



## INDUSTRY 4.0: DRIVING PERFORMANCE AND MANUFACTURING EXCELLENCE

### PROGRAM OBJECTIVES

The Advanced Management Program (AMP) is designed to empower executives with new knowledge and management expertise to drive performance to the highest level in your organization. Engaged with experts in the field from HEC Liège, Management School of the University of Liege you will emerge with expert skills and mindsets to remain competitive in any economy.

### CURRICULUM

Immersed in a series of thought-provoking lectures, case studies, and hands-on workshops, you will explore the steps for delivering differentiated manufacturing excellence. The concept of Industry 4.0 was born in Hamburg in 2013. This concept brings together all of the technological developments that allow industries to produce faster, cheaper and with more flexibility. Industry 4.0 is an extension of current technologies (multifunctional logic controller, networks, active sensors, computer numerical control and learning PEL and MES software). Once interconnected these developments leads to a real breakthrough, a fourth industrial revolution.

**Duration:** 3 days

**Target:** Every person who wants to prepare the future of their industry ( 25 Participants)

**Goal:** Quickly encompass the technological, economic and organizational challenges of the Industry 4.0. – Create customised development plan specific to participant's industry, recognising the unique challenges of that industry.

### DAY 1: STATE OF INDUSTRY AND KEY CONCEPTS

First day is dedicated to the 8 core principles of industry 4.0 and to the latest practical developments. The attendees will have a macro view of what characterize the factories of the future.

The first day is chunked in three sequences:

- Sequence 1: Understanding the concept and the whole set of objectives of industry 4.0.
- Sequence 2: Getting ready in at least 5 technological dynamics.
- Sequence 3: Why enter in these logics? The four issues for the future.

#### SEQUENCE 1: UNDERSTANDING THE CONCEPT OF INDUSTRY 4.0

- Industry 4.0 – Four challenges: Produce faster, cheaper, smaller quantities while being extensively agile.
- Evolutions since 2013 Hanover CEBIT, eight core principles, five technological dynamics, two human challenges and a multiple worksite of normalization, standardization and transformation of legal rules.
- Understanding the very essence of this fourth industrial revolution.
- Review of the initiatives in Europe, USA and Worldwide.

#### SEQUENCE 2: KEY CONVERGENCES

Five technological dynamics will shape the industry 4.0:

1. Convergence and interconnection of networks – Integration of more and more sensors, machine tools and workshops are in a unified command structure and communicating – Determination of the new issues of Ethernet – Necessity of ever more extensive MES and PLM systems – Pivotal role of ERP – Integration of shared CAD to the small batch supply chain management – Potential of Internet of Things, Cloud and IPV6 – Challenges of data standardization and data analysis – Underestimation of cyber-security threats.
2. Machine intelligence – How associating smart sensors, unified command structure and versatile machines radically transforms the production – Collecting data and production numerical modeling – Capacity to draw production scenarios – Machine and human intelligence associated in breakthrough interfaces – Emergence of cobotization.
3. Organized flexibility – How to change paradigms, from operating ranges to personalization, prototyping or economical and technical logics of small batches – Ultra-flexibility – Association of machines and versatile robots – Client driven production (ERP and shared CAD), driven by product (Smart Product, RFID, production scenarios) or by the material itself (Smart Materials, bio-sensors and Nano-sensors).

4. Empowerment – How to evolve from sensors and unified command control to cyber-physical systems concept – empowerment of manufacturing cells – End of manufacturing lines – Calculating and simulating Process in real-time based on manufacturing scenarios database – Learning machines.
5. Optimization – Beyond the direct benefits on manufacturing, the industry 4.0 also changes the cost structure of labor and energy – It better integrates total costs related to a sale from logistics and integrated purchasing to aided maintenance, predictive maintenance all along the product lifecycle – We enter in a product-service, rental or service business model. We must adapt our investment and profitability calculation models.

#### SEQUENCE 3: ISSUES

- Economic issues: Affordability, manufacturing costs of small batches, mastery of economics on long production cycles or on the whole lifecycle of the product – Product-service system.
- Technological issues: We review the portfolio of available, matures, emerging or experimental technologies. We test how to improve "speed", "reliability", "agility", "optimization", "empowerment" and "integration".
- Organizational issues: Possible scenarios of reshaping of the industry of the future – Role of the workers – The need of multidisciplinary teams – The need of new skills and the essential development of labor learning, of the cobotization – How to differently prepare and train teams and managers.
- Societal issues: Industry 4.0 enable to enter moderation economy, in the logic of sustainable management of scarce resources, handle climate change challenge, poverty and emergence challenge, aging population challenge in particular areas of the globe, unmet needs in other areas of the globe, transformation of the globalization and give young people the desire to work in industry.

### DAY 2: CONVERGENCE AND SMART FACTORIES

At the end of this day, attendees will have a clear vision of the constituent parts and steps enabling the convergence between sensors, then between machines and production units or between clients and suppliers. Attendees could produce a checklist of their own avenues.

We will showcase a mere simulation in four steps, and we will illustrate for each step the different parts and questions raised.

#### STEP 1: INTERCONNECTION BETWEEN SENSORS, THE SMART MACHINE

In a factory, we interconnect sensors to mastery the multidimensional environment. This progress enable to switch from a manual control of several machines and parameters to a machine integrated control.

#### STEP 2: INTERCONNECTION BETWEEN MACHINES, THE SMART FLOWS

Getting back to our factory, we have a team working on a communicating control command. They throw away their old software and communication bus for an Ethernet network. Thanks to this new network they can set up a more visual machine control, work paperless and collect more data through more effective data management software. The team start to think of a more extensive MES and of the opportunities and threats of Industrial Internet of Things. The question raised is the difficulty to standardize data and data cross-management.

#### STEP 3: DATA MANAGEMENT IN SMART PRODUCTION SCENARIOS

Our factory unifies its data and starts to manage production data to create a modelisation between several machines. The logic of production scenarios is born and the team discover the power of new CAD, CAM and CAE tools. The operators become analysts and the change of profession underlines the increase of industry 4.0 logic.

#### STEP 4: DECENTRALIZED DATA MANAGEMENT, THE SMART FACTORIES

Last step, getting back to our factory fully equipped with scenarios control command and with brand new robots and tool-machines which are using their sensors to draw production scenarios.

Robots and machines are learning from each other.

The robots start to become more and more autonomous in its daily tasks.

Cooperation between the operator-analyst and the robots: the factory enters in the logic of cobotization where humans and machines work together.

Debriefing after each step – Debriefing after the fourth step.

#### DAY 3: PERSONALIZATION, EMPOWERMENT AND PRODUCTION OPTIMIZATION

At the end of this day, the attendees will have integrated the core principles of flow personalization and empowerment of machines sub-assemblies (CPS).

We will also deal with implementation, development and team mastery of these new production paradigms.

#### PERSONALIZATION WORKSHOP

Practical examples and a flexibility simulation. This example will illustrate for each

step the different parts and key questions raised. Shorter than day 2 simulation, it contains 5 steps:

1. Creation of PLM or integrated line.
2. Integration of multifunction machines.
3. Driving by prototyping.
4. Numerical driving for single piece personalization
5. Product driven production (Smart Product) / RFID.

#### EMPOWERMENT WORKSHOP

A five steps simulation will showcase the empowerment a robots and machine-tools:

1. Autonomy of numerical command
2. Autonomous robots
3. Cyber-physical systems
4. ERP driving
5. Ending of centralized production

#### OPTIMIZATION WORKSHOP

This last workshop will illustrate integration of CAD, smart materials logic, assisted first-line maintenance, predictive maintenance or integrated and distributed logistics.

It will showcase how Industry 4.0 is ready for voluntary policies about energy savings and raw materials.

#### GETTING READY: PROVISIONAL CONCLUSION

- Favorites investments?
- Which equipment to choose?
- How to catch up?
- How to prepare your teams?
- What are the skills to address quickly?
- How to value more flexible investments whose depreciation is more difficult to plan?
- What partnerships to build?

## INDUSTRY 4.0: DRIVING PERFORMANCE AND MANUFACTURING EXCELLENCE

Why HEC Liege, Management School of University of Liege?

HEC Executive School, Management School - University of Liege (HEC-ULg) was created in 2005 as a result of a successful merger between the Economics and Management Departments of the University of Liege and a private business school (HEC Liege).

HEC-ULg is one of the leading Belgian business schools for graduate and postgraduate programs. Currently it has 260 faculty staff with international recognition and more than 4500 students currently enrolled. It also has 13,000 alumni working all over the world.

The School's missions are both to improve the managing and economic skills present within companies and organisations and to provide them with managers and entrepreneurs having a first-rate command of modern management concepts, practices and tools. HEC-ULg particularly emphasizes entrepreneurship and innovation management.

The School's international vision is expressed through its numerous research activities in the fields of management and economics, the many fruitful contacts and partnerships it has with companies and universities worldwide as well as the ever increasing internationalisation of its module programmes and teaching staff. HEC-ULg's ambition is to back up its status as an international school by developing its strong points and by further increasing its quality requirements.

#### ADMISSIONS

Application Process — Please visit [amp@netacademy.com.my](mailto:amp@netacademy.com.my) for complete admission requirements and to apply online. Applications are requested at least four weeks before the program start date. Since qualified candidates are admitted on a rolling, space-available basis, early application is encouraged.

Admission Requirements — Admission is selective and based on professional achievement and organizational responsibility. No formal educational requirements apply, but proficiency in written and spoken English is essential. Advanced Management Program enhance the leadership capacity of the managers enrolled as well as their organizations, and HEC Liege expects full commitment from both. While participants devote time and intellect to the learning experience, sponsoring organizations agree to relieve individuals of their work responsibilities during the program.

Program Fee — The program fee covers tuition, books, case materials, accommodations, and most meals. Payment is due within 30 days of the invoice date. If admission is within 30 days prior to the start of the program, payment is due upon receipt of the invoice. Cancellation policies are outlined in the information provided to applicants upon admission.

#### CONNECT WITH US

For more information, please contact our client service specialists at:

Advanced Management Program

Email: [info@istudyinc.com](mailto:info@istudyinc.com)