

The French model of University of Technology

Bridging the gap between higher education and the needs & expectations of society

*In 2006, 75% of the economy came from technologies...
unknown 10 years ago...
and more than 50% of the jobs profiles were not identified... 15 years ago*

1. The UTC model
2. Some lessons from the last decades
3. Innovation should be open!
4. Technological research
5. Practically, how to bridge the gap?

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Part 1

A glance on the UTC...

The UTC is a public institution specialized in engineering, science and technology awarding Masters (*Diplôme d'Ingénieur*) and PhDs...

fully integrated into the EUROPEAN system of higher education & with strong INTERNATIONAL exposure

Part 1

it was founded in 1972...

to create a new model in France
that would bridge the gap between :

- ◆ the standard universities and the “Grandes Ecoles”
- ◆ higher education institutions and industry

Part 1

the UTC is...

- ◆ a “university” because of its PhD school and its research structure
- ◆ a “*Grande Ecole*” because of its student selection process and its links with industry

Part 1

a model that combines the best assets of USA, Germany and France

- ◆ USA : academic organization
- ◆ Germany : industrial relations
- ◆ France : emphasis on fundamental science

Part 1

the model was reproduced...

- ◆ in France in Belfort in 1985
and Troyes in 1994
- ◆ and abroad in China in 2005
and Chile in 2006

Part 1

it is characterized by...

- ◆ specific curricula design
- ◆ the role of humanities, social sciences and management
- ◆ a technological research that uses a cross-disciplinary approach

Part 1

Facts and figures

- ◆ 3270 students
 - 2750 Engineering degree (high level Master)
 - 250 Master and 270 PhD
- ◆ 320 faculty members
- ◆ 310 support staff
- ◆ 7 academic departments
- ◆ 9 research units

Part 1

Industrial relations

- ◆ 1300 industrial internships each year
- PhD curricula linked to industry
- Continuing education
- Innovation center
- 2 industrial competitiveness clusters
- « Label Carnot »
- Business start-ups, Licencing

Part 1

International relations

- ◆ 60 % of students spend a semester abroad
- ◆ 15 % international students
- ◆ 9 double degrees
- ◆ 186 European and international agreements
- ◆ Active member in EU and international programs and networks
- ◆ International joint-research units
- ◆ International extension of the UT network (Asia and Latin America)

Part 1

Future plans

- ◆ Strong regional base along with European and international exposure
- ◆ 5000 students
- ◆ Introduction of new teaching methods and education programs
- ◆ Cross-disciplinary approach to research
- ◆ Innovation Center
- ◆ Active role in the industrial competitiveness clusters : agro-industry and Intelligent transportation

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Part 2

60 years of interactions between universities and society (1)

- ◆ What have we learnt?
 - Real world and today's life are not anymore the production factory, as an extension of the laboratory
 - Reality is complex, especially in terms of technology
 - Today's innovator needs first to “master” this complexity and then to manage this complexity
- ◆ Anticipation and open dialogue are dramatically required

Part 2

60 years of interactions between universities and society (2)

- ◆ Which qualities are emphasized today?
 - Open mind
 - Flexibility
 - Innovative
 - Adaptability
 - Autonomy
 - Curiosity
 - Behavior...

Part 2

60 years of interactions between universities and society (3)

- ◆ What about tomorrow?
 - Courage
 - Ability to develop its own thinking
 - Ability to make choices and decisions
 - Willingness to take responsibility

- ◆ Education and curricula are catalysts for personality development, not molds!

Part 2

60 years of interactions between universities and society (4)

- ◆ What else about tomorrow?
 - Expertise
 - Aptitude to manage
 - Analyze, summarize, communicate, share and draw involvement & commitment
 - Internationally open and able to integrate multidisciplinary and multicultural teams
- ◆ = expert with sound scientific & technical skills combine with a strong ability to manage people!

Part 2

60 years of interactions between universities and society (5)

- ◆ Resulting profile for an executive?
 - Administrator
 - Open to the environment
 - Organizer of change
 - Conductor of synergies
 - Able to develop global thinking
 - Within a context of networks and partnerships

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Part 3

Key stakes for universities

- ◆ Make readable and more **accessible** skills and *know-how* of our university (esp. for **SMEs**)
- ◆ Better **screening** and **composition** of IP vs. **users** criteria
- ◆ Operate, in high growth sectors, **technical & economical intelligence** to enhance **pro-activity**
- ◆ Step from (improved) reactivity to pro-activity

Part 3

Emergence of a regional “new deal”

- ◆ *Concentration of skills & talents enhancing attractiveness for brains & know-how*
- ◆ *Support devoted to “intangible assets”, non-material infrastructures & intellectual potential*

Part 3

Key competitive advantages

Role of private sector

- ◆ Valorization of research and knowledge is relevant
- ◆ Enterprises are accessing new markets
- ◆ And show even higher innovation capabilities

Part 3

Enterprises get closer and reinforce their competitiveness

- ◆ **Clusters** are more and more considered as the places where tacit knowledge is shared
- ◆ They illustrate local dynamics
- ◆ They need animation, advanced services and relationship with both public and private partners

Part 3 Emergence of “collective intelligence”

Needs conviction and involvement from :

- ◆ Enterprises and groups of enterprises
- ◆ Employees organizations
- ◆ Financial institutions
- ◆ Public and non-public organizations
- ◆ Governmental agencies
- ◆ ...

Part 3

Coupling university to society

- ◆ Exploration of knowledge and its implementation should have as a final vocation to benefit to the community
- ◆ Professional relevance occurs from convergence between education and research both focused on the problematic of the real world

Part 3

Open Innovation (1)

- ◆ The vision of a “closed” innovation process is not relevant anymore
 - Manpower more and more qualified
 - Venture capital
 - Too many ideas perishing on our shelves
 - Competition does exist and “key accounts suppliers” are smarter than before
- ◆ Only, an open vision of this process is relevant

Part 3

Open Innovation (2)

- ◆ As “*coopetition*” between enterprises became necessary
- ◆ Collaboration between academic institutions and enterprises is compulsory
 - Even if time constants and activities cycles significantly differ

Part 3

Open Innovation (3)

- ◆ Bridging this gap is today a significant part of our mission
 - Companies need assistance (less and less large corporate labs)
 - Our governments are encouraging and recommending these partnerships
- ◆ It can be seen as well as a threat or as a huge opportunity

Open Innovation (4)

- ◆ A shared approach:
 “**real world problem solving**”

- ◆ Pay attention anyway to the syndrome...
*“I have a solution...
 has someone got a problem?” ...*

Part 3

University & industry networking

- ◆ Base line for relationship:
we don't intend to model each case, neither to simulate all the dimensions of the relation with industries,
- ◆ Postulate : *commitment to agree*
- ◆ And an agreement for “conflicts resolution”
 = collective *goodwill*
- ◆ + **follow-up and monitoring.**

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Part 4

Technological research

- ◆ Discover what we need to know to build what does not exist

=

- ◆ Know to build

Part 4

Technological research

- ◆ Discover what we need to know to build what does not exist

=

- ◆ Know to build

Part 4 Technological research: our ambition

- ◆ Circulation of practices and know-how:
 - Between disciplinary sectors ;
 - Between University & Society ;
 - Between lab & enterprise ;
 - Between public & private organizations.

Part 4

Make knowledge mobile...

Industrial research

Offers new products & services

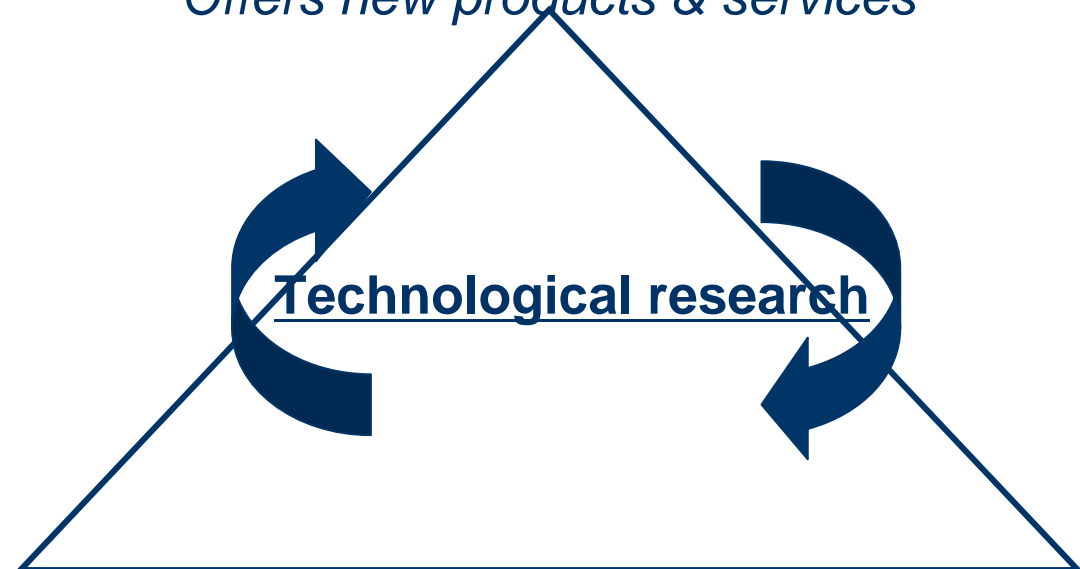
Technological research

Academic research

Challenge the borders of knowledge

« Practice » research

*Make convergent
 innovation and practice*



Part 4

Technological research at UTC (1)

◆ Positioning:

■ *Eco-technologies*

- Allow sustainable development in harmony!

◆ Contribution:

■ *Technologies for Society*

- Answer through technological research the demands from Society ;
- Integrate societal issues into the selection and the management of projects.

Technological research at UTC (2)

- ◆ Eco-technologies for Society:
 - Nature
 - Natural environment: safe, non-polluting & alternative process.
 - Society
 - Societal environment: inform citizens, propose solutions.
 - Individual
 - Cognitive environment: human – technology complex.

Part 4

In other words...

Technological research

- ◆ Forms the objects
- ◆ Complements the human hand
- ◆ Equips the intellect

to

- ◆ Make the world *inhabitable*
- ◆ Make the human *adapted*

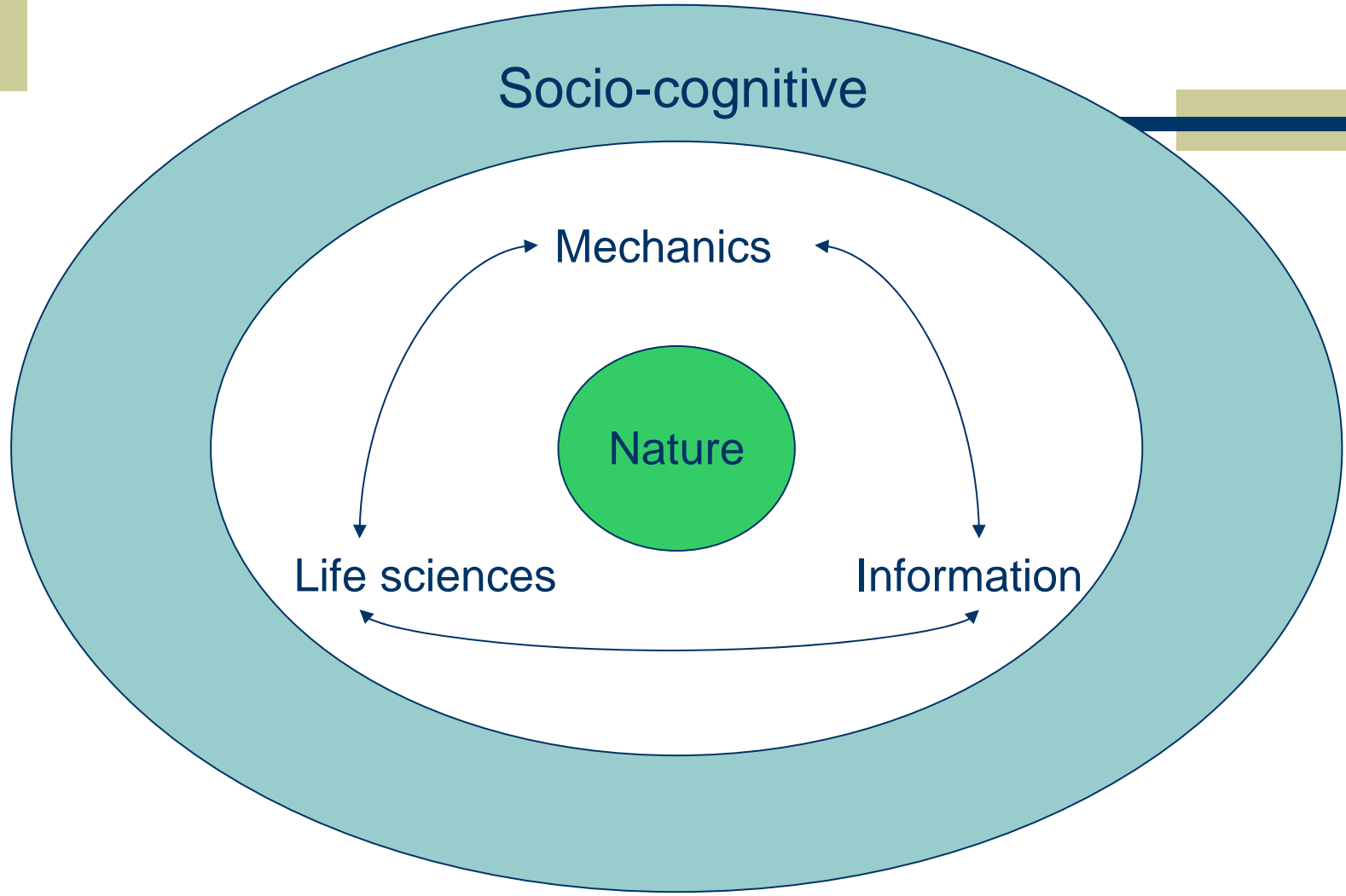
Part 4

Research thema...

- ◆ Biotechnology
- ◆ **Mechanics**
- ◆ Complex socio-technical systems
- ◆ **Biomedical engineering**
- ◆ Sciences & technologies for information & communication
- ◆ **Process engineering**
- ◆ Energy & sustainable development
- ◆ **Modeling & calculus**
- ◆ Transports

Part 4

Influences



Part 4

Applied to...

- ◆ Green chemistry, vegetal alternatives, bio-refinery .
- ◆ Safe & intelligent transports systems
- ◆ Equiped human:
 - Bio-wise : bio-engineering;
 - Intellectually: cognitive technologies, modeling, innovation.

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Part 5 And the issue of coupling between education, research & industrial partnership ?...

- ◆ Every stake-holder must win!

Part 5

Chairs: convenient & trendy tool

University

- ◆ Need to occupy a sector or a *niche* ;
- ◆ Cross-linking education & research ;
- ◆ With external funding dedicated to specific curricula :

Industry

- ◆ Need to externalize education
- ◆ And to secure recruitment sources
- ◆ & to maintain significant *activity* with active partners for their specific domains

- ◆ Example : Hydraulics, signal processing & control, acoustics, etc.
- ◆ Configuration : *chair* professor, secretary, engineer, 3 PhD students
- ◆ Costs : k€ 500 per year.

Part 5

From the *chair* to the *institute*...

- ◆ The *chair* is a local tool which cannot modify the way we are conducting research.
- ◆ Necessary to position the chair into a more global process that meets our structural expectations : the institutes.
- ◆ 3 levels :
 - Model for research & development;
 - Coupling device for existing structures;
 - Clear thematic positioning.

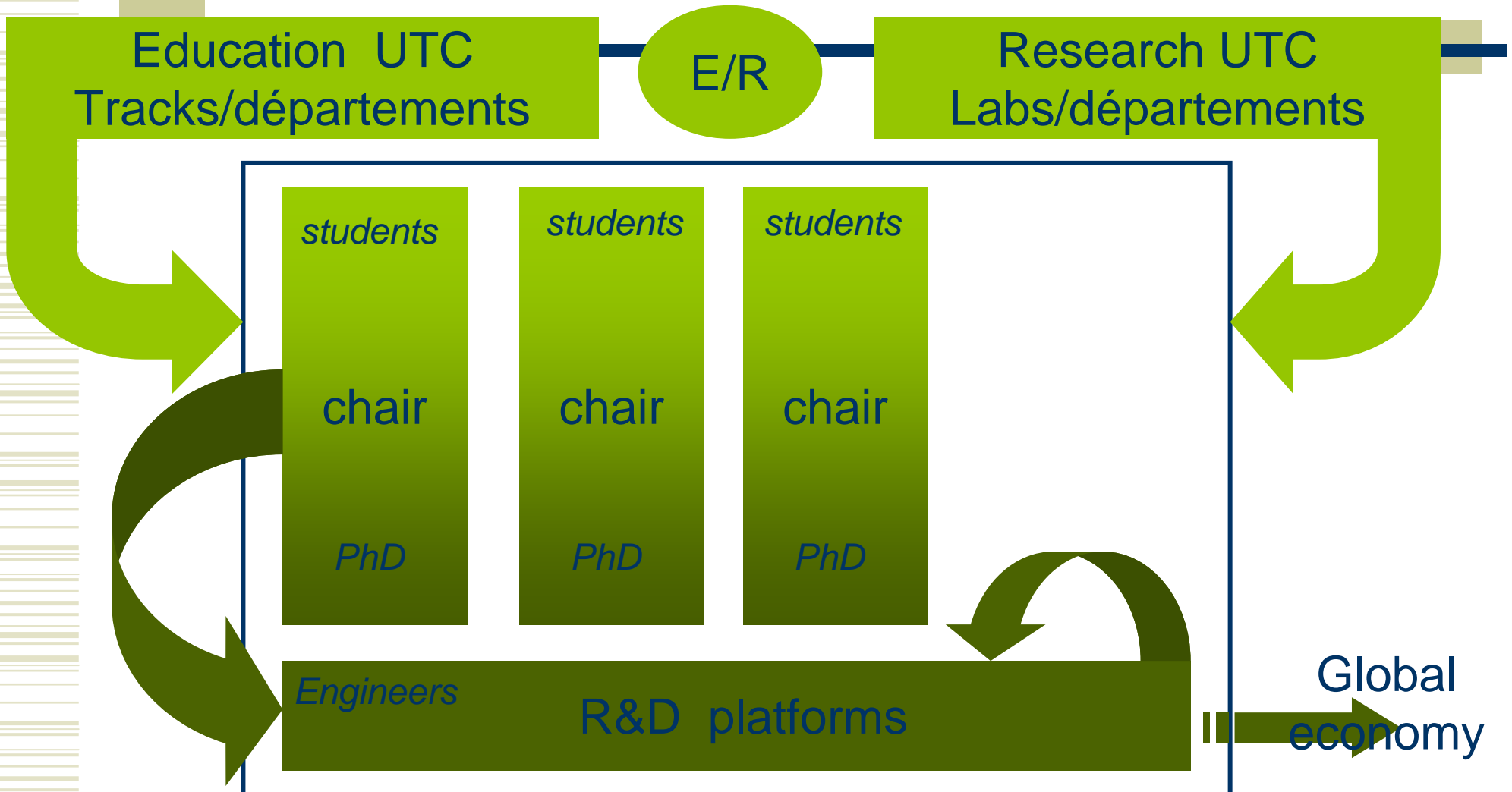
Part 5

Institut: need

- ◆ Technological research requires:
 - Platforms
 - High level development
 - A significant continuity between projects to enhance global research efficiency.
- ◆ Problem:
 - Lobotomy at the end of each project: non-permanent staff should leave...
- ◆ Solution:
 - Stabilize teams during time cycle fitting technology life cycle
 - Couple research & education
 - Associate research & development.

Part 5

Institut: how it works?



Part 5

Which “bridging” initiative?

- ◆ Innovation Center as a tool supporting research, education, industrial valorization and technology transfer
- ◆ ...this center aims to promote a proactive image of conception and innovation in UTC

Part 5

How to define innovation?

- ◆ Innovation is the process which allows to **transform an idea** into a product or into a new or improved sellable service, or into a new process of elaboration
- ◆ Innovation process includes all activities from science, technology, business and finance which are necessary for the success

Part 5

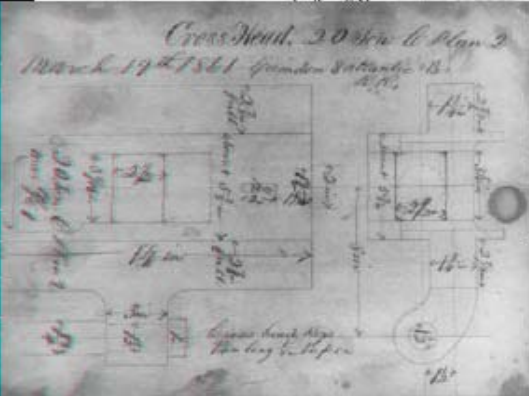
Innovation center is a melting pot

- ◆ We carefully analyzed existing industrial and academic *innovation centers*
- ◆ And retained two principles:
 - One location
 - An educative *technocenter*

Part 5

Specification for One Engine, Class ¹⁰²² C
 Road, Top R. R. & Coal Co.
 No Beads N.A. March 2

Ray,	0"	See Extra Order 461 ^{7/91} for Balv., Bill 2002	Pumps, No. & Kind,
Fuel,	Soft Coal		Top Chamber,
Boiler Material,	Iron - $\frac{3}{8}$ ", Bill 161 Drawing No. 317		Bottom "
Diam.,	142"		Feed Cock,
Plan,	<i>Diagram Top</i>		" Pipes
Domes,	<i>(blank)</i>		Check "
Dome Casing,	Brass		Checks,
" Beads,	Iron		Injectors, No. & Size
Mud Drum,	Stone		
Jacket,	Wrought Iron		
" Bands,	Brass		
Safety Valves,	3 B.L. H. Lock Is. Balance Blow Off Cocks, Brass		
Gauge Cocks,	3		
Furnace Material,	Surface Coal <i>Water Gauge</i> Steel		
Length,	84 1/2		
Width,	28		
Depth,			
Chamber,	Steel		
Hollow Stays,			
Fire Brick,	Rich		
Tubes, Material,	Iron <i>Doppelringe ft. and</i>		
Number,	111		
Diam.,	2"		
Length,	10'0"		
Steam Pipe,	Wrought - Brass Rings		



Engineering department 1880



Part 5



Engineering dept, Steel foundry in Rombas, 1930

Part 5

1968



Part 5

Design dept.



1980



Gerhard Pahl et Wolfgang Beitz, Systematic Design

October 16th

Ronan STEPHAN - Université de Technologie de C

Part 5

1990



Nam P. Suh, Axiomatic Design

October 16th

Ronan STEPHAN - Univ

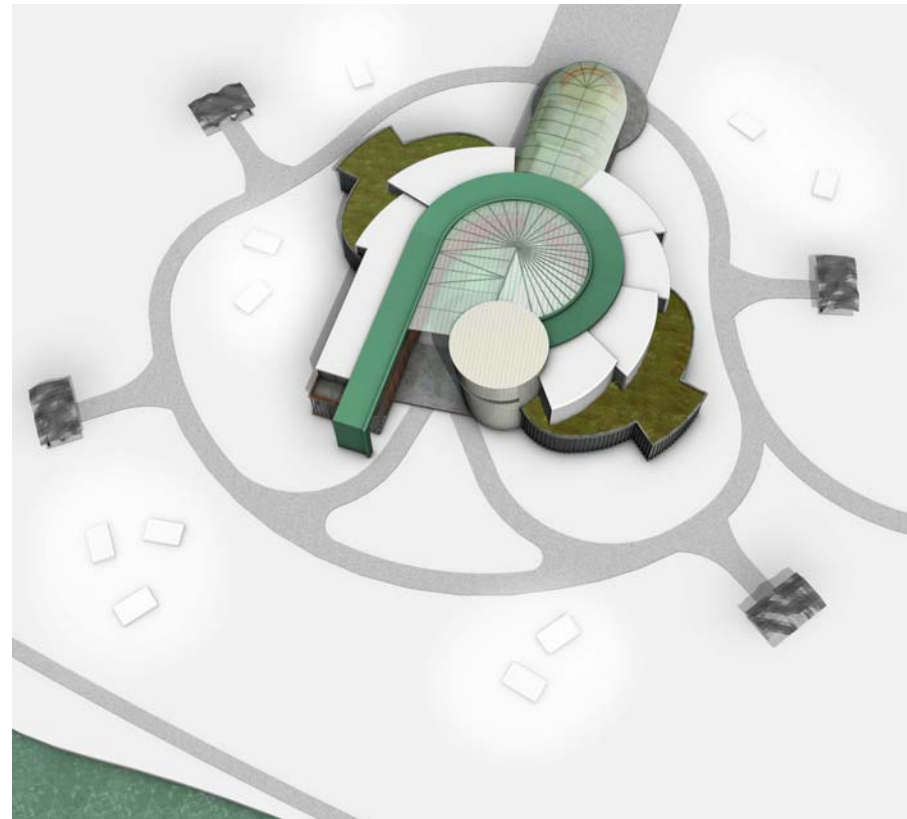


Innovative Design



Part 5

Concept of Innovation Center



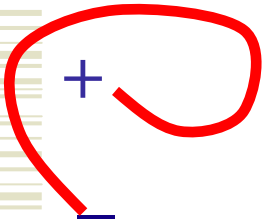
Innovation spiral

Part 5

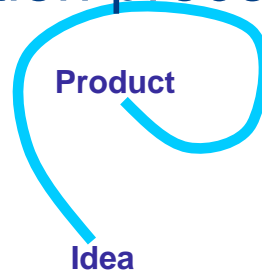
Research on innovation
processes



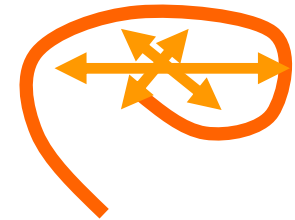
Confidentiality



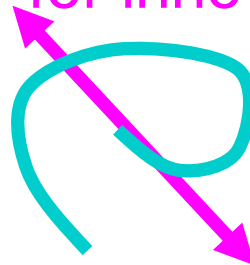
Innovation processes



Interactions



Pedagogy for innovation



Human dimension





Thank you for your attention

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