
# 3T Industry4.0
# Common recommendations & conclusions for Report IO1

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## 1. SCOPE AND ANALYSIS

**IO1 SCOPE**

•To be done: study the content of existing trainings, the assessment of deficiency, the lack of skills

•Objective: Identify the most relevant technologies

Two different reports in English per country will be written, detailing both training needs and available trainings :

- The first, about vocational training Industry 4.0 (I4.0) contents
- The second about I4.0 training in companies

The reports will identify key technologies for training modules development in next IO's

Tools and resources / **IO1 TASKS :**

• Search in bibliographic databases
• Analysis of technical documentation
• Examination of contents of official titles / qualifications of courses / trainings
• Interviews with stakeholders
• Creation of a database containing data from the situation of education and training to be used by all stakeholders in the field of Industry 4.0.

To verify relevance and data collection, a working group was established in each country's partners, formed by a representative of the consortium, a representative of the industrial sector and a representative of an educational institution, plus two external members of the working group, and a moderator.

The MSForms 3Ti4.0 COUNTRY WORKING GROUP were used to fill the relevant information for data collection. See Annex 1 for questionnaire design.

Caar and *Mecanic Vallée* coordinate, transcript and sumarise the research carried out by Aitiip and CMQ. TUBS worked on German data. The data collected for the realisation of the study are uploaded on the project platform and into the database.

MsForms were used to fill other data collected. See ANNEX 9 to find links to each form.

## 2. OBJECTIVES OF THE STUDY AND FINAL RESULT

The study should allow the evaluation of training needs in Industry 4.0, detect gaps, and recommend skills and content to develop the teacher's training modules in the following phases.

To do this, we carry out the following activities:

A) DOCUMENTATION

a) Study of publications
b) Offer of existing trainings
c) Interview questionnaires for companies / in-company training
d) Interview questionnaires for vocational trainers in technologies that apply : freelance trainers and / or solutions providers
e) Interview questionnaire for trainers / in-company.

B) REPORT PREPARATION

a) Focus group
b) IO1 Deliverables
c) Closing of reports: VET & in-company training
d) Data collection.

# 4. ANALYSIS & RECOMMENDATIONS

## 4.1. From Resources

Major emerging keys technologies among this studies are :

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cybersecurity | I A | 3D | Predictive maintenance | IOT | Cloud | augmented reality | DRONES COBOTS |
| | Digital Twin | | Blockchain | HUMAN IN THE HEART OF INDUSTRY 4.0 | Data Analysis | | |

Most relevant points are :

- In these studies, have been identified cross-functional skills to be developed, including Cybersecurity. English must be taught in France and Spain as active language and common tool . This learning on the basis of participatory methods should be accompanied by immersion courses.
- The ability to train continuously, especially for trainers so that they can adapt the training courses to the realities on the ground, whose developments are becoming faster and faster.
- We have to give time to the maturation of technologies, and fully integrate the transformation of society through digital Aim for an international business model taking into account the contribution of technology to value creation.
- We have to promote social ownership of technologies, building on innovation ecosystems, integrating the brakes in the deployment of technologies.
- Workers must be trained at all levels and throughout all life.
- Labor market innovation will redefine VET, which needs to become more dynamic and innovative, in order to increase the innovation capacity of individuals, and make them agents of economic and social change. In addition, VET must innovate to become a relevant and attractive learning solution and be seen by companies as an investment rather than a cost.
- Promoting workplace learning through enabling environments brings together learning and innovation policies, driven by new ideas and intergenerational learning.

## 4.2. Training offer

As said, thirty two courses or trainings were detected **in France,** there is still not a lot of National diploma officially dedicated to Industry 4.0, except two. However, six universities or School for Engineers and Private training centres offer short courses or short Trainings on subjects related

on Industry 4.0. Other Courses are specialisations in engineering courses or specialized master degrees in Industry 4.0.
Some of them are free to attend, but several ones are proposed with high expenses rates.

It is Noticeable that most of those trainings are proposed by large institutions in France : Universities in Toulouse, Paris or Lyon, and School of Engineers as ENSAM or Centrale/Supelec. Around fourteen of these institutions are holding most of Public courses. There are also some major National French Technical centres which are able to propose important courses: CETIM and AFPA About special I4.0 training, for professionals.
We have to note that seven courses are at the level Master, on thirty two trainings and courses.

Most important is to stand out that **in France,** most of these courses are addressing **Big Data, Artificial Intelligence, Cobots**, and in a second step, 3D subjects : prototyping and manufacturing.

In **Germany**, The training offer in Germany is not restricted to VET or in-company training. For the national schedule every person can attend almost all kind of trainings. Especially in this context, 32 cases have been identified for training in Industry 4.0. Some of them are free to attend for professionals but most are correlated with high expenses. The table with all the identified training offers can be found below.

Noticeable is especially the fact that most of the trainings are being held by the big institutions like the TÜV, VDI or DGQ. There are also some minor schools for special training in further education for professionals. Most important is to stand out the free training offer in rising digital technologies of the cluster “Mittelstand 4.0 – mitunsdigital” in the northern part of Germany. Especially in Lower Saxony with the focus on SMEs there is a lot of offers free to attend in this concept.

**In Spain**, The above linked degrees are regulated by administrative orders dating back some 4 to 7 years. Therefore, generally speaking, the I4.0 concept is largely absent. Cornerstones of I4.0, like IoT, smart devices, drones, cloud computing, cybersecurity, collaborative robotics, VR, etc. simply do not appear. Additionally, the constant reforming of legislation due to the politicisation of education, along with the complex autonomous system, make this regulatory system slow to include new ideas. The autonomous regions may modify some features of the content, but cannot significantly alter the texts or indexes.
This makes it difficult for the regulation to include such advanced concepts.
However, it is easy to find content that, while not strictly I4.0, is structurally related to digital features and can, consequently, adapt to the new needs.

## 4.3. Training needs

Most of interviewed companies are currently using technologies related to industry 4.0. Several technologies, such as internet of things are widespread used. Others, as augmented reality are not used yet. To help them in their transition to Industry 4.0, interviewed companies consider necessary following soft skills: capacity of leadership and solving problems, initiative and communication.

“Industry 4.0” concept has been judged as too general. It is necessary to simplify and land I4.0 content for SMEs, who do not feel the need to implement these projects due to ignorance of the possibilities of technology, and because it is beyond their daily lives.

**Focus Groups** thinks that the subject needs to be more explained and detailed. They agreed on the fact that people in the project target levels may not be well-informed on these technologies, or on the same basis, even on their future impacts on their (future) job. To remedy this situation, they propose the creation of a **document including general knowledge about industry 4.0**, in complement to more specific and more technical ones.

The training needs on this side are focused on more emerging technologies. One big factor is Cybersecurity, in links with all new technologies. Then after, technologies about 3D are primordial.

Then, they wonder about virtual Reality environments and the development of skills in general.

Most of companies ask also about Maintenance 4.0 & Predictive Maintenance. Infotronics and maintenance seem to be a convergence between computing and electronics with a clear focus on maintenance and programming of digital systems. The need for a mixed profile of an electronic Technician and a high-level programmer to adapt the market systems to the needs of the company.

At the end, Artificial intelligence (Ai) is the great challenge for all agents who have expressed an opinion in this study. Beyond big data and cloud, connected factory, and predictive systems, Ai gives the plant the ability to make decisions in much more secure environments and based on the analysis of the data that the company stores and manages.

Yet, some subjects proposed in the questionnaire seem to be less pertinent, such as training in cloud computing or drones. But, experts highlight new content of high interest, not usually included in programs, and detect that the VET trainers do not perceive as necessary:

• Connected factory: The previous step for digitisation is to connect the factory so that it allows obtaining data from the processes in real time.

• Digital twin and cyber / physical systems: intimately linked with the previous one, but at a higher level, by requiring the premise of the connected factory, the need to develop content on digital twin and cyber / physical systems is pointed out.

• Data ethics: the enormous amount of information that the company generates, in the interaction of man with the machine, and in the automated processes themselves, requires deep reflection on the ethical use of data, beyond cybersecurity.

### 4.4. Matrix needs / offer

| GAP MATRIX | | TRAINING NEEDS | | |
|---|---|---|---|---|
| TRAINING OFFER | | companies | further needs | results |
| TRAINING OFFER REFERENCE | KNOWLEDGE & competences | | | |
| Big Data | 7,3 | 6,0 | 6,0 | medium |
| Predictive Maintenance | 5,3 | 6,0 | 6,6 | HIGH |
| Cloud computing | 5,0 | 6,0 | 5,8 | medium |
| Cibersecurity | 4,7 | 6,0 | 7,5 | HIGH |
| IoT smart devices | 6,7 | 5,8 | 6,8 | HIGH |
| 3D for prototyping | 6,0 | 5,8 | 6,8 | HIGH |
| 3D for manufacturing | 6,0 | 5,8 | 7,0 | |
| Augmented reality | 6,0 | 6,7 | 5,7 | HIGH |
| Virtual reality | 6,0 | 6,7 | 5,7 | HIGH |
| Cobots | 5,7 | 6,3 | 6,0 | medium |
| Drones | 4,0 | 4,0 | 4,3 | low |
| Bin Picking | 4,0 | 4,0 | 3,8 | low |
| Management 4.0 | 3,0 | 7,0 | 5,7 | HIGH |
| Artificial intelligence | 6,7 | 6,5 | 6,5 | HIGH |

The Matrix for the needs/offer notices basically that the training offer consists of the digitization of companies. Mostly, the offer is restricted to data analytics and other topics regarding this issue. Therefore, the knowledge is based on data as well. The skills which are offered, are more from the programming and implementation side. Out of this the competencies are generated, which result in Big Data and programming experts.

The training needs on the other side are focused on more emerging technologies. One big factor is the visualisation of data in Mixed-Reality environments and the development of skills in general. The skills and competencies are generated out of these topics as well.

## 5. CONCLUSIONS

In conclusion, we consider that Big Data and IoT are well taught. Therefore, the Needs to Offer Matrix gives a wide overview on the Industry 4.0 topics which have to be taught in the future. In this case these are :

- Visualisations (Virtual and Mix Reality).
- Smart devices
- Cybersecurity
- Management 4.0
- 3D-printing for prototyping and series production
- Big data
- And Artificial Intellligence.

## Those proposals have to be confirmed by partners.

Today, there are serious gaps between educational training and industrial needs in industry 4.0 fields. For degrees corresponding to the project target (specialized operator), educational courses don’t offer enough training in these technologies. Yet, companies are already using them, causing a lack of competence. Specialists and middle managers are already aware of Industry 4.0 new technologies, from their studies or training provided by their companies.

A general course about Industry 4.0 technologies could also be relevant, to inform the target workforce of future changes in their jobs and give them general knowledge about this subject.