Engineers for the Industry Renaissance

Preparing the Workforce of the Future

Xavier Fouger
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Industry Renaissance ?
We are not alone...
National Industry Renaissance Initiatives

Similar Industrial Transformations, Common Policy Instruments

- Smart Factory / Building / Farm
- Entrepreneurship
- Additive Manufacturing
- Internet of Things
- New Manufacturing Methods
- Demand Based production
- Customization
- Global Supply Chains

- R&D funding
- Foreign Investment Incentives
- Academic, Vocationnal & Professionnal Education
- Equipment funding for SMEs
- Centers and Clusters
- Supportive Regulation
“...there’s never been a worse time to be a worker with only ‘ordinary’ skills and abilities to offer, because computers, robots and other digital technologies are acquiring these skills and abilities at an extraordinary rate.”

Erik Brynjolfsson and Andrew McAfee, MIT Initiative on the Digital Economy (from their book The Second Machine Age).
Learning Labs for Educational Innovation

Learning Practices | Professionnal Practices
Interdisciplinary Collaboration | International Collaboration
Learning for the Industry Renaissance

Rapid transfer of digital practices from industry to curriculum

- Additive manufacturing
- Virtual Twin
- Social collaboration
  - Global Factory
- Smart Building
- Learning Factory
- Composites
- Cobotics
- Smart Building
- Learning Factory
- Composites
- Cobotics
An Emerging Industry Practice: the Digital Twin

One Practice, Multiple Disciplines

Mechatronics

Additive Manufacturing
Multi-Body Simulation
Compliant Robotics
Dynamics

Configuration & Requirements Management
Project Management
Manufacturing Planning

Man/Machine Interaction
Machine Learning
Mutations in Engineer’s DNA

Is a new engineering literacy emerging with the Industry Renaissance?

- Smart Systems
  - Engineering Ethics

- Complexity
  - Interdisciplinary Skills

- Digitization
  - Digital Literacy & Security

- Globalization
  - Intercultural Agility

- Fragmentation
  - Lifelong Learning
Another Challenge for Educators

• Most new jobs yet unknown

What changes?

What to teach?

• The skills of solving problems
• The skills of Learning

How?

• Project Centric Learning
Project-Centric Learning

Proven Methodologies exist

- Soft Skill & disciplinary knowledge overlaid
- Start with ideation
- Finishes with making
- Contextual: Relevant to Industry, Society, Environment
- Social

Courses “Push” Project
Project as Capstone

Project “Pulls” Courses
Project as Foundation

cdio PBL
Some Engineers may need to solve differential equations. All must solve problems.

**USA 2016**
- NAE top award for engineering education went to WPI for their "revolutionary PBL implementation"

**France 2016**
- National Engineering Accreditation guidelines require increase in problem based projects

**India 2016**
- “This will allow institutes and faculty to teach students the skills that the Indian economy demands, in particular problem solving skills” (TEQIP III)
Transposing the context of practice
From Projects in Industry to PBL in Education

INSPIRATION  INNOVATION  CREATION

Industry
Academia

LEARNING  EVALUATION
The 3DEXPERIENCE PLATFORM

A Multi-disciplinary, Cloud-based, Social Platform for
i. Ideation,
ii. Solution Modeling
iii. and Making.
ILICE: Great Experiences by early Adopters

Across Continents:

GLOBAL FACTORY 2012 - 2014
SMART FARM 2014 - 2016
FACTORY FUTURES 2016 - 2017

500 students, 18 Universities, 14 countries, 13 hours time difference; Yearly: September-January

and for all ages:

EURLAB 2012 - 2018

Distributed design of mechatronics systems, high school students meets one a year to build and operate
ILICE in the Eyes of Educational Experts

Science starts to be available....

Facilitating process competencies with digital workspace
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Abstract

 Nowadays, industries demand more process competencies for work online in virtual teams. The study focuses on the 3DEXPERIENCE platform and digital workspace to support project work in a PBL course of Automation of Manufacture Process. As long as the collaboration and projects management are facilitated, the students acquire process competencies. In the platform, students perform all the present group activities, including communication, direction, building and documentation, while using real engineering tools to finish the project. The course of the undergraduate curriculum of Mechatronics Engineering has 64 students, and 32 students from the last semesters. The carton is divided in 14 modules and projects. Each group of five or six students has to develop a project taken from an industry real manufacturing process. This study shows the first implementation experience and lessons learned. The data were collected from open-ended questions and by making the group projects into the online platform. The effectiveness of this strategy was assessed by using test analysis and achievements were compared with previous courses.

Development of innovative suspensions for a radio-controlled light racing car
Collaborative project into 3DEXperience platform

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Students’ experience with Dassault Systèmes’ ILICE platform for PBL

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Abstract

Students increasingly bring digital tools and practices into formal educational arenas. For consideration and organisation of the problem-based project work at Aalborg University (AAU), students eagerly use tools that they have from everyday use and personal education, e.g. Facebook and Google Docs. These might be easy to use, but they necessarily the best tools to support the learning process and experience. The university currently does not provide a feasible alternative solution for digital support for project work. The primary virtual learning environment of the university is a learning management system mostly used for delivering course descriptions and resources, leaving the students on their own with respect to collaborative tools. This paper is remarkable, especially given the fact that AAU considers the Problem Based Learning to be the key to its educational success, since the last almost 50 years.
India: Strong Dynamics

WHAT AN IDEA

India is betting on compulsory internships to improve its unemployable engineers
Employment-Relevant Learning

Aerospace & Defense Centre of Excellence (CoE)
Visvesvaraya Technological University (VTU)
Government of Karnataka.

Experience Center
Andhra Pradesh State Skill Development Corporation (APSSDC).

Initial & Continuing Education - Requalification
Enabling New Age Learning in India

Experiential Learning
Product Innovation Labs
ILICE

Validation of Skills
Certification Program
“DASSAULT SYSTEMES Academy Member” Label
RECOGNITION

Student Competitions
Project of the year, Aakruti

3DEXPERIENCE®

INNOVATION

3D

VR

V•R

INNOVATION

LEARNING

Industry Connect
Tech Talk Series

Industry Oriented Learning Material
Peer Learning Experience Program

“Empowering Students to be ready for Future of Industry
Equip colleges with Innovation Platform for Continuous Learning”

INNOVATION

CREATION

RECOGNITION

INSPIRATION

EXPERIENCE