



**POLITECNICO  
DI TORINO**



EIT Manufacturing is supported by the EIT,  
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# Teaching factory-oriented activities at Politecnico di Torino

*FISP project*

# 1. THE QUEST OF NEW SKILLS



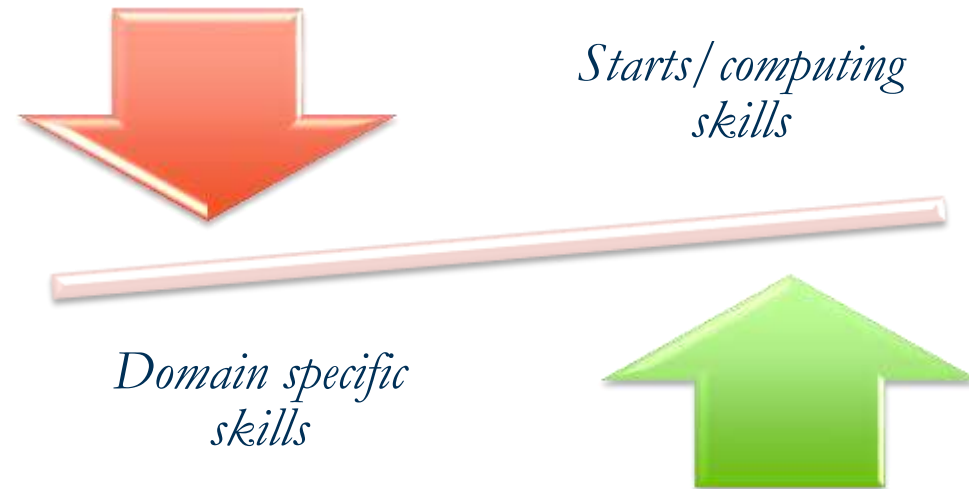
# The effects of new technologies on manufacturing firms

- There is a **growing debate** about the effects on work due to the introduction of new technologies in manufacturing firms.
- Among the reasons of the surging demand for more skilled employees, we can find:
  - the **complexity of the new technologies** that characterize the “digitalization” of firms,
  - more **sophisticated managerial processes** related to product innovation and higher quality standards,
  - **changes of work routines** by a heavy use of lean methodologies, that bring radical changes in the distribution of decision power, analysis of defects, design of tools, improvement of practices, etc...
- The effect on skills is multifaceted and makes **training more frequent and multidisciplinary**:
  - Employees must deepen the knowledge about the existing “ordinary” capabilities that lie at the core of any firm.



# The necessity to learn new complementary skills

- The national education systems may play the role of aiming at developing the “*ability to learn*”.
- Employees need to learn **new complementary skills** regarding **stats/computing skills** and **domain specific skills**, with transversal skills (soft skills)
  - There is the need to find a balance between these types of skills



## 2. TEACHING FACTORY-ORIENTED ACTIVITY AT POLITECNICO DI TORINO



# Features of a teaching factory-oriented activity

- **On-site activities** in a company.
- Students face **real-time challenges** and achieve operational solutions.
- It is a **two-way training** since professionals benefit from cutting-edge university knowledge and methodologies.
- **Professors** prepare students before and debrief after.
- **Industrialists** are part of the training effectively.



# Teaching factory-oriented activity at Politecnico di Torino

TECNOLOGIE  
PER L'INDUSTRIA  
MANIFATTURIERA



Laurea Triennale  
Professionalizzante  
Politecnico di Torino

# Teaching factory-oriented activity at Politecnico di Torino

- The experience at Politecnico di Torino:
  - Its teaching factory-oriented activity provides to the students a broad-based preparation on subjects related to **industrial and information engineering**
  - There is a particular attention to **methodologies and technologies** that require the integration of:
    - **Applied knowledge and skills** (regarding disciplines such as Industrial Automation, Production Systems, Process Technologies, Industrial Plants, New Digital Technologies and Management Economics) and
    - An adequate **preparation in Mathematics and other basic sciences**, which are the essential tool to interpret, describe and solve engineering problems.





# Benefits for students and industrial partners

- **Students** get a real work experience, develop technical skills, specialized skills, and above all non-technical skills such as teamwork and stakeholder's interaction.
- **Industrial partners** can be provided with solutions to real problems that they would not have considered, can identify students with good potential, and develop links with the university. They can also:
  - Internalize new competencies regarding design of training program, teaching methodologies, ecc...
  - Create unique resources and capabilities
  - Adapt and fit the skills to the changing manufacturing environment



# Benefits for professor and the national system

- **Professors** have the opportunity to address concrete industrial topics and collect case studies or thesis topics.
- **Universities** may play a key role, **helping the national system** meet the demand of new through the creation of technical graduate professionals with a high technical profile that could be quickly hired in manufacturing companies.



**3. A FOCUS ON THE COURSE  
“FUNDAMENTALS OF ECONOMY AND  
BUSINESS ORGANIZATION”**



## **3.1. EDUCATIONAL GOALS AND TRAINING PLANS**



# Educational goals

- Creation of **technical graduate professionals** with a high professional profile
- They can be quickly inserted in the technical offices of manufacturing companies, in freelance activities, in professional offices, entering directly into the company in the function of production engineering.
- Students face real-time challenges and achieve operational solutions.
- These **objectives** are pursued through:
  - learning by doing
  - learning by thinking methodologies



# Training plans

- Series of activities aimed at consolidating in mathematical, physical, chemical and computer science **knowledge** to create a methodological and knowledge base on which to deepen the knowledge in a professional sense.
- Series of characterizing activities aimed at providing **specialized skills** on:
  - digital technologies, typical of the 4.0 approach,
  - production and industrial automation,
  - those typical of the "lean" philosophy of production process and quality management.
- **Concrete application of concepts** through practical **experimental work activities** carried out in teams to promote more effective learning:
  - Analysis of "***Cost Competitive Benchmarking***" (disassembly, cataloguing, costing and technical-qualitative product analysis) of products on the market.
- **Internship** to apply practically the acquired concepts.



## **3.2. COURSE OBJECTIVES OF «ELEMENTS OF ECONOMY AND BUSINESS ORGANIZATION»**



# Course objectives

- An example of **innovating teaching method** to:
  - Provide the student with **economic and managerial concepts** necessary for the understanding of manufacturing processes.
  - Provide the **correct language** that allows technicians to deal with the management of the company.
  - Through **cost analysis activities**, understand their own technical solutions and those of competitors, to **improve the technical choices of the product**.



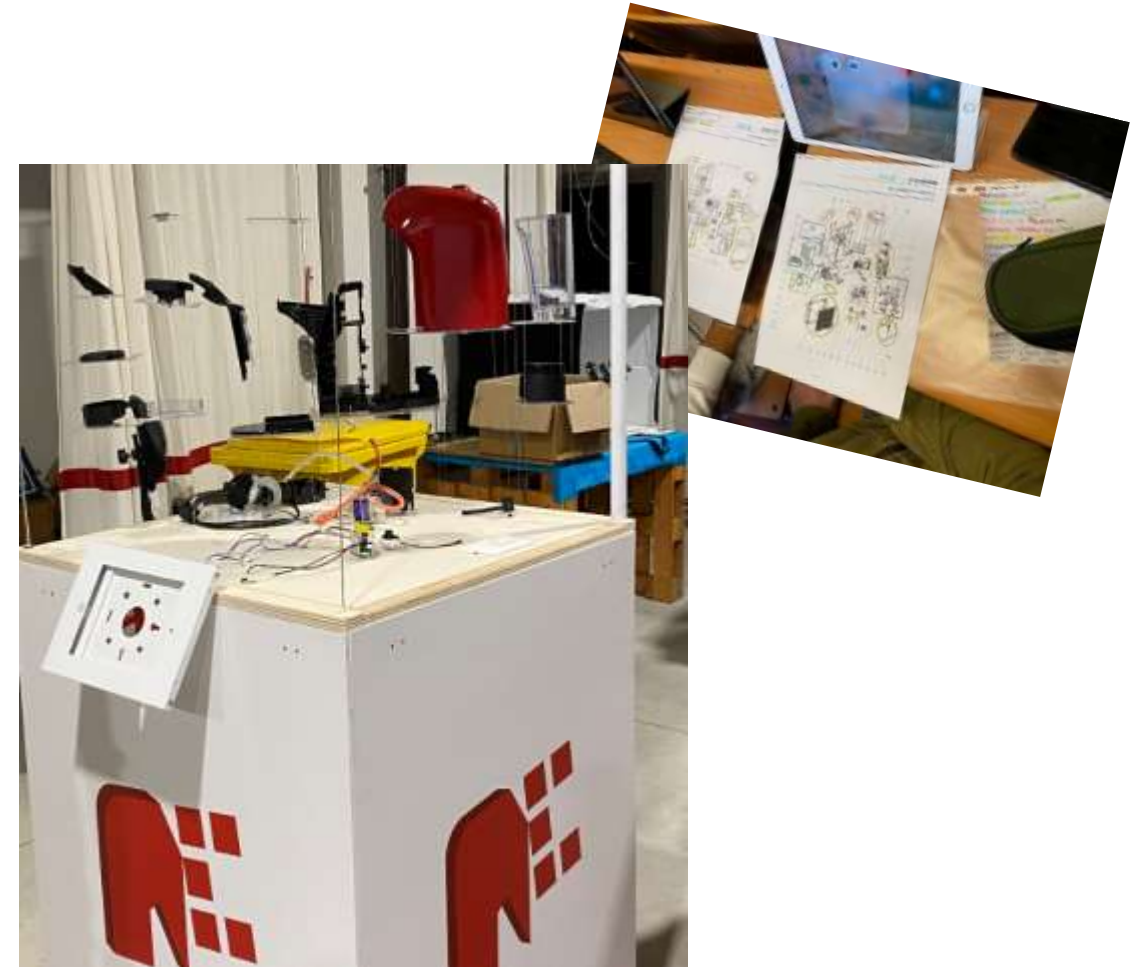


### **3.3. TEACHING METHOD OF «ELEMENTS OF ECONOMY AND BUSINESS ORGANIZATION»**



# Teaching method

- Lessons, practical exercises and workshops
- Custom e-Book designed by the teachers of the course together with the publishing house containing preparatory concepts for practical activities in the classroom and in the laboratory
- Laboratories with group work, with **on-site activity at MeC Srl - Cost Engineering Consultancy company**, carried out through the use of dedicated calculation software and technical tools that allow economic evaluations of products on a large scale



# Project Work in laboratory

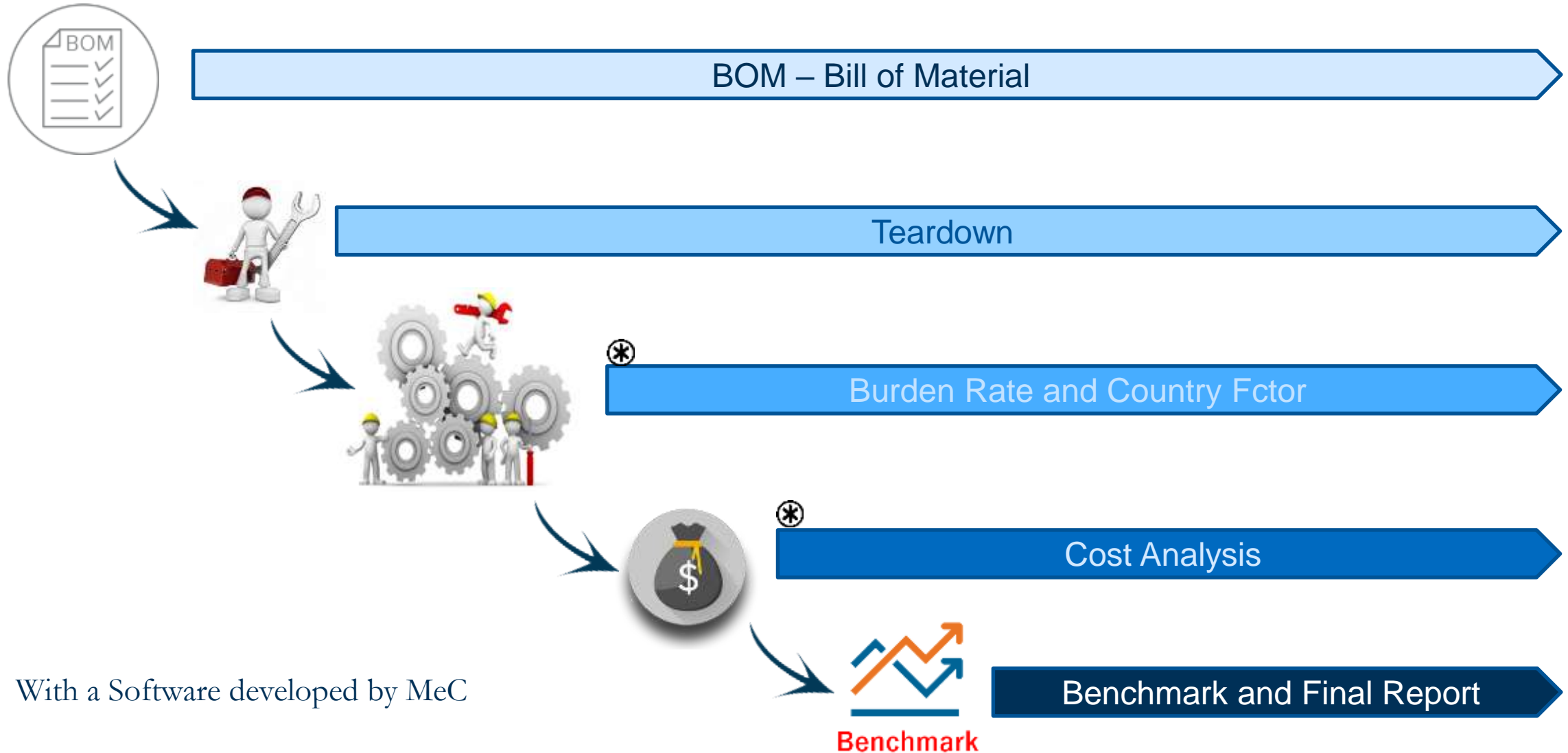
The **Project Work** conducted in the **laboratory** proposed to students aims to show the outcome of the cost analysis of the product under examination, through:

- the evaluation of the production processes and related costs incurred for the production and realization of the finished product,
- the analysis of the competition consisting of an "equal product" assigned to a different working group, with the intention of generating ideas to improve its product.

In detail, the products assigned were two espresso coffee machines.



# Steps of the project work in laboratory



# Examples of visual BOM

Below are some of the **Visual BOMs** realized by the students during the practical experience.



## 4. CONCLUSION





# Conclusion (1/2)

- Teaching factory-oriented activities provide to the students:
  - A **broad-based preparation** on subjects related to industrial and information engineering, with particular attention to methodologies and technologies that require the integration of these two skills:
    - The **fundamental knowledge and skills** of the disciplines that characterize them, such as Industrial Automation, Production Systems
    - Processing Technologies, Industrial Plants, New Digital Technologies and Management Economics.
  - An adequate preparation in mathematical and other **basic sciences**, which are the essential tool to interpret, describe and solve engineering problems
  - An adequate preparation in some related disciplines, useful to provide **further engineering knowledge**, such as mechanics and technical design, necessary to understand what technological solutions are available



# Conclusion (2/2)

- **Employment and professional opportunities:**
  - **Production Process Management Technician 4.0**
    - She/he manages production processes according to lean and flexible logics through an interconnected and digital structure/configuration.
    - In manufacturing companies she/he analyzes production processes and reorganizes them in a logic of continuous improvement in order to exploit the latest technological innovations in the field of digitization and IoT, but also exploiting lean production management logics.
  - **Freelance professionals enrolled in the Order of Industrial Graduate Experts**
    - Graduates with the skills, abilities, knowledge and abilities necessary for the exercise of the freelance activity of Industrial Expert Graduate
    - Graduates who are able to apply their knowledge and understanding in a way that demonstrates a professional approach to their work, and have the appropriate skills both to design and support arguments and to solve problems in their field of study







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