and Urban Environments
- Transport : Structures, Infrastructures and Mobilities

## INSA Lyon An integrated approach







- 1) A smart communication network
- 2) Connected devices / energy efficiency
- 3) A secure system /private life & data
- 4) Reliable scaling solutions

## INSA Expertise

- CITI lab **C**entre of **I**nnovation in **T**elecommunications and **I**ntegration of **S**ervice [www.citi-lab](http://www.citi-lab)
- Industrial Chair with SPIE

## Initiatives/ programmes

- Awareness campaign among 1st year students
- Several projects, including internships at SPIE
- Introduce the challenges/ to understand them
- Emerging related technologies
- Scientific challenges requirements
- 2 Examples
  - 5th-year project
  - INNOV@INSA IoT track

### **Smart Cities and IoT:** 4 courses and a project

- 1) Smart cities and protocols: introduction to smartcities issue, with both a societal and technological view point, survey of the networking technologies diversity, hands-on session on the IoT-lab national experimental platform, business presentations
- 2) Cloud-IoT: introduction and practical training to software technologies for distributed clouds dedicated to IoT, experiments in the YouPI platform of the CITI lab
- 3) Software Defined Radio: theoretical and practical introduction to SDR, development of a networking stack on GNU-Radio
- 4) Long Distance Networks: general considerations on long range low power networks (Sigfox, LoRa, NB-IoT) for sensor data collection bridged to a cloud environment, experiments on a campus-wide lora platform



**In  
English**

# **INNOV@INSA**

**European Perspectives In Engineering  
and Innovation**

**May, 18th - June 15th, 2018**

## A 4-week program for 6 US credits

<b>French Language, Cross-cultural Communication, Industry and Society</b>	
<b>1 - Connected Devices and Smart Devices</b>	<b>2 - Management and Innovation in Europe</b>
<b>Social and Cultural Activities</b>	

# Connected Devices and Smart Devices

## **Objective:**

introduce a practical “How To” guidance, tools and design methods that students can apply immediately.

## **Teaching Methodology**

Classes will typically consist of lectures, guest speakers, rapid prototyping tools, in-lab exercises, and discussions of case studies.

## **Visit major industrial actors in the field of the IoT in the city of Lyon**

- RENAULT TRUCKS, ALSTOM and ROBOTICS, ORANGE Lab.

## **Attend on-site demonstrations**

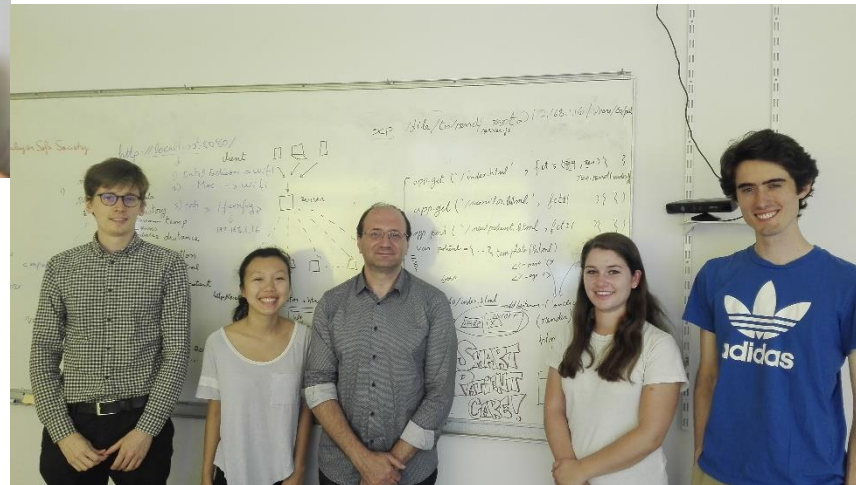
- smart home prototypes, smart cars, robotics, ...

# Smart and Assistive Environment Projects

## Smart Refrigerator (summer 2016)



## Smart Patient Care (Summer 2017)



# Worldwide perspectives of adapting engineering education to change

To conduct change

To support and motivate new initiatives

To develop an attitude of lifelong learning

To adapt

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To listen, to share , to benchmark

**Gaston Berger** (1896-1960): Philosopher, teacher, manager ,  
Director of Higher education (1896-1960). **Father of the French  
prospective and co-founder of INSA Lyon**

*« L'avenir est moins à découvrir qu'à inventer  
It is less to discover than to invent... »*



# Discussion: How can we leverage Global E3 relationships to develop new initiatives

What are some wicked problems that your institution is actively addressing?

How can we partner with other Global E3 member institutions who share the same concerns?

What models of collaboration are the most successful in addressing wicked problems?

What have been your biggest challenges in collaborating with other Global E3 institutions to develop specific connections?

Please share some success stories about fruitful collaborative efforts within the Global E3 consortium....