IoT4Industry

Project Deliverable

Training and service portfolio definition

Project Title	Towards a smarter means of production in European manufacturing SMEs through the use of the Internet of Things technologies
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Instrument	Innovation Action
Topic	Cluster facilitated projects for new industrial value chains
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Related task number and name	Task 2.1
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Reviewer(s)	

Abstract

This report will focus on highlighting the requirements for IoT training workshops that will be delivered to European SMEs as part of the IoT4Industry project. This is accomplished by analysing the outcomes of market research conducted in Task 1.1 (*European mapping of concerned SMEs and selected/suggested focus topics and sectors*) and Task 1.2 (*ICT competencies for existing or potential developments of IoT Smart Manufacturing solutions*).

This report will also highlight the established training offer and additional services portfolio developed for the IoT4Industry project (to be provided by the IoT4industry project partners).

Keywords

Industry 4.0; Smart Manufacturing; Digital Manufacturing; IoT;

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Revisions

Version	Submission date	Comments	Author
V0.1	29/06/18	Draft Structure	Brett Parlour
V0.2	10/07/18	Part complete for internal review.	Brett Parlour
V0.3	23/07/18	Changes made after internal feedback from Junuz Jakupovic. Content added to complete "1st draft".	Brett Parlour
V0.4	07/08/18	Changes made after final internal review. Document ready to be shared on the shared folder.	Brett Parlour
V0.5	13/08/18	Minor changes for final submission.	Guillaume Roux

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Acronyms and definitions

Acronym	Meaning
IoT	Internet of Things
WP	Work Package
IIoT	Industrial IoT
SME	Small or Medium Sized Enterprise
ICT	Information and Communication Technologies

The IoT4Industry project

The proportion of the manufacturing industry is currently decreasing in developed European countries' by GDP. Industry 4.0 – also called smart manufacturing, digital industry or industry of the future – provides several technological responses to the challenging competitive market. The Industry 4.0 focuses on the development of processes based on technologies and devices autonomously communicating with each other along a value chain. Indeed, the integration of the Internet of Things (IoT) and related components – Cyber-Physical Systems (CPS), Digital Security, Cloud Computing and Big Data – in manufacturing SMEs will improve efficiency and flexibility in production and consumption.

IoT4Industry is an EC-funded project aiming at fostering this integration by connecting ICT clusters having capacities in IoT with Advanced Manufacturing clusters having access to process manufacturers and manufacturing SMEs. Based on a cross-border and cross-sectorial approach, one hundred SMEs will be selected to receive funding and support to develop their access to smarter means of production and to modernize their processes and security. In fine, the project and this integration aims at creating new or improved value chains and new business opportunities.

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1. Introduction

The IoT4Industry project is focused around 3 three main aspects:

1. Market analysis focusing on the needs of manufacturing SMEs and the offers from IoT technology providers to help add direction to future activities.
2. Stimulating the development of collaborative IoT projects between manufacturing SMEs and IoT technology providers by:
    a. Identifying interested parties via a call for expression of interest;
    b. Development and delivery of training and education workshops to European SMEs;
    c. Collaborative project matchmaking;
    d. A portfolio of additional services (in the form of project support services) offered by the project partners (for members only).
3. Managing the call for projects in which successful collaborative projects will gain funding via innovation vouchers.

Work Package 2 focuses on the activities mentioned in aspect 2. More specifically, Task 1 of Work Package 2 (Task 2.1) focuses on the definition of the SME training and definition of the optional additional services. The "training" involves training workshops which are to be delivered by each IoT4Industry project partner (two separate workshops) to SMEs interested in IoT4Industry. The training workshops are an important element of the project as they can establish a common understanding of industrial IoT (IIoT) among manufacturing SMEs and IoT technology providers. This is very important for SMEs when they progress and aim to develop collaborative projects for innovation vouchers.

The definition of the SME training will ensure that the training sessions, conducted by the different project partners, are aligned. This report will therefore detail the approach that must be followed for all training workshops. This report will also detail the additional services portfolio (agreed upon by the project partners) which will serve as a vehicle for the project partners to provide additional support to their members.

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2. Deliverable objectives

The objectives of this deliverable 2.1 “Training and service portfolio definition” are:

1. To identify the training requirements of SMEs in the domain of IoT. These requirements provide a basis for establishing the training offer and training material.
2. To present the established training offer to be delivered to SMEs. This training offer will outline the training approach, format, and structure. The formal training material will also be made available on the project.
3. To define the additional services portfolio to be offered by the IoT4Industry project consortium.

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3. Methodology

The approach taken to define SME training, additional services portfolio and complete this deliverable report (D2.1) consisted of the following elements:

- Define the requirements for the training workshops by using:
  - Input of WP1* analysis to identify the general interest in IoT and level of IoT knowledge in the manufacturing industry.
  - Input of WP1* analysis to identify the key areas of interest within the IoT umbrella.

- Define training offer (format, structure, resources) using the identified requirements in WP1 and MTC's training expertise**.

- Define training material using identified requirements and MTC's technical expertise in advanced/digital manufacturing***.

- Define additional services portfolio which has been agreed upon by IoT4Industry project partners. The method for this involved documenting brainstormed ideas for additional services (for each project partner) then refining to ensure that all project partners were happy to offer the a consistent portfolio of additional services.

*The WP1 analysis used comes from Task 1.1 (deliverable D1.1) and Task 1.2 (deliverable D1.2). Task 1.1 (*European mapping of concerned SMEs and selected/suggested focus topics and sectors*) was focused around understanding the position of manufacturing SMEs with regards to IoT. This represents the "demand side" of the IoT4Industry project. The main source of information for Task 1.1 came from interviews conducted with manufacturing clusters across Europe (who represent manufacturing SMEs). In contrast, Task 1.2 (*ICT competencies for existing or potential developments of IoT Smart Manufacturing solutions*) was focused around understanding the position of IoT solution providers with regards to the manufacturing industry. This represents the "offer side" of the IoT4Industry project. The main source of information for Task 1.2 came from interviews conducted with ICT clusters across Europe (who represent ICT/IoT solution providers).

**The arm of the MTC which deals with training activities is called the AMTC (Advance Manufacturing Training Centre). The experienced instructional designers at the AMTC develop and deliver quality training to manufacturing industry professionals. The AMTC website states *"At the Advanced Manufacturing Training Centre, we are focused on developing, maintaining and building upon the vital skills required by manufacturing graduates, technicians, engineers and managers to deliver the technologies that keep the Great British manufacturing industry globally competitive. The industry is ever-evolving and we will work closely with the latest developments to deliver up-to-date, practical training to ensure that you and your staff can stay on track with the skills that they need now and in the future."*

***The training material is not included in this report. The training material (detailed agenda, presentation, and workbook) will be uploaded to the project drive prior to the train the trainer workshop on 06/09/2018.

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4. SME training requirements

During the activities of Task 1.1 (*European mapping of concerned SMEs and selected/suggested focus topics and sectors*), interviews were carried out with a number of European manufacturing clusters representing manufacturing SMEs across Europe. The clusters were asked to state their interest in IoT and their technical level in IoT. These results can be seen in *Figure 1* and *Figure 2*.

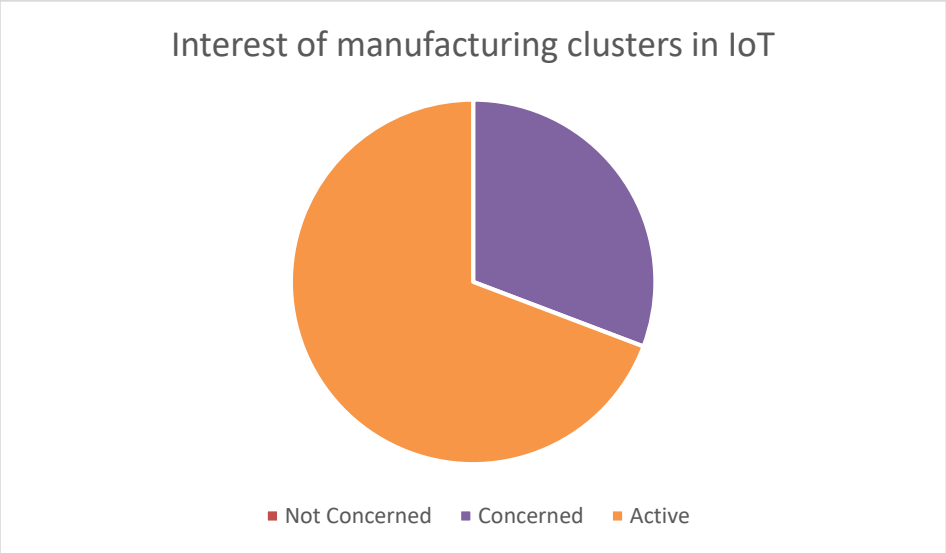

Figure 1: Interest of Manufacturing Clusters in IoT

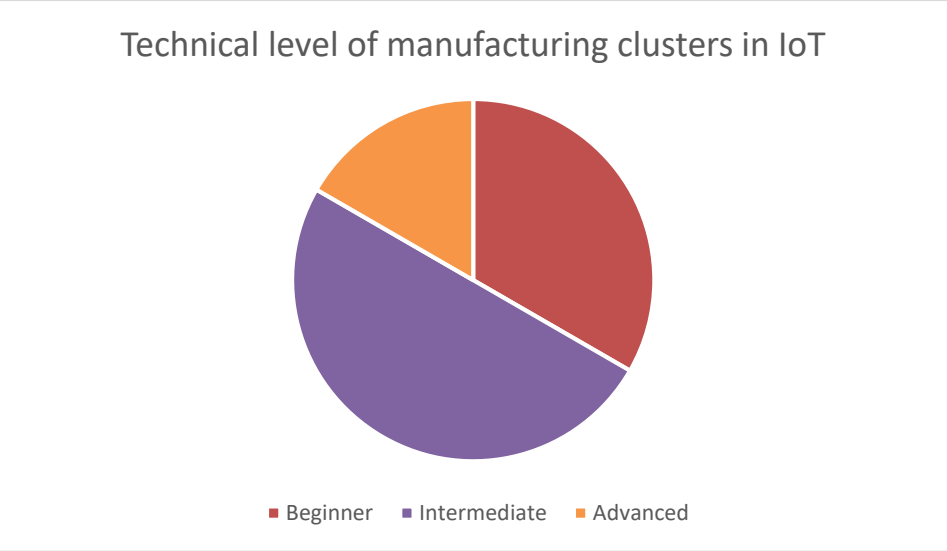

Figure 2: Technical Level of Manufacturing Clusters in IoT

Figure 1 highlights that the manufacturing industry have a very high interest in IoT since none of the clusters responded with 'not concerned'. This indicates that training in the IoT domain would likely be relevant and of interest for manufacturing SMEs. *Figure 2* highlights the intermediate to low technical level of manufacturing clusters. This suggests that manufacturing SMEs are very unlikely to have a high technical understanding of IoT. Furthermore, this indicates that IoT training would be welcomed before SMEs adopt IoT technologies.

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It can therefore be concluded that there is an overall interest in IoT and potential for IoT training within manufacturing. Now that this conclusion has been drawn, it is necessary to map out the individual requirements for the IoT4Industry SME training.

4.1. Required tone of the training

Within the Task 1.1 cluster interviews, the clusters were asked to state the most common barriers that manufacturing SMEs have with regards to adopting IoT technologies. *Figure 3* shows a summary of the most common answers.

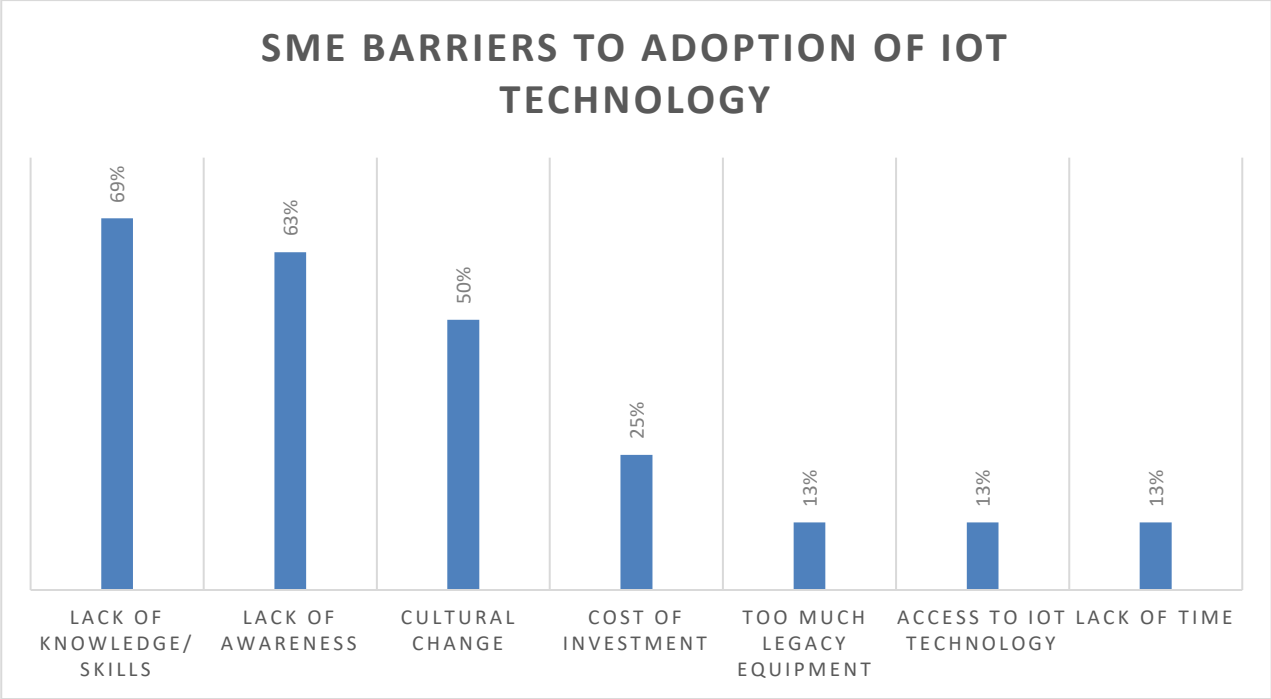

Figure 3: Manufacturing SME Barriers to Adoption of IoT Technology

Using *Figure 3*, we can identify the most significant barriers to adoption of IoT technology:

Table 1: Top Three Barriers to Adoption

1. Lack of knowledge/skills,
2. Lack of awareness,
3. Cultural change.

These findings highlight the need for greater awareness and knowledge around IoT within manufacturing SMEs. Gaining awareness and knowledge will help to demystify the topic of IoT in manufacturing. This can in turn lead to informed decision making regarding the implementation of IoT solutions to solve manufacturing challenges. In addition, the "cultural change" barrier may seem less significant once SMEs have a better understanding of implementing IoT solutions. The "Lack of skills" barrier is a challenge which will be addressed by IoT4Industry project collaboration between manufacturing SMEs and IoT technology solution providers. This will be achieved by the IoT solution providers applying their technical skills in a collaborative environment.

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An important conclusion drawn in the Task 1.1 report (*European mapping of concerned SMEs and selected/suggested focus topics and sectors*) is: "An awareness campaign is an important element that has to be pointed out. The analyses of relevant reports and all the interviews emphasize how important it is to support and train SMEs. Without this metric the transformation to the European Industrial Digitalization will be difficult to lead. SMEs know they have to change their business model but they don't know how to proceed." This conclusion highlights the importance of awareness, training and support in "Industrial Digitalisation. Manufacturing SMEs moving towards "Industrial Digitalisation" could make ill-informed decisions if they do not have access to the resources (awareness, training and support) which provide understanding.

The above Task 1.1 conclusion was also echoed by the analysis conducted during Task 1.2 (ICT competencies for existing or potential developments of IoT Smart Manufacturing solutions). Task 1.2 concluded: "the main hurdle that IoT providers see is what could generally be called 'Lack of Knowledge'. By this the technology companies mean that manufacturing companies and companies from the industry domain lack the technical knowledge to understand IoT." This conclusion confirms that the IoT 'knowledge, understanding and awareness' gap within the manufacturing industry is the top issue to be addressed before widespread IoT adoption is achieved.

Using the highlighted Task 1.1 and Task 1.2 analysis, it seems sensible to conduct the IoT4Industry project SME training with the main focus being "awareness and knowledge". The training should aim to demystify IoT technologies to ensure that manufacturing SMEs can make informed decisions. By doing this, some of the discussed concerns and barriers will be addressed.

4.2. IoT technologies and their benefits

The lack of knowledge and awareness around IoT solutions points to the need to inform manufacturing SMEs about the benefits of such solutions. In order to do this, the manufacturing SMEs firstly require awareness of what the technologies are. This means that the training would require a segment which introduces the technologies to provide a base for manufacturing SMEs to understand the potential benefits of these technologies.

It is important to use common terminology when the technologies are being discussed. The use of common terminology avoids confusion and misunderstandings – especially when manufacturers want to communicate on a somewhat technical level with IoT technology providers. This should in turn make the definition of collaborative projects easier.

After introducing a technology, the potential applications of that technology should be explored. This will help stimulate thinking about how these technologies align to specific manufacturing challenges SMEs might have and how these technologies can benefit them. For example, after 'big data analytics' is introduced, predictive maintenance (a possible application of big data analytics) will be mentioned which could spark interest to those manufacturing SMEs who struggle with machine downtime. This kind of context will help SMEs understand how their businesses could tackle certain challenges through technology.

The IoT technologies to be explored have been defined based on the most popular technologies identified in with Task 1.1 and Task 1.2 cluster interviews. The ranking of technologies among manufacturing clusters (Task 1.1) is:

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Table 2: IoT Technologies (Task 1.1)

1. Robotics and Automation,
2. Simulation and Modelling,
3. Sensors,
4. Big Data & Analytics,
5. Cyber Security,
6. Virtual Reality & Augmented Reality,
7. Artificial Intelligence,
8. Additive Manufacturing,
9. Cloud Based Platforms,
10. Communication Protocols

And, the ranking of technologies among IoT clusters (Task 1.2) is:

Table 3: IoT Technologies (Task 1.2)

1. Sensors,
2. Communication Technologies,
3. Prototyping,
4. Big Data & Analytics,
5. Cyber Security,
6. Cloud,
7. Artificial Intelligence,
8. Simulation and Modelling,
9. Virtual Reality & Augmented Reality,

[Please note that there were slight discrepancies in the list of IoT technologies used by Task 1.1 and Task 1.2 interview guides. It is therefore not significant that, for example, Robotics & Automation is not represented in *Table 3*.]

It is recommended that the *Table 2* list of technologies (manufacturing needs) is used to define the technologies which are explored. This ensures that manufacturing SMEs can learn more about the technologies which they view as important and also any IoT technology providers in attendance can understand which technologies are prioritised by manufacturing industry. This may influence the technologies that IoT providers offer going forwards.

4.3. Exploring case studies

One interesting need highlighted in the Task 1.1 manufacturing cluster interviews is the need for access to real use cases. It was highlighted that real use cases provide a powerful demonstration of the technology capabilities leading to a greater realisation of the benefits. This thinking is echoed by the Technology Transformation team at the MTC and their experience engaging with manufacturing SMEs. Hence, the SME training should include a segment which explores a range of industrial IoT use cases.

Task 1.2 highlight that “IoT companies lack knowledge and experience to produce systems for an industrial context” and “often technology companies underestimate the requirements that an industrial environment poses.” Approaching the topic of IIoT using case studies will also demonstrate real value to IoT technology providers because they can gain understanding around the implementation of technology in an industrial environment.

The amount of case studies explored will again be dependent on the amount of time portioned to this segment of the training. It is recommended that at least 3 in depth case studies are explored that cover different manufacturing applications. In Task 1.2, IoT clusters identified relevant topics for Industrial IoT (IIoT) projects as:

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Table 4: Relevant Topics for IIoT Projects (Task 1.2)

1. Smart Data,
2. Smart Sensing,
3. Connected Systems,
4. Energy Management Systems,
5. Robotics/Cobotics.

These areas align with the most popular technologies identified by manufacturing clusters seen in Table 3. IoT clusters also identified their expected applications of IoT technologies in manufacturing to be:

Table 5: Top 5 Expected Applications

1. Predictive Maintenance,
2. Logistics and Supply Chain (Optimisation),
3. Tracking and Tracing,
4. Monitoring (Condition Monitoring, Digital Twin),
5. Process Analysis (Analysing production data).

Again, this aligns with answers from manufacturing clusters. For example the manufacturing clusters consistently highlighted monitoring and predictive maintenance as areas of interest. Based on this information, it would be favourable to include case studies which align to the areas highlighted in Table 4 and Table 5. However, the quality of case studies collected (by the project partners) may also have a bearing on which case studies are explored.

4.4. Stimulate IoT4Industry project ideas

It is important that the IoT4Industry training gets attendees thinking about how the IoT technologies discussed can filter into their own industrial projects. A powerful way to simulate this thinking is via group discussions and activities. These group discussions and activities can help trigger valuable project-idea creation but also keep attendees engaged and promote a collaborative environment. These factors are very important when moving forwards towards the IoT4Industry call for projects (which is overseen by WP3 – Innovation Vouchers).

4.5. Information regarding the IoT4Industry project and additional services

The final requirement for the training is to provide additional information on the next steps of the project. This can be covered at the start of the training (and recapped at the end) or at the end of the training. This segment should cover:

- Projects (types of project, project ideas);
- The matchmaking process;
- Call for projects (dates, how to submit, project proposals);
- Potential funding synergies (Optional)*;
- Additional services (Optional).

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This segment will provide the necessary information, but should also serve as an opportunity for any questions to be asked regarding the IoT4Industry project as a whole.

*The potential international, national and regional funding synergies are explored in Task 1.3. The deliverable report D1.3 should be used as the reference for any content involving funding synergies.

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5. Training format and structure

5.1. Training format & resources

To remain consistent with the IoT4Industry grant agreement, the SME training should be delivered as workshops. It is recommended that this workshop is a one day event which utilises the resources below. A version of these resources will be developed and shared by the MTC.

- PowerPoint presentation. This resource will add a visual element to the training and also provide structure to ensure it runs smoothly.
- Attendee workbook. This resource will allow all of the information covered to be taken away by the attendees so that no knowledge is lost. It will also allow attendees to make notes and carry out activities so that ideas are captured. The workbook will therefore ensure that attendees get the most out of their training workshop.

5.2. Training structure

The suggested training agenda is listed below. The training developed at the MTC will follow this structure.

- Welcome and introduction to the day/IoT4Industry project;
- Introduction to the Industry 4.0/Smart Manufacturing;
- Introduction to IoT (including barriers of adoption);
- Introduction to the technologies (overview of IoT technologies and their applications);
- Case Studies (real examples of implementation of IoT technologies);
- Discussion (brainstorming activity about current challenges and potential solutions. Each table to bullet key points and present back to room);
- Group activity* (analyse fictitious company scenarios and advise how to proceed);
- Q&A and final note about the project call (opportunity to discuss additional services).

*Possible time-dependent inclusion.

5.3. Training material

The full training pack will be uploaded to the IoT4Industry project drive. This will include a detailed session plan, attendee workbook, and presentation. The bulk of the detailed material will be included in the workbook. These documents will be internally reviewed at the MTC and will be used in the IoT4Industry SME training workshops. The remaining project partners can use this training pack, or can adapt as necessary provided that a consistent approach is taken. With regards to material content, the following will be covered:

- Introduction to Industry 4.0/Smart Manufacturing,
- Introduction to IoT,
- IoT Technologies,
- Use cases/Case Studies/Examples,
- Discussion/Activity.

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6. Additional services portfolio definition

The project partner clusters naturally want to support their members when they look to take advantage of funding opportunities. Due to their position in the IoT4Industry project, it was decided that only a fully transparent and consistent portfolio of additional services would be offered by the project partners. This additional services portfolio summarises the extra offering (related to the IoT4industry project) of the project partners to their members*. The list of additional services can be seen below:

1) Further support in the matchmaking including:

- Helping companies choose the right collaboration partners;
- Demystifying the demand/offering of potential collaboration partners;
- Assistance in contacting collaboration partners and explaining the scope of the call to them.

2) Support with project idea/planning:

- Advice on project type (feasibility study, prototype, demonstrator/pilot);
- Advice on relevance of project ideas;
- Provide direction to relevant project ideas.

3) Supporting in project submission including:

- Review of project proposal;
- Advice on proposal's alignment to call.

4) Advice and reorientation with regards to other potential funding opportunities:

- Use D1.3 (*Report on European regional strategies and European Structural and Investment Funds with relevance to smart industry*) to point to regional funding opportunities.
- Advice on adapting proposals for other funding opportunities.

5) Close follow-up of the project execution and assistance in conflict resolution

6) Promotion and visibility of the project (in addition to the promotion made in the framework of IoT4Industry).

*The MTC (UK) has a different membership structure to the other project partner clusters. It has therefore been decided that the MTC will offer the agreed additional services to companies with their "network". Companies within the MTC's "network" are not necessarily paying members. The MTC shall offer these additional services with a cap on the amount of time spent with each company who enquire about support. This cap is set at the MTC's discretion.

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7. Appendix

7.1. Methodology of the project IoT4Industry

The IoT4Industry Project is focused on 4 stages (work packages):

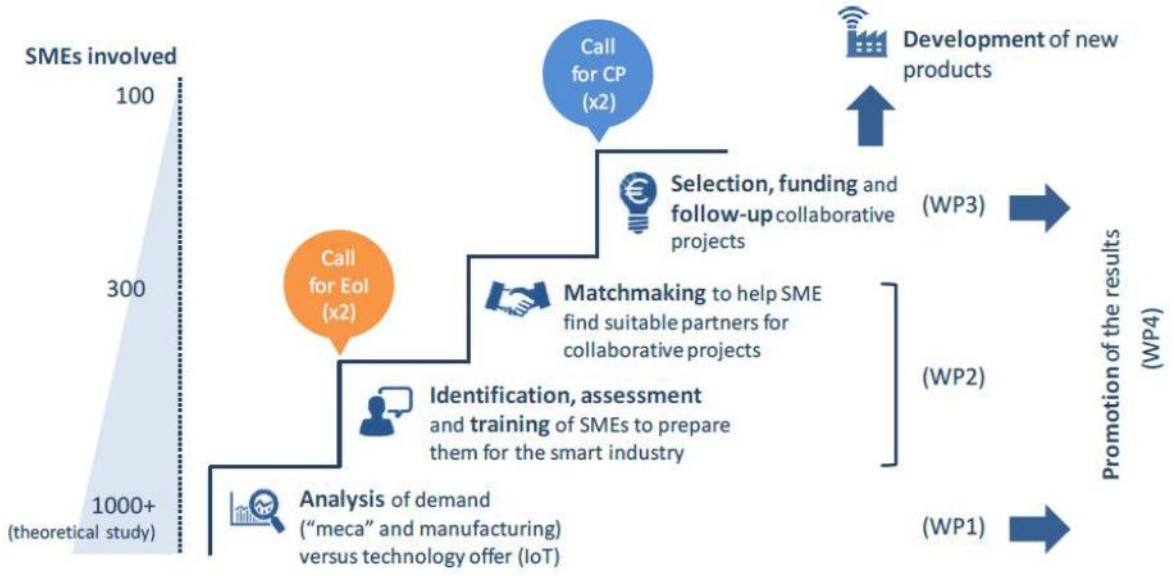

Figure 4: IoT4Industry Project Stages

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