

University 4.0: a new concept in education

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<http://www.univ-pau.fr>
<https://e2s-isite.fr>



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Teaching:

System and Software Engineering
 Cloud Computing and Industry 4.0/IoT Platforms
 SOA, Business Intelligence
 Semantic Web, Cognitive Computing

Research Domain:

- Autonomic Architectures
- IoE Integration Platforms
- Model-driven self-management
- Research projects: GCAP, EuQoS, NetQoS, Feel@home, IMAGINE (Europeans) / QoS-Seeker (Australian), Tornado



2013

2014

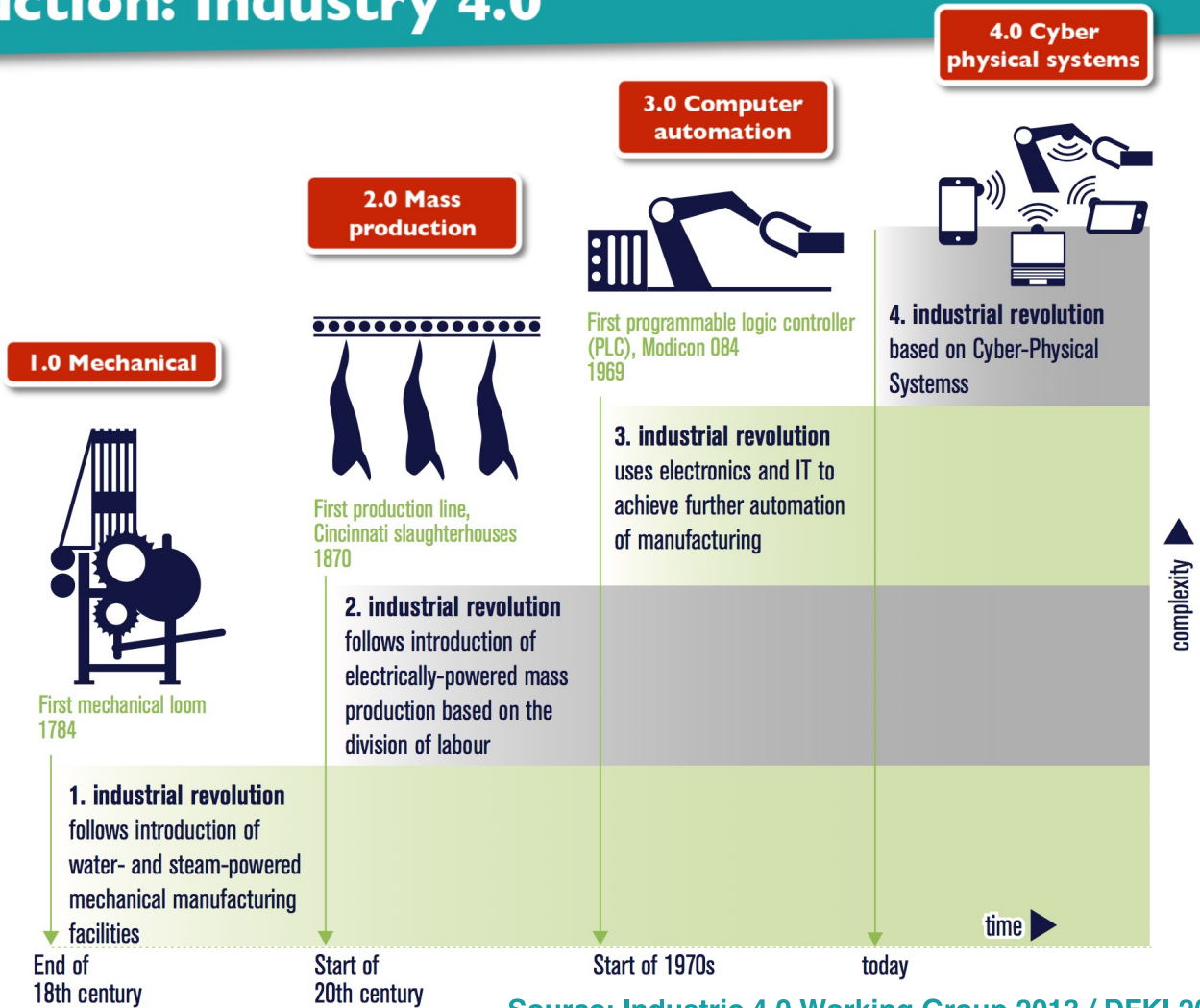
2016



Industry 4.0



Introduction: Industry 4.0



What does it mean today ?

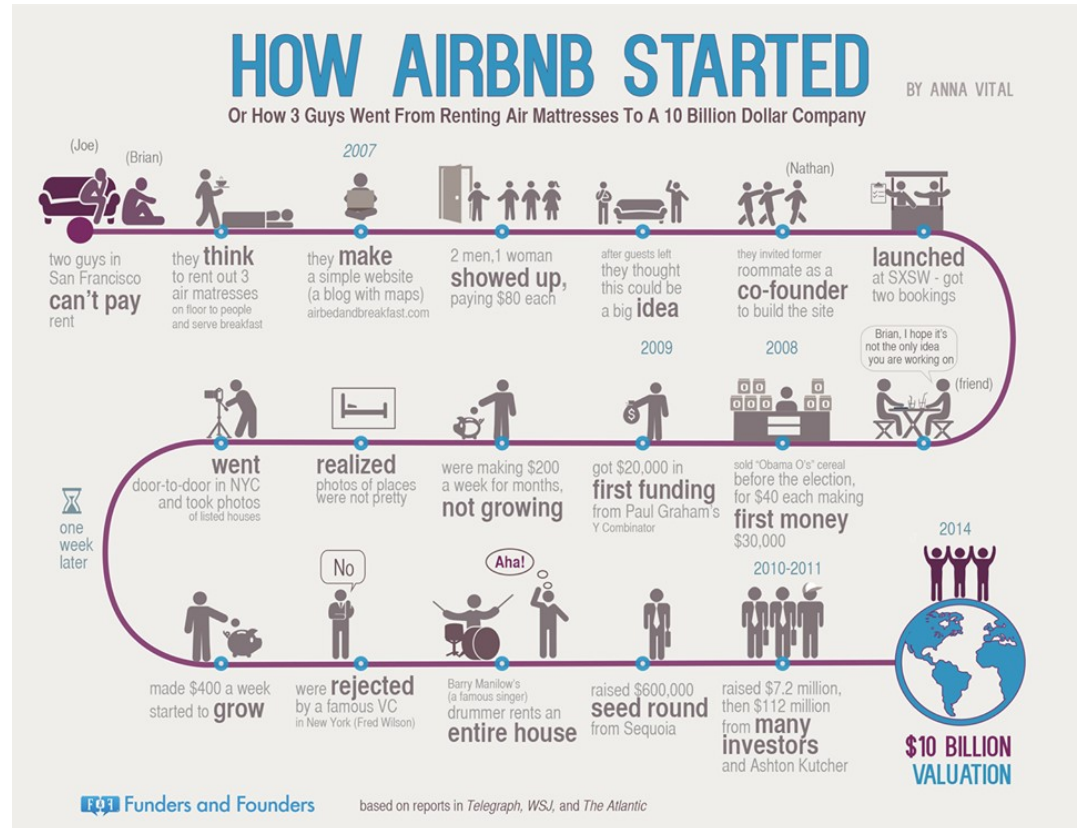
**Only Industries of products
manufacturing ?**

What about Industry of Services?



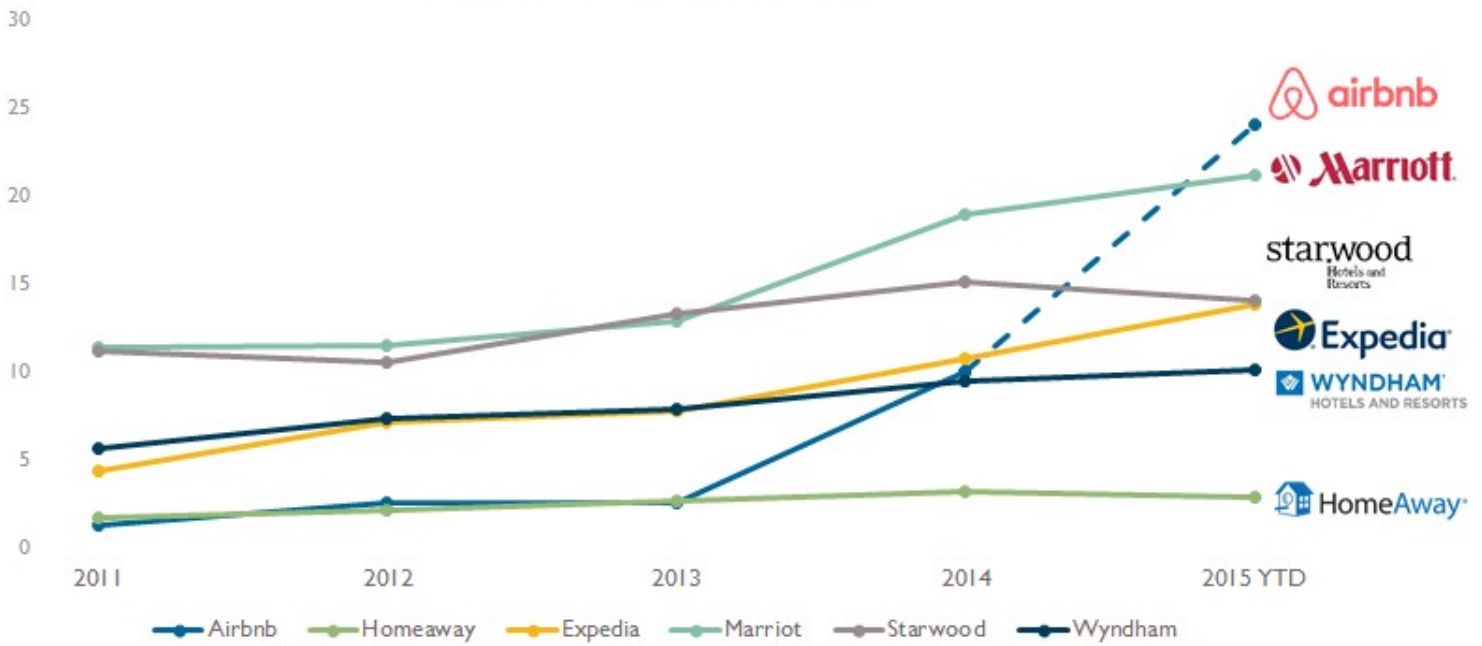
Airbnb: Airbed & Breakfast

Idea:
connecting
travelers
with
home owners
with
available
home spaces



Airbnb: Airbed & Breakfast

AirBnB vs. Public Competitors: Valuations Over Time (\$B)
2011 - 2015 YTD (6/18/2015)



*AirBnB did not raise a round between 2012 and 2014, and therefore it's valuation stayed the same during this time

**Valuations were taken at dates where AirBnB raised. 2013 data was taken at 6/1/2013




www.cbinsights.com



Source: <https://digital.hbs.edu/platform-digit/wp-content/uploads/sites/2/2018/03/AirBnB-Valuation-1.png>

Airbnb: Airbed & Breakfast

 **Company:** Airbnb

 **Founder(s):** Brian Chesky, Nathan Blecharczyk, Joe Gebbia

 **Year founded:** 2008

 **CEO(s):** Brian Chesky

 **Headquarter:** San Francisco, California

 **Number of Employees (2017):** 3,100

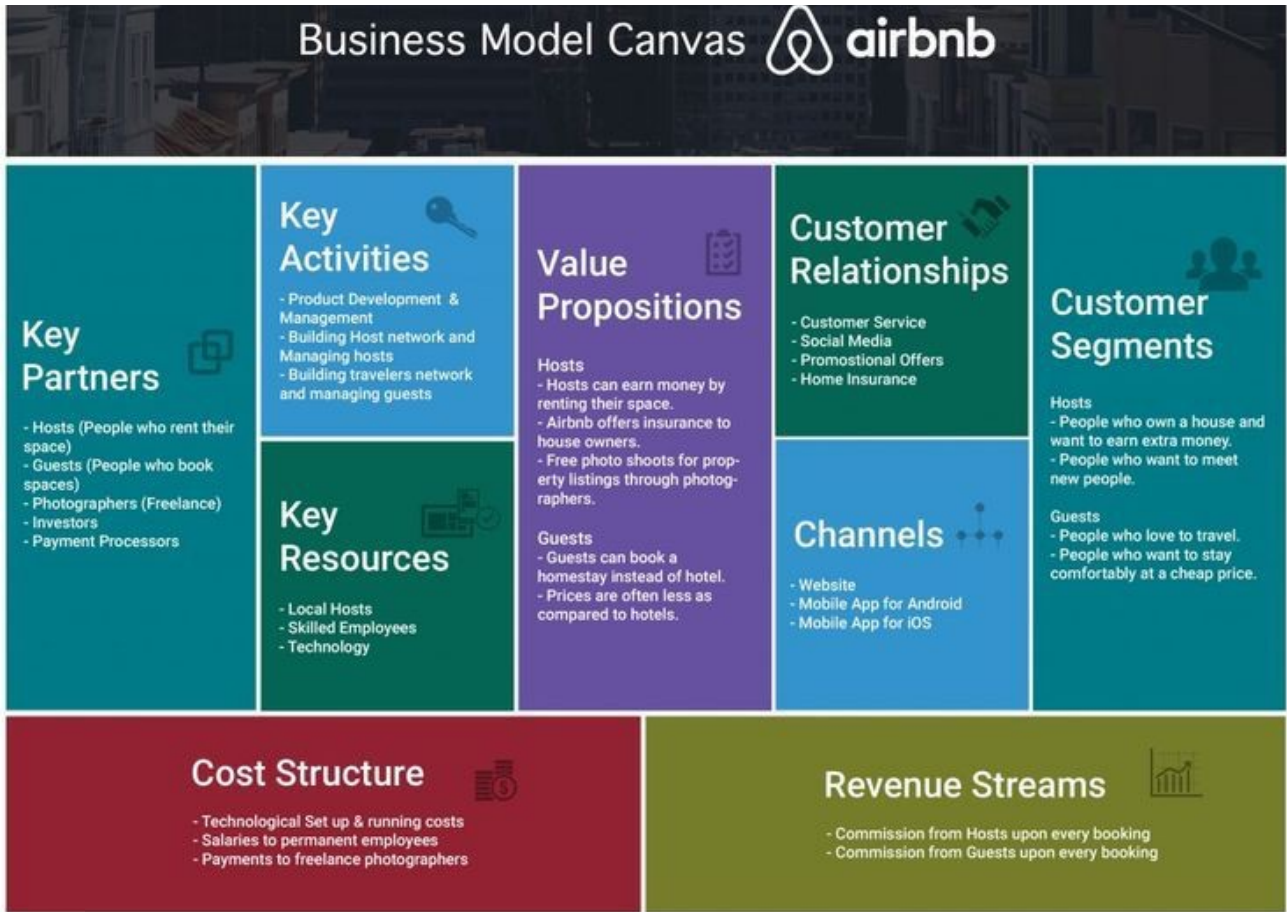
 **Type:** Private

 **Valuation (2018):** \$31 Billion

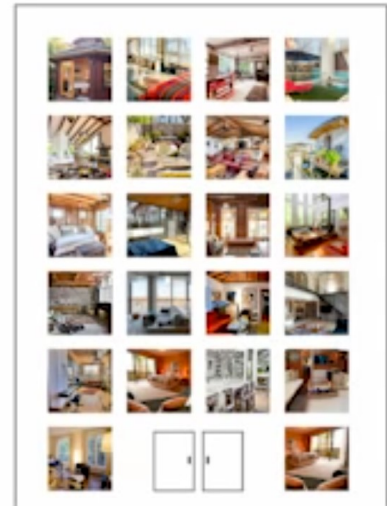
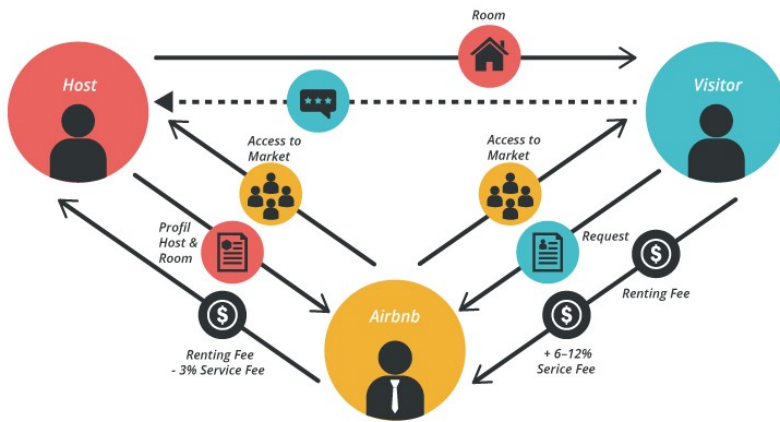
 **Annual Revenue (2017):** \$2.6 Billion

 **Profit | Net Income (2017):** \$ \$93 Million

Airbnb: Airbed & Breakfast



Airbnb: Airbed & Breakfast Platform





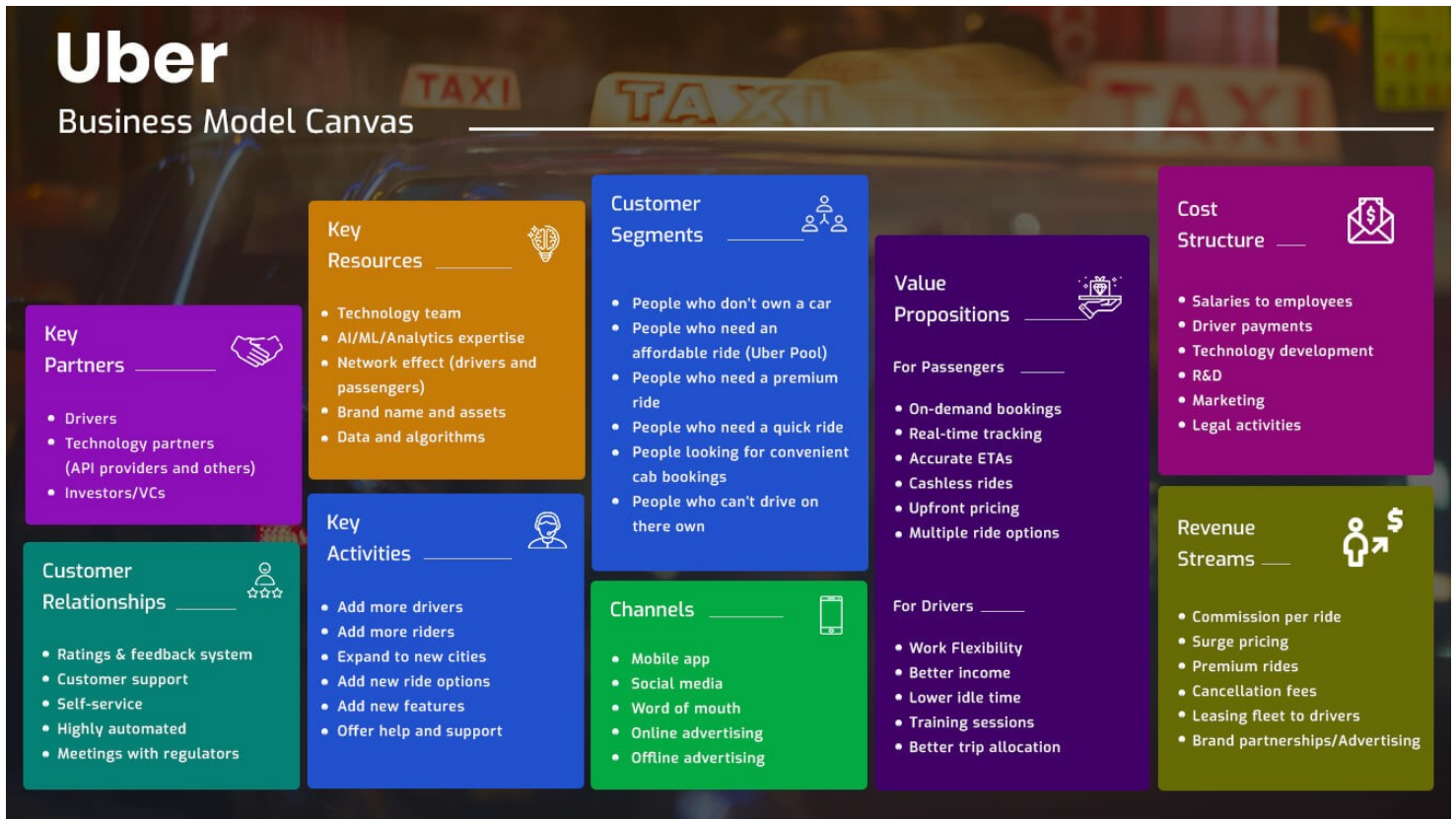
Q Anywhere · Experiences

AIRBNB EXPERIENCES

One-of-a-kind activities hosted by locals

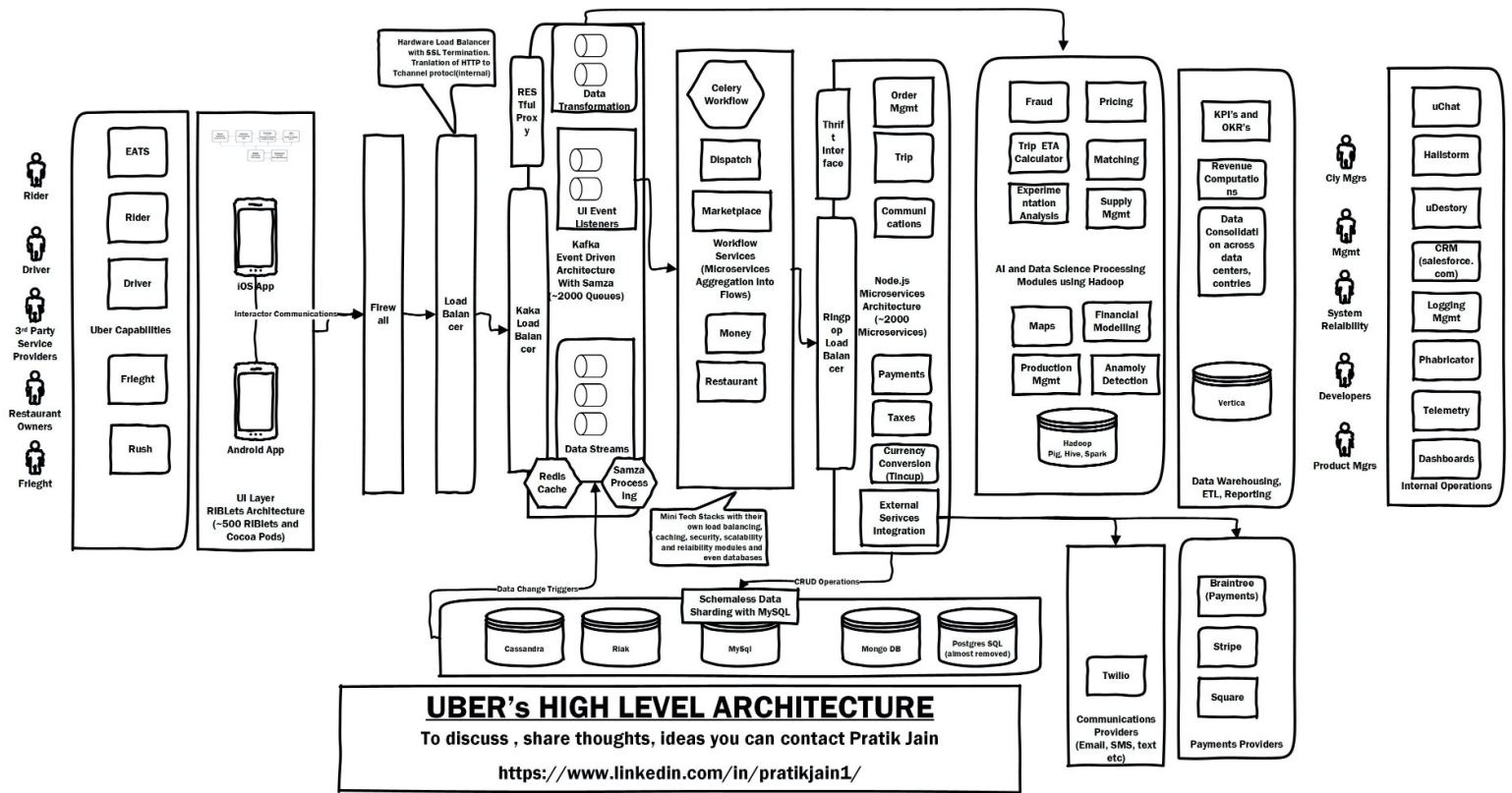


UBER: largest fleet of taxis (?)

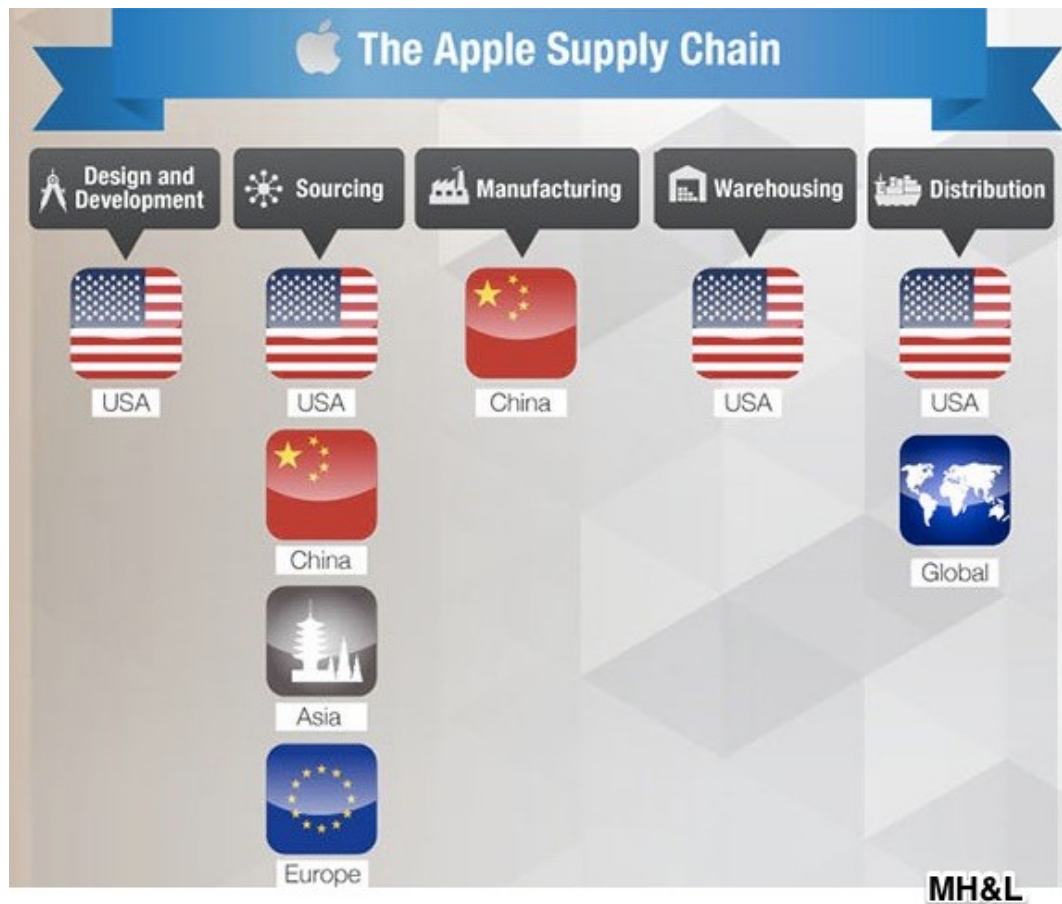


Source: <https://mobisoftinfotech.com/resources/blog/uber-business-model-explained/>

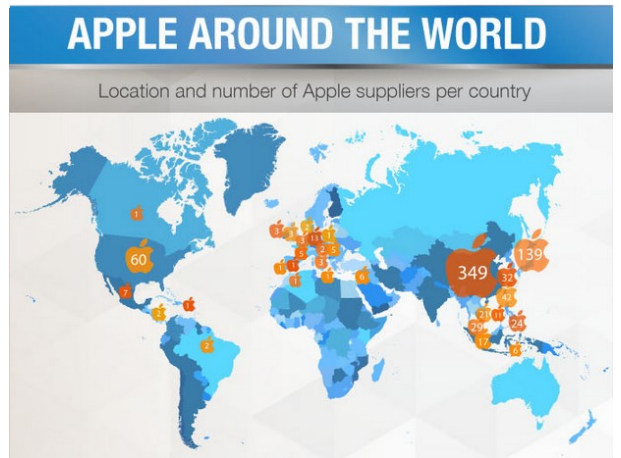
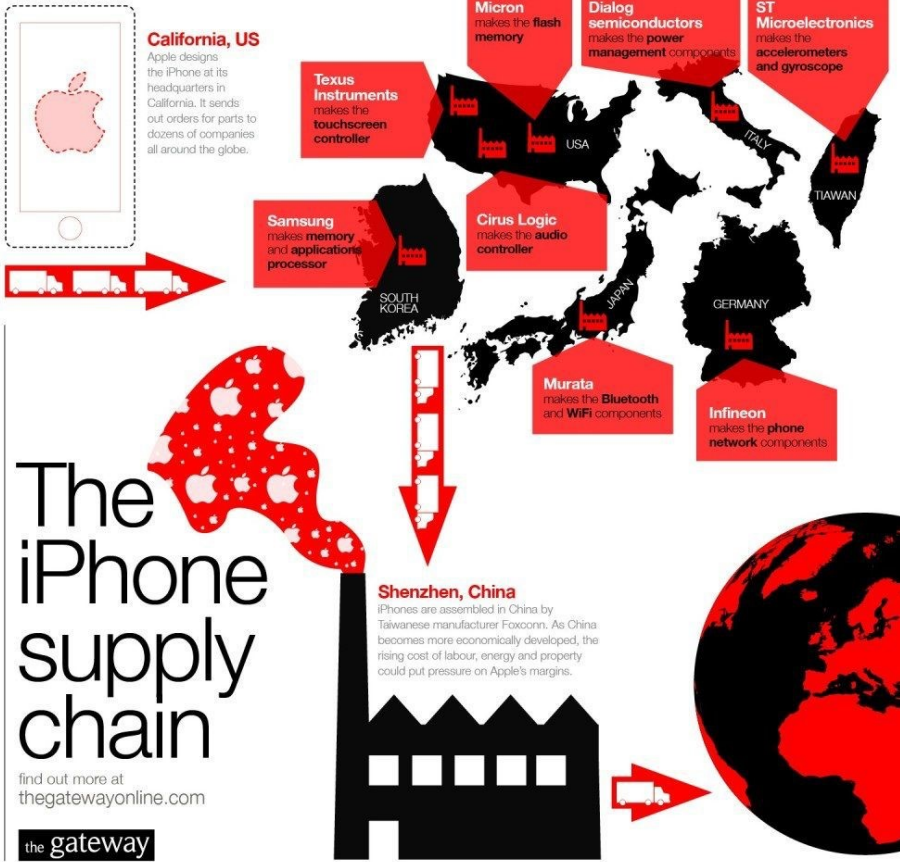
UBER: Transport as a Platform



Apple: largest phone manufacturer



Apple: distributed smart supply chain



Education / University 4.0: A new concept?



21st century University: a new revolution?

Industrial revolutions analogy

1.0
Mechanical

2.0 Mass
production

3.0 Computer
automation

4.0
smart connected industry
(Cyber physical systems)

University generations

1.0
Mainly founded
by Religious
Organizations

Reserved to a
low % of the
population

2.0
Public and
Private
universities

democratized
access to
education

3.0
Inclusion of IT
technologies

mass
development of
distance
education

4.0
smart connected
education systems

How to teach for future
unknown jobs?

how to cope with new
students generations?



- **Agile society/industry/world**
 - How to design university curricula?
- **New cognitive models**
 - Generations Y,Z,Millennium, Alpha,..
 - Why first? then go...
 - From individual ("disconnected") to collective ("connected")
 - From "broadcast" to "on-demand"
 - From "just-in-case" to "just-on-time"
- **IT innovations**
 - From "Synchronous" to "Asynchronous" communication styles
 - From "local" to "universal", the limit is the Internet
 - From "massive" to "personalized" education

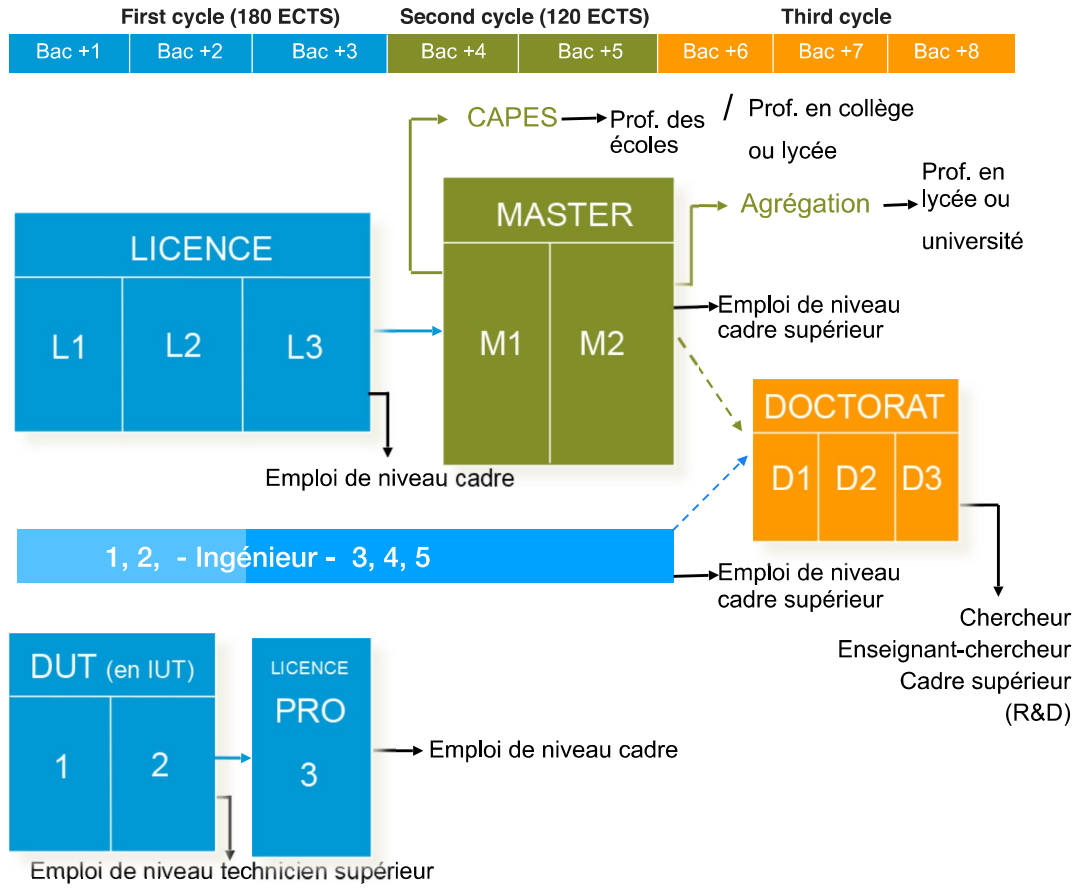
Education Innovation (UNIVERSITY 4.0)

Learning outcomes standards
Curricula design

Smart connected education systems

Introduction to the French Education System

Education System in France (European LMD model)



Bologna declaration: signed by education ministers from 29 European countries in 1999 and followed by 48 countries of the created European Higher Education Area institution
 LMD: 60 European Credit Transfer and Accumulation System (ECTS) per year
 Reform in France: replacement of DEUG, Maîtrise, DESS, DEA



1. Curricula design

Learning Outcomes Standards



1. Defined by the European Qualification Framework (EQF) for lifelong learning outcome as:

"a statement of what a learner knows, understands and is able to do on completion of a learning process"

2. Defined by the *Commission des Titres d'Ingénieur* in France (CTI) as:

"...les acquis de l'apprentissage (learning outcomes) sont exprimés en termes de connaissances, de capacités ou de compétences, générales (nécessaires à tout ingénieur) ou spécifiques (liées au domaine ou à la spécialité)"



European Qualification Framework (EQF) definition of Learning Outcomes:

"a statement of what a learner knows, understands and is able to do on completion of a learning process"



Implementation

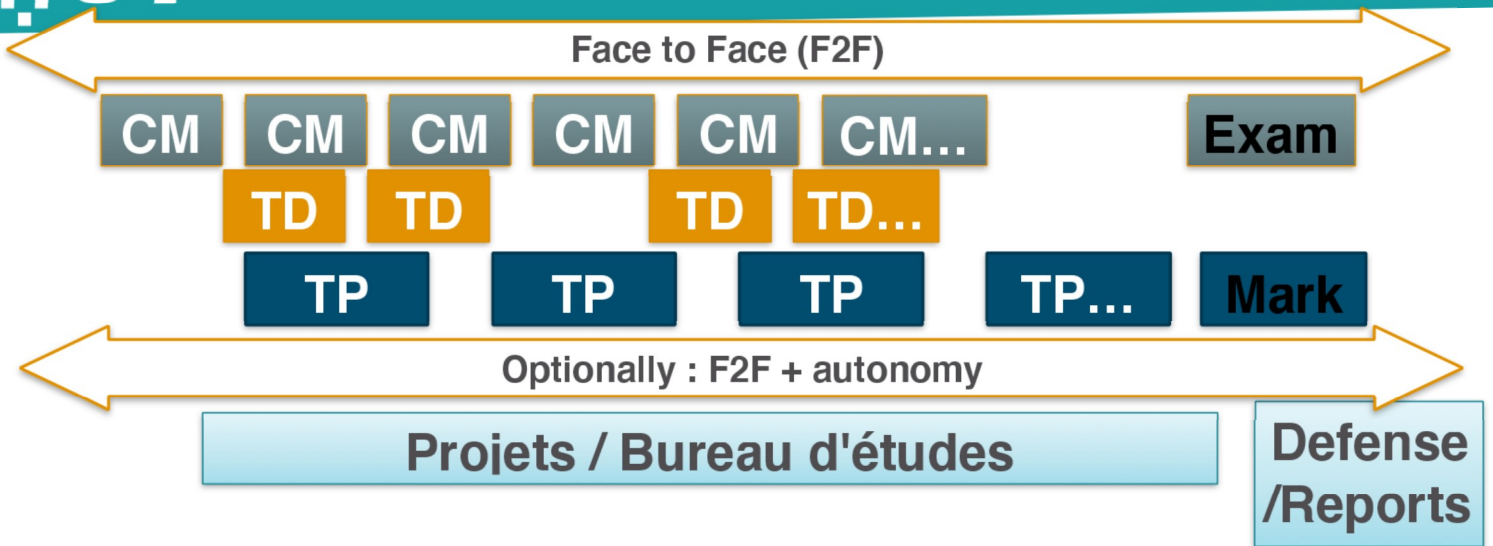
lectures

labs

projects
internships
thesis
jobs



French-style traditional implementation



<i>Traditional Approach (F2F)</i>		
<i>Name</i>	<i>Description</i>	<i>Level</i>
<i>Cours Magistral</i>	<i>Lectures</i>	<i><u>K</u></i>
<i>Travaux Dirigés</i>	<i>Guided labs, a correction is provided, controlled</i>	<i>C,AP</i>
<i>Travaux Pratiques</i>	<i>Labs in more autonomy, corrections is not mandatory, semi-controlled environment</i>	<i>C,AP</i>
<i>Projet/Bureau d'études</i>	<i>Projets in higher autonomy, evaluated (reports, results), semi-controlled environment, participants from industry,</i>	<i>C,AP</i>

2. Curricula Learning Outcomes implementation in the era of the University 4.0



1

Universal Referential models

- ▶ Knowledge Bodies
 - ▶ Reference books
 - ▶ National/International standards
 - ▶ IEEE bodies of knowledge

2

Pedagogical Model

- ▶ Intended Learning Outcomes
 - ▶ Knowledge,
 - ▶ Competences,
 - ▶ Capacities
- ▶ Levels of acquisition

3

Blended Learning Design

- ▶ Traditional (F2F)
 - ▶ Lectures, Labs
- ▶ Online / In autonomy
 - ▶ Individual and Groups Projects
- ▶ Active Learning (PBL)
- ▶ Smart Learning Systems

Bodies of knowledge

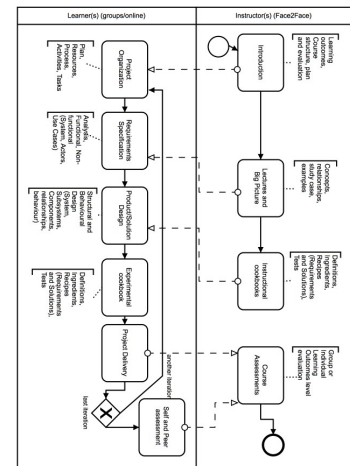
Software Engineering
Information Technologies
Computer Science...

Electrical/Electronics engineering
Civil Engineering
Chemical Engineering
Environmental Engineering
Systems Engineering
.....

[IEEE Computer Society, ACM ...]



[Bloom 1956]



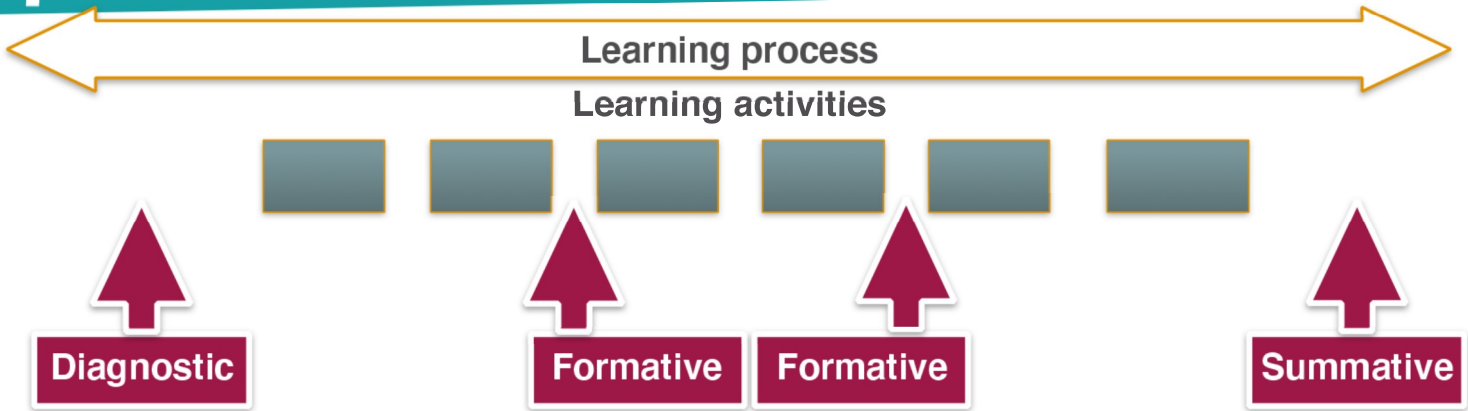


<i>Traditional Approach (F2F)</i>		
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<i>Projet/Bureau d'études</i>	<i>Projets in higher autonomy, evaluated (reports, results), semi-controlled environment, participants from industry,</i>	<i>C,AP</i>
<i>New Approach => Reduction of F2F</i>		
<i>Name</i>	<i>Description</i>	<i>Level</i>
<i>Cours Magistral</i>	<i>Big Pictures, Case studies, Debates, JIGSAW, Clickers, Quizzes*, Learning-Rooms*, MindMaps*</i>	<i>C</i>
<i>Travaux Dirigés</i>	<i>1 minute paper*, workshops*</i>	<i>AP, AN</i>
<i>Travaux</i>	<i>Problem-based learning, collaborative environments *</i>	<i>AP,AN</i>
<i>Projet/Bureau d'études</i>	<i>Project-based learning, collaborative environments *</i>	<i>AP,AN</i>





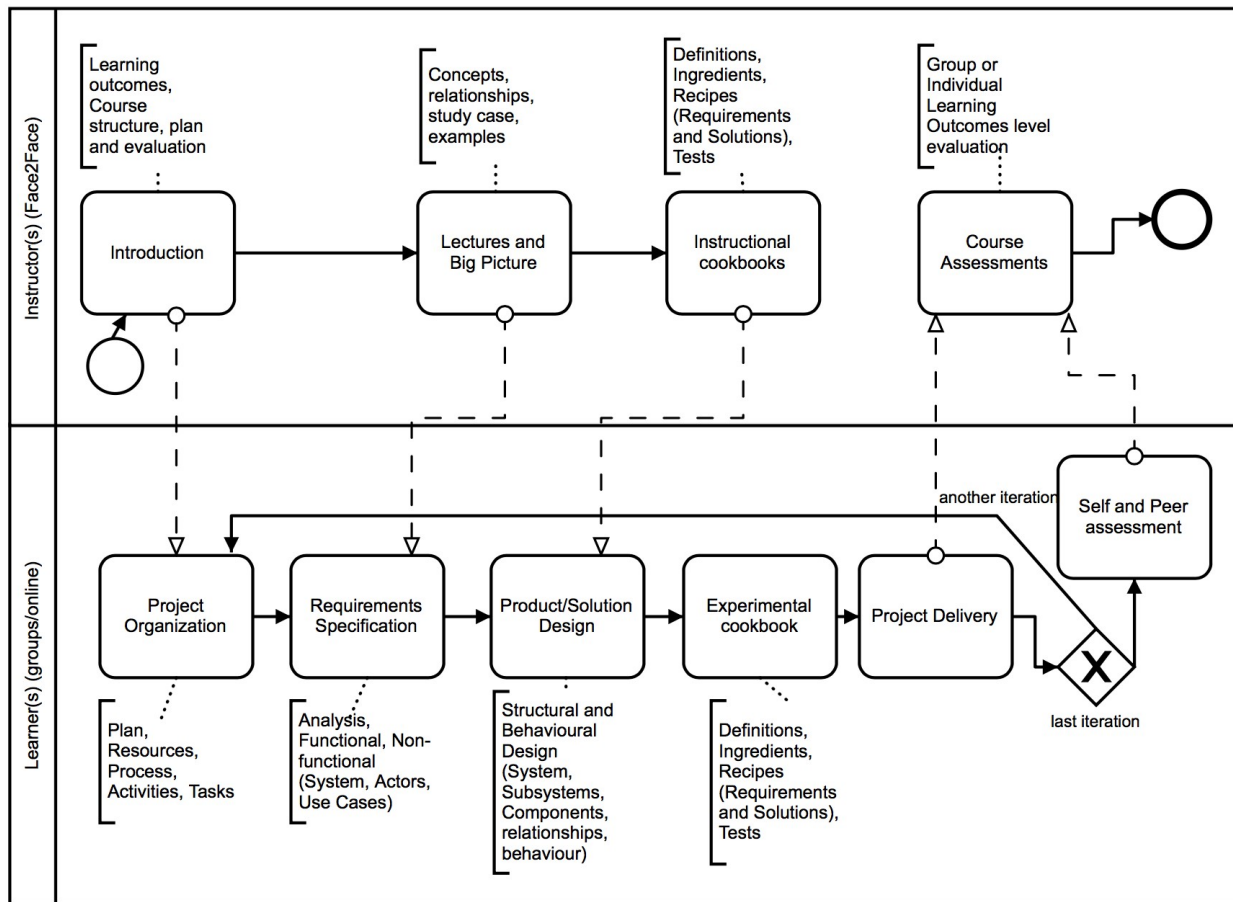
Blended Learning Assessments

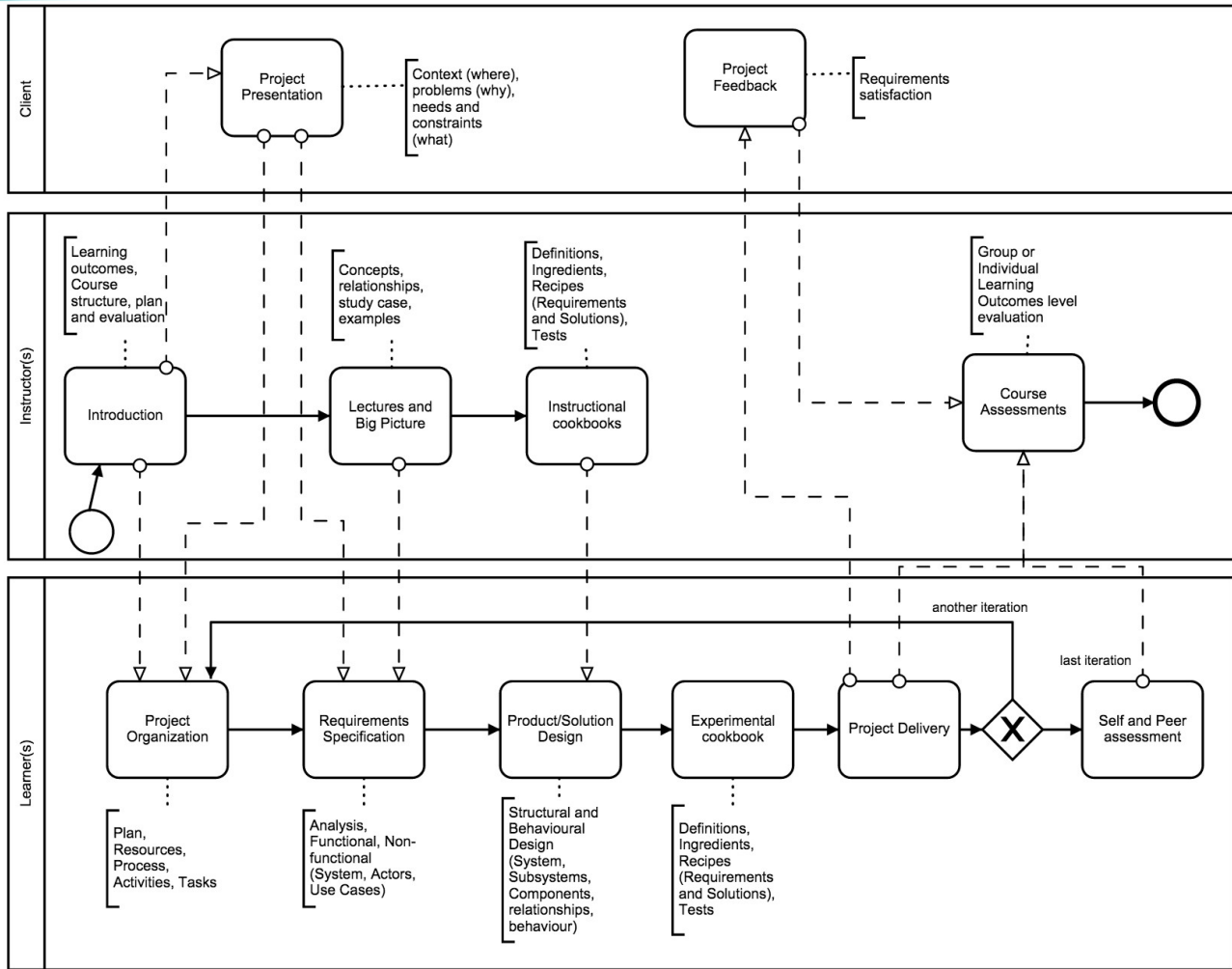


Assessment

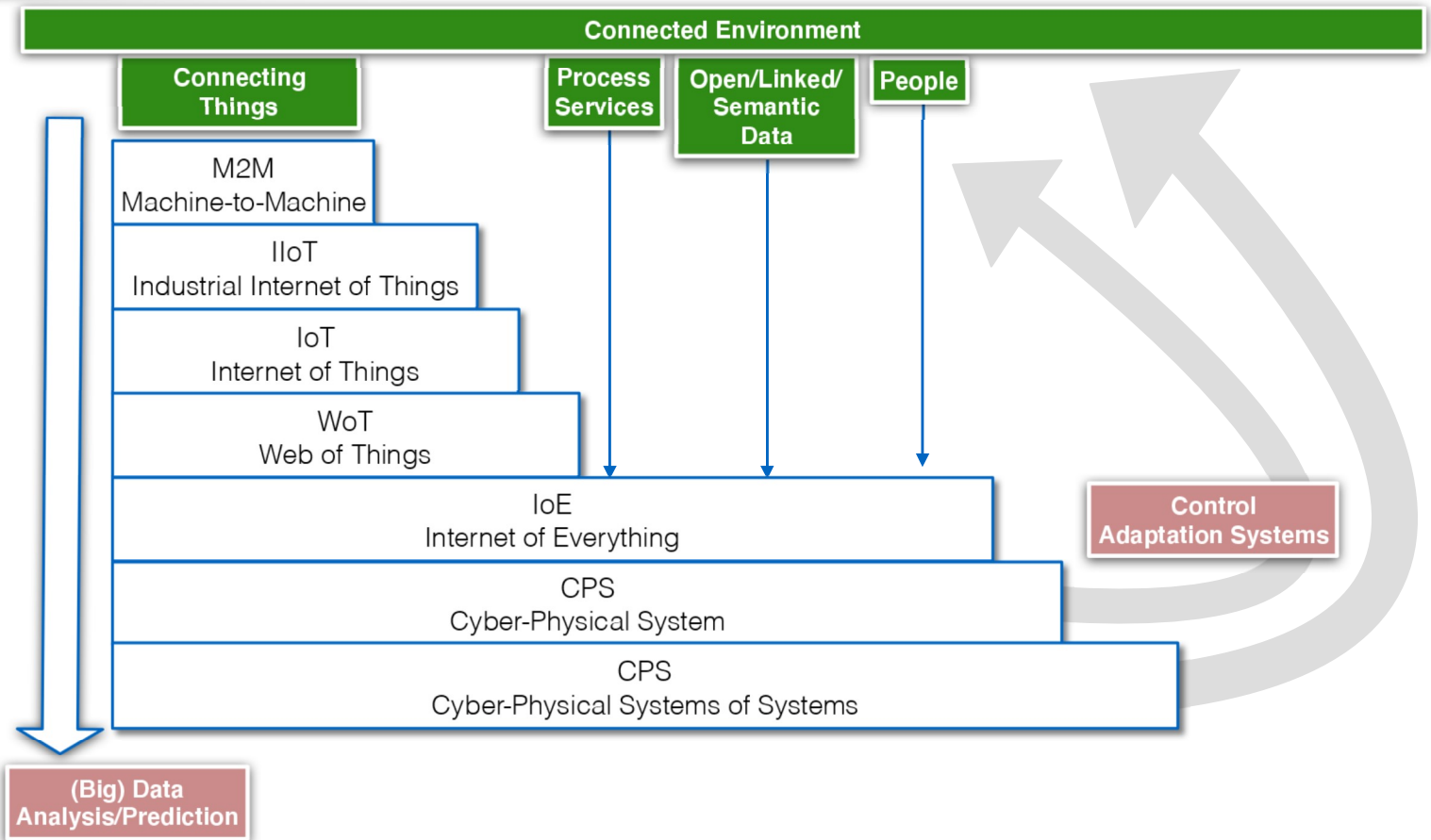
Name	Description
<i>Diagnostic</i>	<i>To identify, before teaching activities, the current level of knowledge/competences/capacities, for students and instructors.</i>
<i>Formative</i>	<i>To get feedback (to students and instructors) during the learning process. Help to prevent fails and is part of the learning process.</i>
<i>Certification/ Summative</i>	<i>To assess the acquisition level after the learning process has been completed.</i>

IT Innovations: AI machine learning analytics / personalized recommendations....





Internet of Everything: new Education context

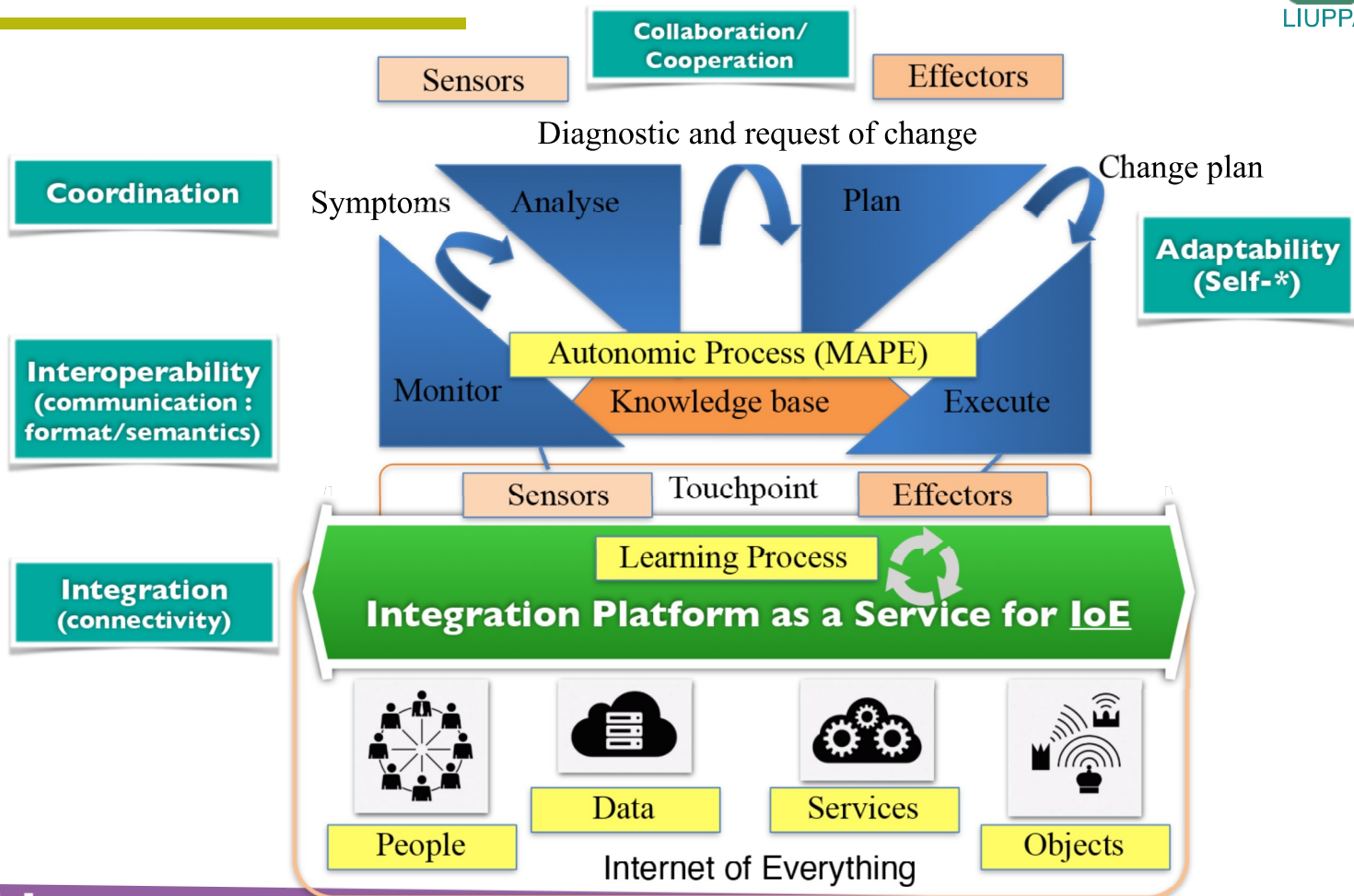


Case Studies



Aeronautic, Transportation, Telecommunications and Education







EXCELLENCE PROGRAM
E2S UPPA
Ernesto Exposito
Internationalisation Officer



Chemistry & Life Sciences:

Chemical and Microbiological Characterisation for Environmental Issues

Computer Sciences :

Industry 4.0

International Master in Civil Engineering:

Mechanics and Physics in Porous Media
Computations in Civil and Coastal Engineering

Materials Science & Engineering:

Chemistry and Physico-Chemistry of Materials

Mathematics & Applications:

Mathematics, Modelling and Simulation
Stochastic Tools and Computational Methods for Decision

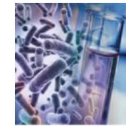
Simulation & Optimisation of Energy Systems

Petroleum Engineering

Evolutionary ecology in aquatic environments

General Management

Programmes taught in English



Master's degree |
in chemistry and |
Life sciences |



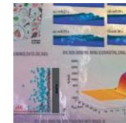
Master's degree |
in Materials |
Sciences and |
Engineering |



Master's degree |
in Computer |
Sciences |



Master's degree |
Mathematics |
and applications |



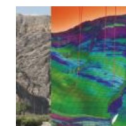
Master's degree |
in Physics and |
Simulation in |
Civil Engineering |



Master's degree |
in Energy |



Master's degree |
in General |
Management |



Master's degree |
Petroleum |
Engineering |



Master's degree |
Sciences and |
technology for |
agriculture, food |
and environment |



International Master Program

INDUSTRY 4.0



System Engineering of cognitive cyber-physical systems (Methodologies, Modelling, Reference Architectures, Project Management)

Research Initiation (POC)

Internet of Objects (Sensors, Effectors, Robotics, Cyber-physical systems, wearables)	Cloud Computing Services and Technologies (Infrastructures, Platforms and Software as a Service)	Service and Micro-Service Oriented Architectures (Architecture, Integration, Interoperability)	Semantic Web, Advanced Databases and Open Linked Data (Design, Development, Integration and Management)	Security, Protection, Confidentiality, Privacy, Trustiness (Virtual Networking, Software Defined Networks, Blockchains)
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Fundamentals

Technologies

Research and
Innovation

Openness

Data Analytics and Artificial Intelligence (Business Intelligence, Business Analytics, Machine Learning)

FLE (Français Langue Étrangère) or English (3 ECTS) + Entrepreneurship

Research or Industrial Internship (5-6 months)

PhD and Master schemes

