IoT4Industry

Project Deliverable

European mapping of concerned SMEs and selected/suggested focus topics and sectors

Project Title	Towards smarter means of production in European manufacturing SMEs through the use of the Internet of Thingss technologies
Project Acronym	IoT4Industry
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Instrument	Innovation Action
Topic	Cluster facilitated projects for new industrial value chains
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Name of the deliverable	European mapping of concerned SMEs and selected/suggested focus topics and sectors
Number of the deliverable	D1.1
Related WP number and name	WP1 - Identification and analysis of focus sectors for collaboration support
Related task number and name	Task 1.3 Analysis of RIS and synergies with regional funding schemes
Deliverable dissemination level	Public
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Task leader/Main author	MBI / Perrine Grosjean
Contributing partners	MTC, PMT, MESAP
Reviewer(s)	DSP V - Bjorn Van de Vondel

Abstract

This report aims at :

- Analyzing the major trends and main technological development regarding manufacturing sectors' State of the Art
- Analyzing the future potential with connection to the needs in relationship with smart IoT solutions

Keywords

Industry 4.0; smart manufacturing; SMEs; IoT; big data; cloud; automation; robotics; artificial intelligence; sensors.

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Revisions

Version	Submission date	Comments	Author
v0.1	24/05/2018	Skeleton structure and draft structure	Jeko Conseil
v0.2	12/06/2018	Advanced version	Perrine Grosjean
v0.3	26/06/2018	Version for peer review	Perrine Grosjean
v0.3	26/06/2018	Version shared with partners	Perrine Grosjean
v0.5	27/06/208	Peer review	Bjorn Van de Vondel
v1.0	29/06/2018	Version for submission	Perrine Grosjean

Disclaimer

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Acronyms and definitions

Acronym	Meaning
IoT	Internet of Things
WP	Work Package
ROI	Return On Investment

The IoT4Industry project

The proportion of the manufacturing industry is currently decreasing in developed European countries' 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, a hundred of 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. Executive summary

Industry 4.0 and IoT are emerging trends in industry. The keys thematic are:

- **Data analyses, data management, monitoring.**
- **Predictive maintenance.**
- **Quality processes.**
- **Cloud, platform.**
- **Machine learning.**
- **Communication.**

All of them are linked, because to realize predictive maintenance and increase the quality processes we need to collect information (data) and analyze it. Then, the step of gathering is coming. That is the role of cloud platform.

SMEs don't really know how to integrate and deal with issues of this emerging market, they need to be educated and supported. SMEs know they have to change their business model but they don't know how to proceed.
The main objective is to find out the switch bouton with SMEs to make them understand how important is to implement digitalization in all their new development to stay competitive.

Current technical offer seems to cover and answer to main topics of Industry 4.0 and industry Internet of Things.

Regarding the technical inputs we have, we can constitute an initial level on the four technological needs:

Main technological needs and potential related topics	
Need 1 : Automation ► Potential related topic: **monitoring machine tool to improve the quality of the final pieces** (sensors, software)	Need 3 : Big data ► Potential related topic : **measure of vibration to realize predictive maintenance**
Need 2 : Simulation/modelling ► Potential related topic : **VR to realize delocalized live maintenance support**	Need 4 : Cybersecurity ► Potential related topic : **how to protect the data that factory is collecting and analyzing**

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2. Introduction

The first part of WP1 focuses on manufacturing and more precisely on potential needs and applications where recent and ongoing developments in IoT may offer new solutions with increased efficiency and competitiveness. Thus, the three advanced manufacturing clusters (MBI, MESAP, PMT) and MTC will be involved in this activity, with methodology support through Inno.

The analysis will focus on the analysis of major trends and main technological development regarding the manufacturing sectors' State of the Art, and the analysis of future potential with clear connection to the needs in relationship with smart IoT solutions. Focus will be made on 2 main groups of companies: "Machine / tool SMEs" which can co-develop with ICT companies' new smart devices, and "Factory SMEs", which will be the pilots and end-users of these solutions.

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3. Objective

The objective of the deliverable D1.1 “European mapping of concerned SMEs and selected/suggested focus topics and sectors” has two components:

- The first one is to provide an overview of technological and strategic needs regarding IoT of representative clusters for calibrating the open call offers to the actual needs.
- The second is to provide content for WP2 (training materials and service portfolio for SMEs, calls for expression of Interest for identification of SMEs) and WP3 (Calls).

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4. Target Audience

The target audience is composed of two segments:

- 21 Clusters interviewed, representative of European manufacturing sectors: Directors / Project Managers.

Table 1: List of European Manufacturing Cluster Interviewed

	Name	Country	Name
1	AFM cluster	Spain	Xabier Ortueta
2	BalticNet-PlasmaTec	Germany	Katerina Ulich
3	Brainport industries	Netherlands	John Blankendaal
4	Cluster Precision	Switzerland	Patrick Roth
5	DIMECC	Finland	Arto Peltomaa
6	EEF	United Kingdom	Charlotte Horobin
7	Engineering and Machinery Alliance (EAMA)	United Kingdom	Jack Semple
8	Flanders Bike Valley	Belgium	Celis Bert
9	IT'S OWL	Germany	Martin Rabe
10	Linz Center of Mechatronics (LCM)	Austria	Johann Hoffelner
11	Materalia	France	Sakina Seghir
12	MBI	France	Jean-Marc André
13	MESAP	Italy	Silvia Zinetti
14	Midlands Aerospace Alliance	United Kingdom	Andrew Mair
15	MTC	United Kingdom	Dean Baker
16	PANEL	Hungary	Andras Hary
17	Plastipolis	France	Patrick Vuillermoz
18	PMT	Belgium	Anthony van Putte
19	Pointex	Italy	Lino Campanile
20	POOLING Engineering and Tooling	Portugal	Rui Tocha
21	Processing & Packaging Machinery Association	United Kingdom	Russell Sion

- IoT4Industry partners in charge of shaping the call for projects.

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5. Input

We also complete the analyses with the study of **relevant reports**. We selected them with all the partners. It is composed of different type of reports in different languages (brochures, blank document, infographic…):

- Gartner. Top 10 Strategic Technology Trends 2017. Infographic. 2016
- BDVA (Big Data Value Association), Big Data Challenges in Smart Manufacturing. 2018
- Made Smarter review 2017
- The Manufacturer. Annual Manufacturing report 2017
- www.industrialdigitalisation.org.uk , Industrial digitalization review. July 2017
- AIOTI WG11. Report of Smart manufacturing. 2015
- Usine du futur, Alliance Industrie du futur, FIM (Fédération des Industries Mécaniques), Guide pratique de l'Usine du Futur, Enjeux et panomara de solutions. May 2016
- Solutions Communicantes Sécurisées pôle de compétitivité mondial, Optitec pôle photonique & imagerie, Offre Technologique des pôles de compétitivité SCS et OPTITEC pour l'Industrie du futur. Second edition June 2017
- Jeko conseil, Identification des thématiques RDI de l'Industrie du Futur en région AURA et structuration d'une feuille de route. December 2017

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6. Process / Implementation

WP1.1 is composed in 5 subtasks to analyze 1. the state of the art, 2.the needs of the demand side (manufacturing):

- Study of relevant reports
- Interviews with up to 21 clusters representatives of a wide panel of manufacturing sectors' clusters all over the EU, to understand the technological and strategic roadmap of a representative sample of clusters in the domain
- Short benchmarks of experimentations lead by a set of up to 8 larger companies will be done and the adaptability to SMEs explored
- Synthesis of results on potential needs and applications where IoT may offer new solutions will be presented in D1.1

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7. Analyse

7.1. Introduction

WP1 will focus on overviewing the state of play of both the manufacturing (representing the demand side) and the IoT (offering smart solutions) side, and of regional strategies with regards to these two sectors and the related new value chain, to allow a clear categorization of the existing offer and demand respectively, which will be the basis for the pre-identification of SMEs (WP2) and the selection of trans-sectoral collaborative projects (WP3).

Detailed objectives are:

- Define the needs and identify the highest potential for collaboration between the demand and the offer sides' actors in order to better prepare the matchmakings.
- Understand regional strategies and ecosystems, and identify the opportunities for leverage between IoT4Industry and regional support mechanisms (including European ones).
- Recommendations on the needs for training and awareness (WP2), and main topics of interest for the trans-sectoral collaboration cases (WP3).

WP1 contributes notably to the project's smart objectives n°1 (foster the use of IoT to meet the needs in manufacturing…) and n°4 (better understand the role and added value of IoT for a new value chain…).

Description of work

Manufacturing is a large field with multiple application sectors, and the IoT concept encompasses a variety of technology offers, some of them being currently tested or implemented in Industry 4.0. In order to focus the project support to sectors with the highest potential impact for a sustainable development of Industry 4.0 across Europe, the project team will establish:

- A mapping of the different SMEs and competences on the territory of our consortium but also more globally throughout Europe with regards to advanced manufacturing and IoT.
- A list of relevant actors in European industry with successful IoT implementations.
- An analysis to identify the most promising fields of applications and the most dynamic technological progresses.
- The definition of a common ontology to align the offer on the ICT side, and the needs on the manufacturing side.

The first part of WP1 (Task 1.1 - State of the art and needs analysis of the demand side) focuses on manufacturing and more precisely on potential needs and applications where recent and ongoing developments in IoT may offer new solutions with increased efficiency and competitiveness. Thus, the three

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advanced manufacturing clusters (MBI, MESAP, PMT) and MTC will be involved in this activity, with methodology support through Inno.

The analysis will focus on the analysis of major trends and main technological development regarding the manufacturing sectors' State of the Art, and the analysis of future potential with clear connection to the needs in relationship with smart IoT solutions.

Focus will be made on 2 main groups of companies:

- "Machine / tool SMEs" which can co-develop with ICT companies new smart devices.
- "Factory SMEs" which will be the pilots and end-users of these solutions.

The results of task 1.1 will be matched with task 1.2 and 1.3. This cross analysis will define the principles of WP2. Collecting the needs will give input in the definition of the training material and service portfolio for SMEs.

7.2. Methodology

This document aims at providing the IoT4Industry project with the analyses of the manufacturing needs in IoT. The 21 interviews of manufacturing clusters is composed with two documents:

- **A project note**: to present IoT4Industry project, the objectives of the interview, what will be the benefits and some details about the calls. This project note is an attached file on an email to contact manufacturing clusters.
- **An interview guide**: an interview guide is the foundation of the analysis to realize a quality study. This one is a directive interview with a structure to standardize the process because the 21 interviews will be realized by several members of the consortium. The interview is composed with different types of questions:
    - Closed
    - Multiple choices
    - Opened

It is important to have a **qualified contact list** to speed up the process of "initial contact" and get the 21 interviews done rapidly. The list is composed with clusters partners and with desk researches.

A first draft of the project note and the interview guide was sent to our partners (MTC, PMT, MESAP) to get feedback to improve these tools. These documents were sent by email, presented on a conference call meeting, during the kick off meeting, and available online to add comment and modify it.

We established a weekly call to follow up the progress of the interviews with a dashboard.

Table 2: Follow-up dashboard

Interviewed structures	Country	Sector	Name	Status

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The conference meeting forecast:

- 3rd of May 2018
- 17th of May 2018
- 24th of May 2018
- 31st of May 2018
- 7th of June 2018
- 14th of June 2018
- 21st of June 2018
- 28th of June 2018

This planning is also duplicated to follow-up the subtasks of WP1.2 and WP1.3.

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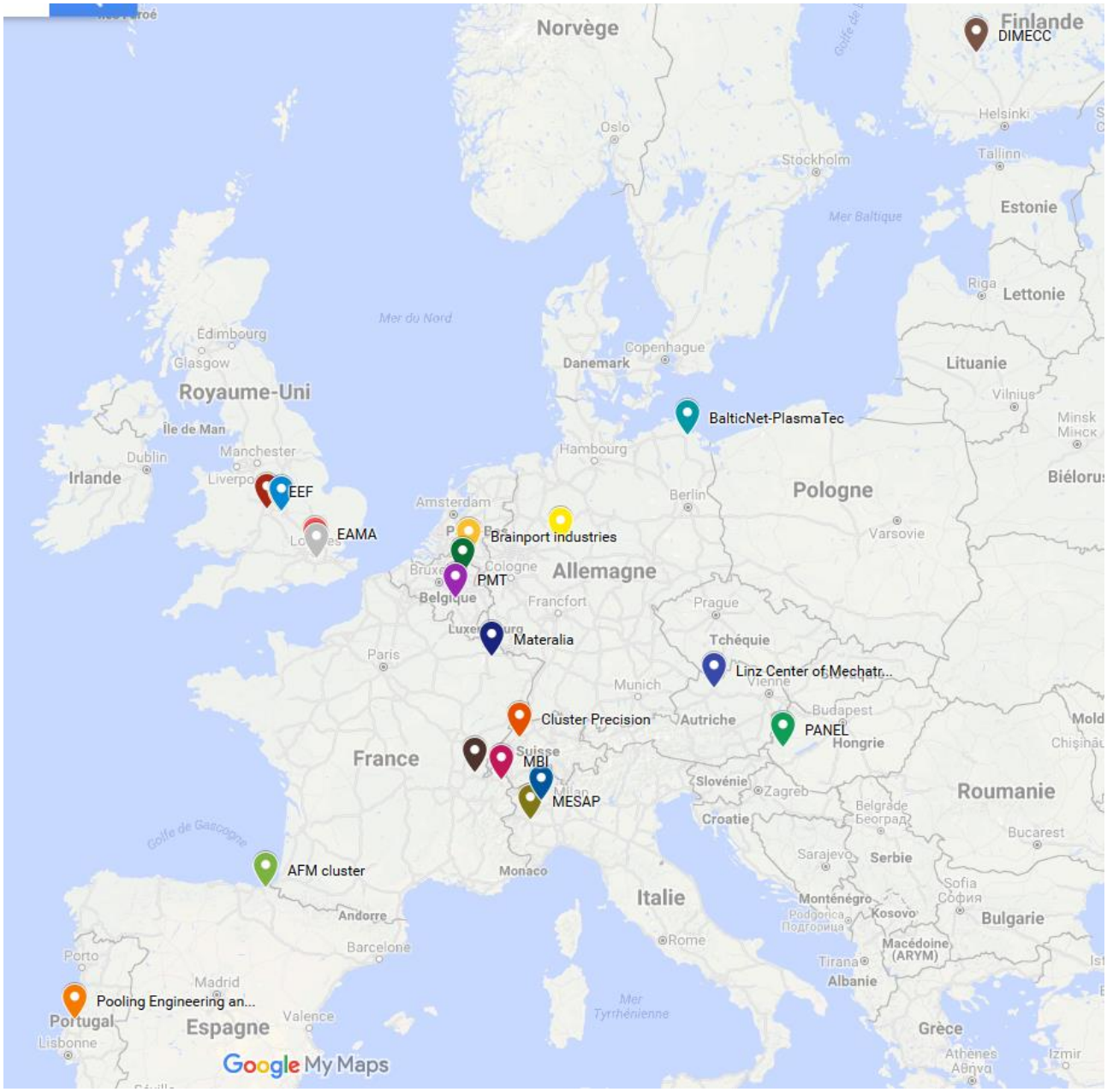
7.3. Interviews figures and environment

We decided that each partners realized a minimum of 5 interviews, so we shared a list of manufacturing clusters' contacts (eg. Target Audience) ► **21 clusters in 12 European countries.**

Figure 1: Map of the clusters interviewed



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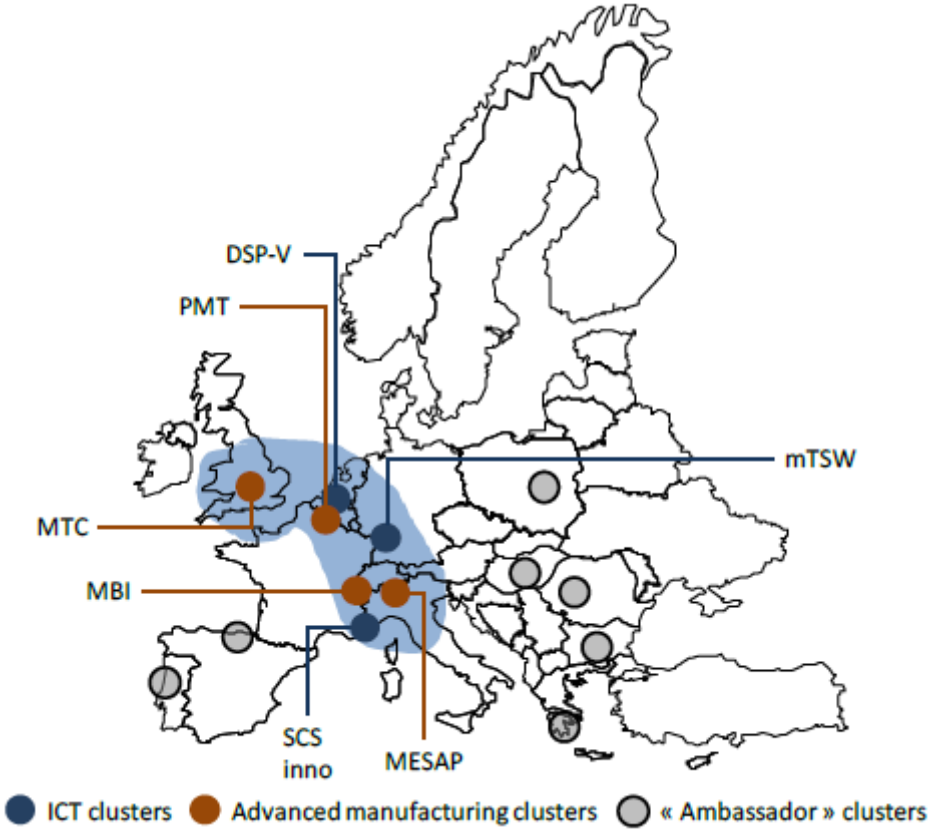
The IoT4Industry project consortium includes 3 ICT clusters (SCS, mTSW, DSP-V), 3 Advanced Manufacturing clusters (MESAP, MBI, PMT) and one technology center (MTC). They cover the **main industrial regions of Europe** ► United Kingdom – Midlands, Benelux, Germany, French Alps and Northern Italy, also called the **"Blue Banana".**

Figure 2: IoT4Industry partners in the "Blue Banana"



As we can see with figures 1&2, most part of the clusters we interviewed are located in this region of the "Blue Banana". This concept of European Megalopolis emerged in 1990s to appoint a densely populated and heavily urbanized space from London to Milano connected to worldwide trade by the north of Europe.

Therefore, according to this concept our interviews are representative of the main active and economic parts of Europe.

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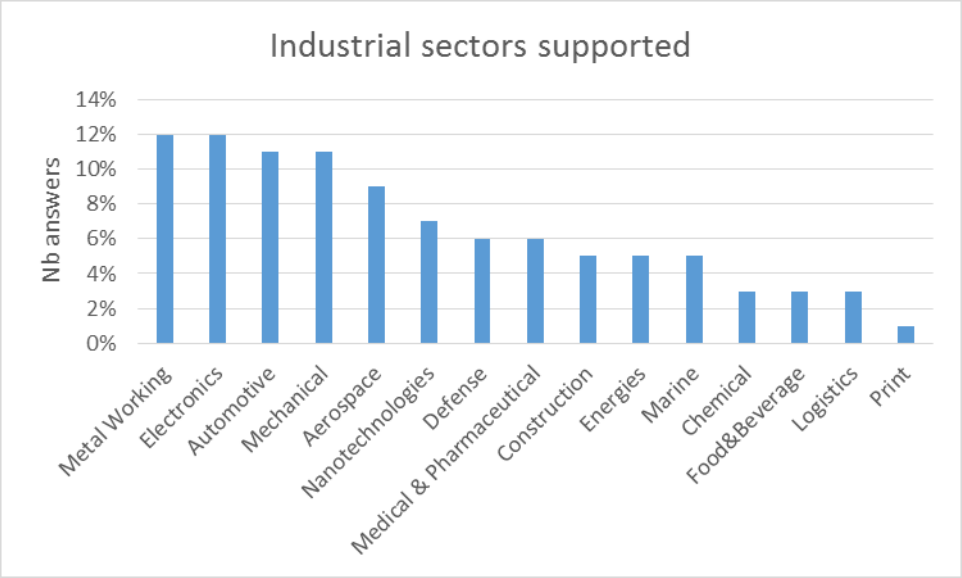
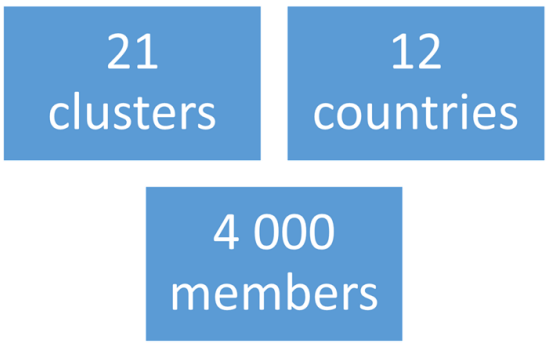
The industrial sector supported by these 21 clusters are also similar to the global key figures of the Industry in Europe.

Figure 3: Industrial sectors supported by the 21 clusters interviewed



The analyses of the industrial's need is composed with a panel of **21 clusters** from **12 European countries**, around **4 000 companies members**. Metal working, electronics, automotive, mechanical and aerospace are the main sectors represented.

Figure 4: Interviews' keys figures



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7.4. Overview of the mechanical manufacturing offer

7.4.1. Synthesis of relevant reports

Most of the reports speak about the importance of Industry 4.0 to stay competitive on the market for the industrials. This trend has **not only a technical aspect**, it concerns all the organization:

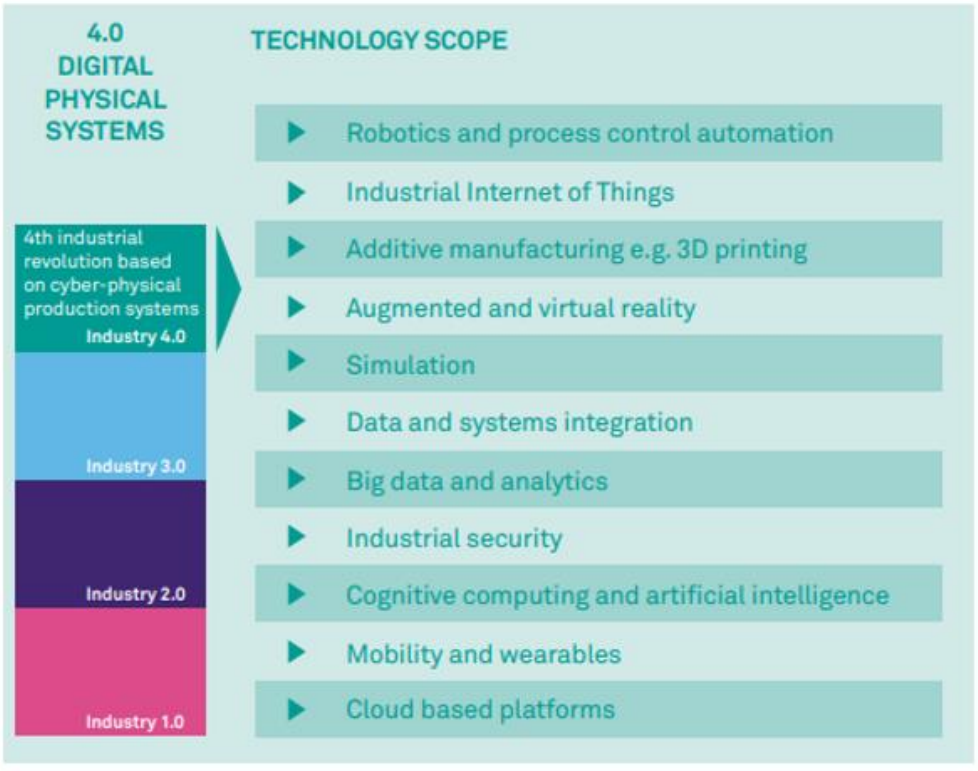
- **Market's evolution** and the impact on the societies.
- **Human, organization and digitalization**.
- **Environment**.
- **Digital tools**.
- **Technology**.

This segmentation is extracted from « *Guide Pratique de l'usine du futur - Enjeux et panorama de solutions ».* **Business models** should evolve to integrate Industry 4.0 objectives.

The **customer service** is also a priority. Customers are expecting an experience in addition of only a product. A complete service around a product is an added value and a differentiating factor. The importance to get information about the product, at anytime, anywhere, and at the right time is a service of Industry 4.0, and IoT is part of all these processes to get data and analyze it.

Industry 4.0 is involved all over the value chain, the review Made Smarter establishes a list of the main technologies to guide the United Kingdom into the industry of the future at medium and long terms.

Figure 5: Technology scope by Made Smarter, Accenture



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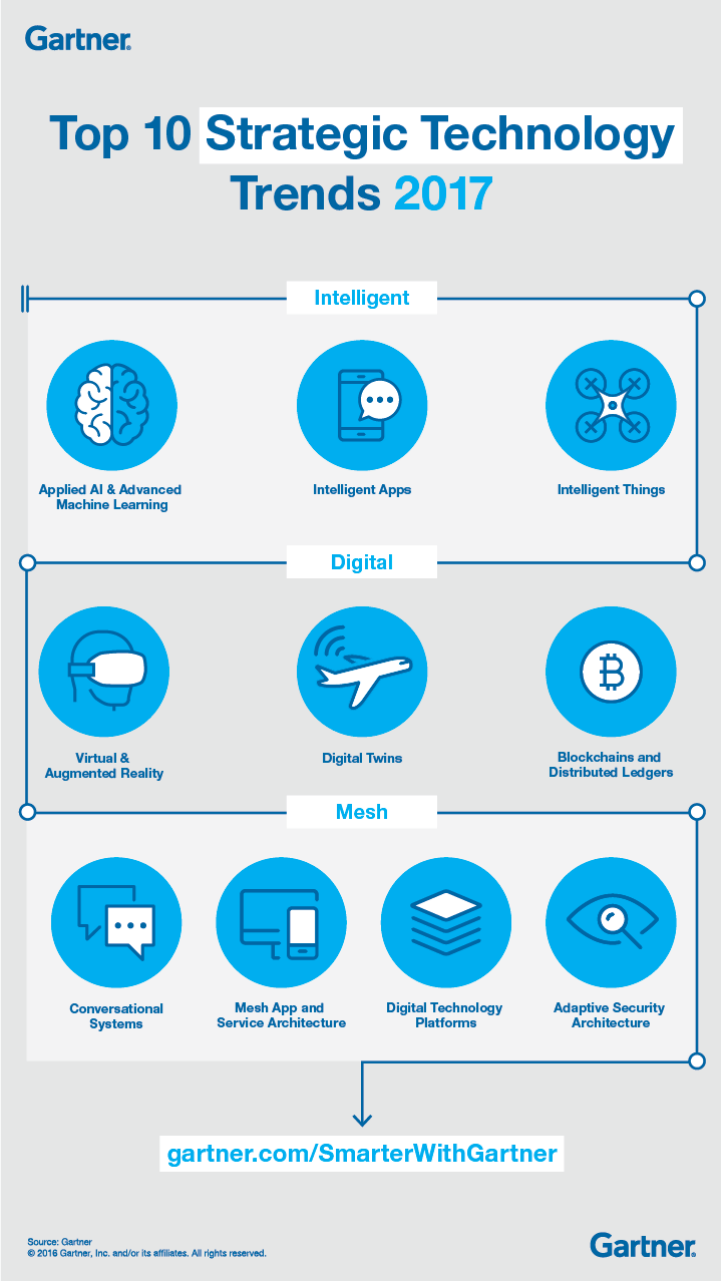
This list reflects the themes highlighted in the infographic of *Gartner*, "Top 10 Strategic Technology trends".

Figure 6: Top 10 Strategic Technology Trends, Gartner



All the reports are also mentioning these subjects as the trend to follow to stay competitive on the market for industrials. We can conclude that these themes establish the global vision of the industry of the future in Europe.

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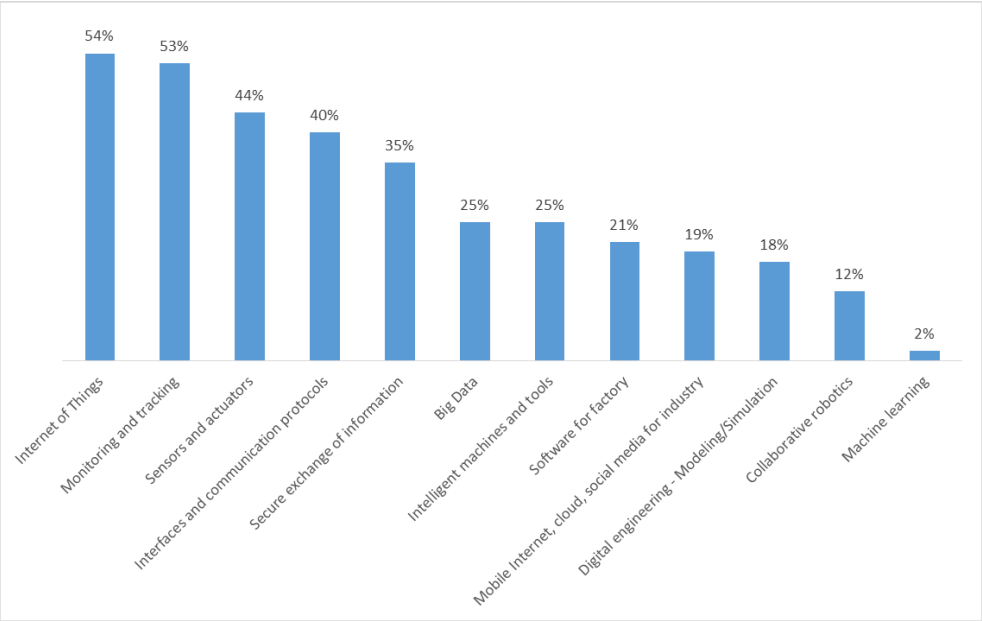
We have as inputs a brochure of providers' offers. We can notice with 57 providers that the offer is important and diverse.

Figure 7: Technical offer, *Offre Technologique des pôles de compétitivité SCS et OPTITEC pour l'Industrie du Futur*



These offers are matching with the themes highlighted previously when we defined the global vision of Industry of the future.

Elements emphasize and give a good overview on the different topics that will be approach for the calls.

Reports are also warning on the aspect "**adoption**". Industrial Digitalisation Review points that the adoption of Industry 4.0 by SMEs is poor – 21% report having no Industry 4.0 goals.

It mentions also the complexity of having the right skills because the current system is not providing **trainings**. One of the solution proposed is to emphasis messages that are delivered, to offer a better support to SMEs in their ecosystems and financing innovation.

Figure 8: How to promote investment in Industry 4.0 for SMEs, *Industrial Digitalisation Review*

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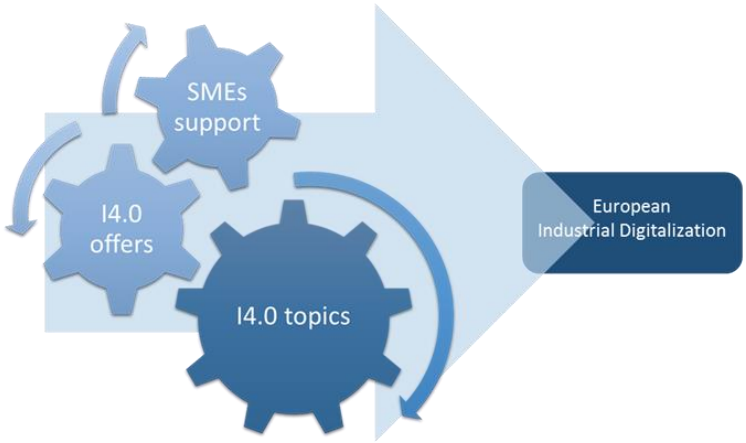
This example is referring to UK environment but it can be duplicated for all European countries, because the assessment about SMEs is similar.

This analyses brings out three important points:

- Industry 4.0 is covering multiple field (technical, digital…) that are essentials for industries to stay competitive on the market.
- Offer is significant, technical aspects are not a limit.
- Currently major part of SMEs needs support to understand the issue of Industry 4.0.

The main focus is on point 3, it has to be emphasized to start the European Industrial Digitalization.

Figure 9 : European Industrial Digitalization



Synthesis of the documentary analysis

Figure 9 is a synthesis of the analysis. It highlights that Industry 4.0 and IoT are emerging trends in industry. The main topics are **big data, simulation, cloud, robotics, connectivity and security**.

It points out SMEs don't really know how to integrate and deal with issues of this emerging market, they need to be educated and supported.

Current technical offer seems to cover and answer to main topics of Industry 4.0 and industry Internet of Things. This analyses will be confirmed in D1.4 to highlight the potential of collaboration between the demand side and offer side.

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7.4.2. Implementation of IOT - Benchmark

IoT4Industry project's is to connect and encourage collaborative projects between relevant innovation actors from the industrial and IoT sectors to:

- Modernize the production capabilities in European industry, specifically in SMEs.
- Increase the competitiveness.

A short benchmark of experimentation and implementation of IoT in larger industrial companies is interesting to explore the adaptability of these solutions for SMEs.

We select **8 industrial companies** with personal input, desk researches and information from the clusters interviewed.

- AIRBUS (France, Europe)
- AVENTICS (Germany)
- BOSCH (Germany)
- HILTI (Liechtenstein)
- SCHNEIDER ELECTRIC (France)
- SIEMENS (Germany)
- STEUTE (Germany)
- VENJAKOB MASCHINENBAU (Germany)

We created a template to standardize the benchmark and get an easy reading.

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AIRBUS	**Activity** Airbus is an international pioneer in the aerospace industry. We are a leader in designing, manufacturing and delivering aerospace products, services and solutions to customers on a global scale. We aim for a better-connected, safer and more prosperous world.

Innovation
Airbus is demonstrating a drone-based, innovative maintenance tool – Airbus' Advanced Inspection Drone – for use inside a hangar, which accelerates and facilitates visual checks, considerably reducing aircraft downtime and increasing the quality of inspection reports.
Following a predefined inspection path, the automated drone captures all the required images with its on-board camera. High quality pictures are then transferred to a PC database for detailed analysis using a software system. This allows the operator to localise and measure visual damage on the aircraft's surface by comparing it with the aircraft's digital mock-up. The software automatically generates an inspection report.

Status
This is a demonstrator, it will be available for the industry in the fourth quarter of 2018 following EASA approval of the new inspection process

Adaptability for SMEs
This concept of quality, maintenance and scanning can be duplicated in SMEs warehouse to reduce inspection time, inventorying and it will improve the worker safety.

AVENTICS	**Activity** AVENTICS is one of the world's leading manufacturers of pneumatic components, systems, and customer-specific applications. The pneumatic engineering company provides products and services for industrial automation, while additionally focusing on the sectors of commercial vehicles, food and beverage, railway technology, life sciences, energy, and marine technology. By integrating electronics, the use of innovative materials and prioritizing trends such as machine safety and the Internet of Things, AVENTICS is a pioneer in applied and environmentally-friendly solutions.

Innovation
Smart Pneumatics Monitor (SPM) – product for digital process networking
AES fieldbus solution, the Smart Pneumatics Monitor (SPM) IoT gateway analyses existing sensor signals and uses the result to generate reliable status information. To monitor the wear of a shock absorber, for example, the SPM breaks down the end switch signals to evaluate the cushioning sequence. Algorithms written by AVENTICS based on the company's application experience analyse this data internally and send the information either to defined people or to the parent MES or ERP systems via the OPC UA interface.
Use case:
- **Predictive maintenance** through integrated diagnostics
- **Energy efficiency** through effective use of compressed air
- **Operating comfort** simple plug-and-run application

Status
This solution is a final product.

Adaptability for SMEs
SPM product can be implemented on machine tool and all pneumatics solutions to monitor the component life cycle for example.

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BOSCH Invented for life	**Activity** Bosch does business all over the world and is active in the most wide-ranging sectors. Business sectors: • Mobility solutions • Industrial technology • Consumer goods • Energy and building technology

Innovation

Software tools IoT Gateway

- Simple exchange of data between existing production machines and IT applications, such as MES systems, analysis, database, or cloud applications.
- Parallel operation of IoT gateway and machine control without interference in the machine program
- Web-based configuration and management without any programming effort
- Perfectly coordinated, pre-configured and validated hardware and software modules
- Robust, reliable and durable XM control hardware

The IoT Gateway – perfectly coordinated hardware and software components

- Scalable embedded control hardware
- Dashboard App for system administration, configuration and parameterization
- Devices App for the integration of I/O modules, sensors and PLC
- Processing App for processing and forwarding of process data

Status

This solution is on the market

Adaptability for SMEs

Transmission of the data via open interfaces into overall systems like MES. Integration into the HMI via app for transparent data visualization on the machine, tablet or other mobile devices.

HILTI	**Activity** Hilti makes and designs leading-edge technology, software and services, which power the professional construction industry.

Innovation

ON!Track, is a total asset management system solution (service, software, hardware) helps solve the question of "Where is my stuff?" and "Who is responsible for it?".

- Hardware: Bluetooth tags & Data Matrix (2D Barcode) adhesive, metal plate, and hanger tags
- Software: Cloud-based and free smartphone app (iOS and Android). With unlimited users.
- Service: Onsite consultation, asset tagging, onsite training, data upload, complete with best in class customer support

ON!Track is designed to manage all assets, regardless of brand or manufacturer, and includes more than just tools

Status

This solution is already on the market. "The right tool, at the right place, at the right time"

Adaptability for SMEs

This concept can be duplicated on the workshop's tools or on car fleet or spare parts…to avoid production shutdown

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Schneider Electric	**Activity** Schneider Electric is leading the Digital Transformation of Energy Management and Automation in Homes, Buildings, Data Centers, Infrastructure and Industries.
Innovation EcoStruxure is Schneider Electric's IoT-enabled, open and interoperable system architecture and platform. It delivers Innovation At Every Level across connected products, edge control, and apps, analytics, and services, with domain expertise in machinery to enable smart machines by combining products and software packages into automation solutions for OEM machine builders.	
Status Available on the market. Example: Stäubli and Schneider Electric sign partnership to more easily integrate robotics solutions into EcoStruxure TM smart machines. Schneider Electric is integrating a customized version of the Stäubli TS series four axis SCARA robots into its solution portfolio. Labeled Lexium STS series, these robots will now be fully integrated into the architecture of Schneider Electric´s leading PacDrive motion control solution.	
Adaptability for SMEs Transmission of the data via open interfaces into overall systems like MES. Integration into the HMI via app for transparent data visualization on the machine, tablet or other mobile devices.	

SIEMENS	**Activity** Electrification, automation and digitalization are the long-term growth fields of Siemens. In order to take full advantage of the market potential in these fields, our businesses are bundled into eight divisions and Siemens Healthineers as well as Siemens Wind Power as a separately managed businesses. Siemens has a portfolio ranges from power plant construction and wind turbines to rail vehicles and medical technology.
Innovation MindSphere, The cloud-based, open IoT operating system for digital transformation It offers a cost-effective, scalable cloud Platform as a Service (PaaS) that's perfect for developing apps. Designed as an open OS for the Internet of Things, it lets companies seamlessly connect with their machines like never before so they can improve the efficiency of plants by harnessing the huge volumes of data that their assets generate. MindSphere offers seamless connectivity between data-based services from Siemens and third party providers. And it lets companies integrate their own apps and services.	
Status This solution is on the market	
Adaptability for SMEs MindSphere is an operating system and can be implemented on all devices and machine. It is configurable on the platform, it's a tailor made service which can be used in every production lines.	

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.steute	**Activity** Today steute is a globally renowned specialist for the development and production of safe and reliable switchgear for complex and critical applications. The steute product portfolio comprises a wide range of serial products, as well as numerous customised solutions, and is divided into four business fields, each with its own core area of competence: Wireless, Automation, Extreme and Meditec.
Innovation An intelligent and intuitive assistance system, which explains work processes by means of a graphic user interface. A touch screen is used to show the employee images and films, which explain how the individual components are correctly assembled. In order to assure quality, process steps can be checked and documented in paperless form using the system. The architecture of the assistance system is based on standardised process models and can be linked with other levels of the company IT. It is also possible to dynamically expand the system. As part of this process, the breadth of information displayed is based on the error frequency during product assembly or the experience level of the employees. This means that experienced employees are not limited in what they can achieve. Benefits: • Easy to find he correct sequence of working steps • Disruptions can be forwarded to the production manager directly using camera images and other explanations • The system can also be used to train employees	
Status Solution used in the plant steute Schaltgeräte.	
Adaptability for SMEs Digital devices to guide the different step of production can be implemented in SMEs production processes.	

Venjakob	**Activity** Venjakob Maschinenbau, a medium-sized manufacturer of in surface finishing machines, handling equipment and exhaust air cleaning
Innovation The company took the first steps towards the development of an intelligent coating system. This system should be able to recognise the wear of components in good time and report this to the operator independently. As part of this process, an ionising rod neutralises and removes charged dust particles on the workpiece. If the performance of the ionising rod abates and maintenance does not take place in good time, this has a negative effect on the entire coating process. Dust particles are also coated and the workpiece can no longer be used. The use of machine learning processes enables a forward-thinking maintenance plan (condition monitoring), in which the coating system informs the employee about the imminent maintenance in good time. Product waste and unplanned downtime are minimised.	
Status It is an internal development, this forms the basis for future innovations. It ensures the further development of the coating systems and enables the expansion of Venjakob's market position as a leading innovator.	
Adaptability for SMEs This is a specific development for this specific company. The approach of development "self-optimization" has to be noted because it enables the expansion on market position	

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Synthesis of the benchmark

The keys thematic of all these examples are:

- **Data analyses, data management, monitoring.**
- **Predictive maintenance.**
- **Quality processes.**
- **Cloud, platform.**
- **Machine learning.**
- **Communication.**

All of them are linked, because to realize predictive maintenance and increase the quality processes we need to collect informations (data) and analyze it. Then, the step of gathering is coming. That is the role of cloud platform.

The machine learning is also a process of gathering data. One of the objective is to reduce down time production and increase companies' efficiency.

This benchmark of 8 companies give interesting inputs away to guide SMEs to aim to smart factory by digitalization the "plants' world". The majority of these examples are already on the market and used by their own factories as a pilot demonstrator.

The main objective is to find out the switch bouton with SMEs to make them understand how important is to implement digitalization in all their new development to stay competitive.

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7.5. Main needs of manufacturing companies

According to the interviews, the benchmark and the documentary analysis, the main needs of manufacturing SMEs is to **know what is industry 4.0 and to understand the added value** of this trend.

We asked clusters about their members' barriers to invest in Industry 4.0. The trends are all similar. There is **a lack of awareness** to demonstrate the interest of these solutions. Furthermore, it is hard to **provide a ROI** because it is new system, new procedures... A phase of test is needed like for all "innovation" to learn how to proceed and to measure it. Here the question of measuring is also a problematic, because there is a considerable **lack of skills**.

These elements evidence the fact that the core is **business model**. Factory companies are focused on reducing production's costs and fast ROI. This model is quite different than researching and testing which are less factual and countable, therefore it seems more risky to invest on such field.

Industry 4.0 and specifically Internet of Things is a new field of research that requires investments to grow the competitiveness of industrials to make them durable.

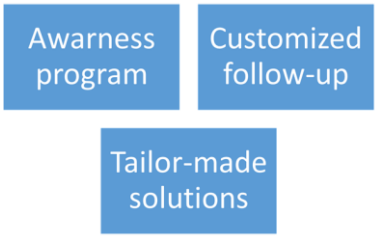
The relevant weakness of SMEs is that **they usually don't have time** or don't give time to Industry 4.0. They deal with daily problems and try to resolve them. They need to look beyond their usual organization to get an outside overview.

The **company culture** is also mentioned as a limit that has to be passed. It is important that all the employees also understand what is Industry 4.0 and IoT to remove any fears to be replaced and lose their job. It is not only automation and robotics. Humans has a priority place in this digitalization process.

Information about specific needs is needed. All processes are different and **customized solutions** are obvious even if the frame is similar. Current providers are focusing on the frame and not enough in specific needs. This is the center of the business for IoT providers.

Sometimes **lack of standard communication protocol** is a limit, but it slows down the process of companies' digitalization.

Figure 10: Main needs on IoT for industrials



Technical issues are not the specific needs, because the actual offer is covering it as the benchmark demonstrates and figure 7: technical offer (cloud solutions, monitoring software, sensors…). This point is relevant for the project because it suggests successful projects. Industries with the follow-up and customized solutions of IoT experts/providers will develop high performance solutions to attend to smart factory.

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Synthesis of the main needs of manufacturing companies regarding IoT

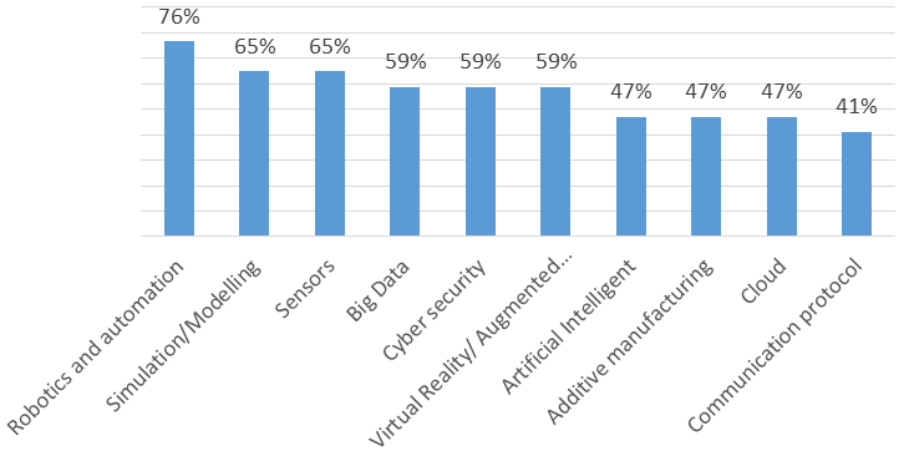
We noticed SMEs have **more expectations on non-technical topics** because the concept of industry 4.0 and IoT is not well defined for them. They have difficulties to get it into their strategies therefore they are expecting support and inputs.

On the other hand, they know that science is needed to get **real-time data collected to improve their production monitoring and processes**. Implicitly they need **high quality sensors, innovation in metrology science, cybersecurity, communication protocols (machine to machine**)… and much more.

7.6. Recommendations and impact

We asked clusters about the different thematic their members are interested in to invest. The objective was to get a first idea about the topics we will receive after the expression of interest and the calls in order to guide the process of matchmaking.

Figure 11: Clusters' members' thematic interests



On the diagram we analyse that all the topics are linked and inter-connected. These results are aligned with the needs and the convictions of industrials.

Figure 12: Tag cloud main key words

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These words were used all over the discussions during the interviews. This tag cloud is the synthetises of the analyses of the demand and it reflects the industry of the future.

Synthesis of the report

As a conclusion, figures 6 and 7 clearly define what should be the thematic of the calls.

The use of amongst smart sensing, automation, virtualization, internet connectivity, cloud computing, big data technologies… but certainly by a smart combination of those, will help SMEs to digitalize their organization and tend to industry of the future.

Awareness campaign is an important element that has to be point 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. They also need support to learn how to sell in the environment of new business model. It is no more only high quality product, delivery time… a global solution with a service included is needed.

SMEs can identify at macro level technical topics but they are not able to identify precisely what they need. Therefore the offer side (ICT) has to really push their solutions and prospect manufacturers because technologies they offers represent an emerging market.

Regarding the technical inputs we have got during the interviews; we can constitute an initial level on the four technological needs :

Main technological needs and potential related topics	
Need 1 : Automation ► Potential related topic: **monitoring machine tool to improve the quality of the final pieces** (sensors, software)	Need 3 : Big data ► Potential related topic : **measure of vibration to realize predictive maintenance**
Need 2 : Simulation/modelling ► Potential related topic : **VR to realize delocalized live maintenance support**	Need 4 : Cybersecurity ► Potential related topic : **how to protect the data that factory is collecting and analyzing**

This deliverable has several impacts to pursue the IoT4Industry project:

- **It gives inputs to customize messages which will be deliver to target audience.**
- **It provides a baseline for impact assessment of the Expression of Interest and the calls.**
- **It guides on the main needs and sectors IoT4Industry project team has to target.**
- **It points out relevant topics definition and give warnings that WP2 and all partners have to consider.**

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7.7. References

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Benchmark Hilti: https://www.youtube.com/watch?v=SliMK6Z2jlA

Benchmark Schneider Electric: https://www.schneider-electric.com/ww/en/documents/Press/2018/04/23-release-partnership-staubli-robotics-ecostruxure-smart-machines-tcm50-377217.pdf

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Benchmark Steute and Venjakob : https://www.its-owl.com/fileadmin/PDF/Informationsmaterialien/2017-Technology_Transfer_web.pdf

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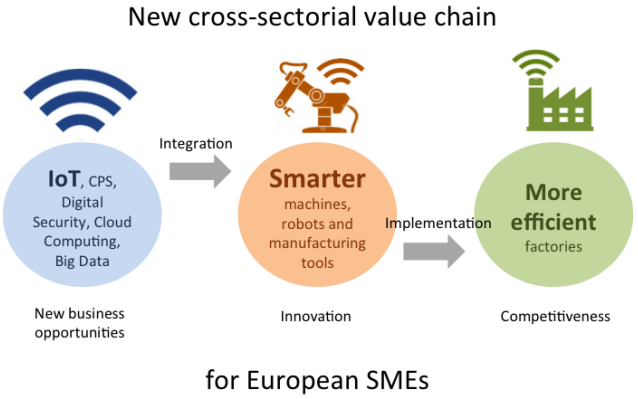
7.8. Annexes

7.8.1. Project note

Context

The IoT4Industryproject seeks to support EU growth and competitiveness through the development of a new cross-sectoral industrial value chain based on the **integration and use of IoT and related components (DigitalSecurity, Cloud Computing, BigData, Artificial Intelligence…) into manufacturing tools, machines and robots**, through the cross-border collaboration between SMEs and other RDI actors of the ICT and advanced manufacturing sectors.



Objective

The goal is to connect and encourage collaboration between relevant innovation actors from the IoT and industrial sectors to:

- Enable the access to industrial market to IoT SMEs
- Modernize the production capabilities in European industry, and in particular in SMEs

Your benefits?

- Your members will have the opportunity to get European grants.
- They may be qualified to receive voucher from 25 to 60K€ to invest in IoT (Feasibility study, prototyping, demonstration/pilot)*.
- You and your expertise will be recognized to speed up and assist industrial companies in their transformation for the future.

We would like to have a discussion with you to gather your vision and analyses on the Internet of Things in your environment.

Contact

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*Types and characteristics of vouchers

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Appendix

	Feasibility study	Prototyping	Demonstration / pilot
TRL of envisaged project	5-6	7-8	8+
Maximum amount granted per beneficiary (SME)	25 000 €	45 000 €	60 000 €
Maximum Lump sum per project	50 000 €	80 000 €	120 000 €
Funding rate		Lump Sum	
Time frame	Up to 6 months	Up to 12 months	Up to 12 months

Methodology of the project IoT4Industry

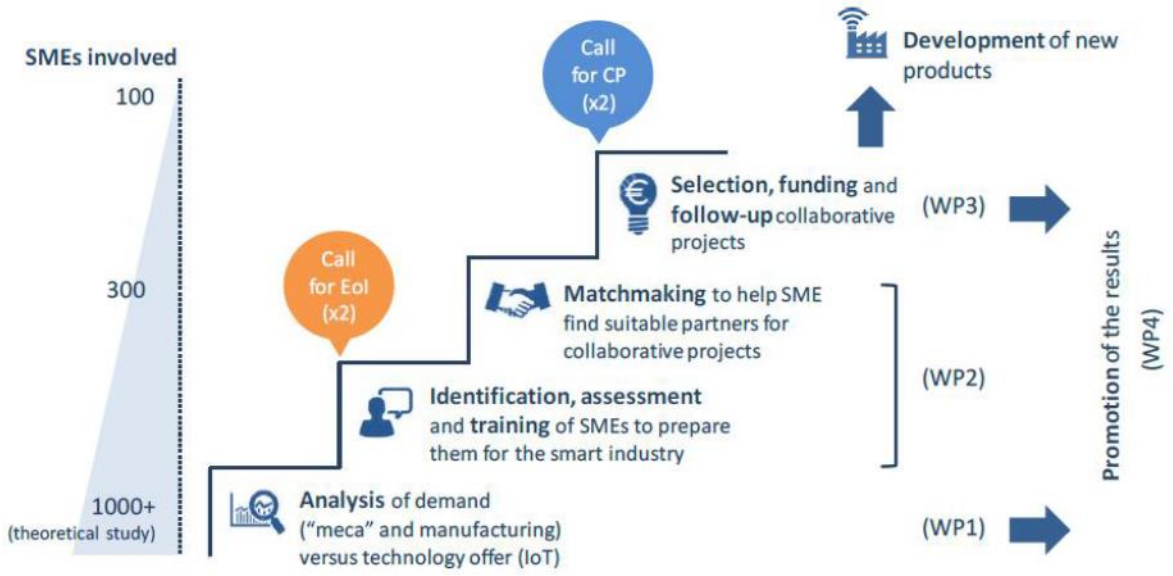
It is organized on 4 steps (Work Package):

• Provide large information support to SMEs throughout Europe having shown their interest in the matter of smart manufacturing.

• Provide them training.

• Provide them matchmaking action (collaborative projects between manufacturers and ICT companies).

• Provide them a support to develop products, processes….



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7.8.2. Interview guide

I. ID's Cluster interviewed

CONTACT		
Last name / First Name		
Function		
Phone number		
Email		
ORGANISATION		
Name		
Address		
Status (public / private)		
Website		
Country		
Number of members	Total members	
	Small and Medium sized Enterprise (> 50 up to 250 employees)	%
	Medium-size enterprises size (< 250 up to 1 000 employees)	%
	Large enterprises (> 1000 employees)	
	Research and Technology Organizations	%
	Universities	%
	Associations and networks	
	Other	%
More active members		
Coverage area of the cluster	☐ Regional ☐ National	☐ European ☐ Worldwide
ACTIVITY		
Technological themes supported (referred to the European Factories of the Future Research Association (EFFRA)'s classification)	☐ D1. Advanced Manufacturing	Innovative processing for both new and current materials or products
	☐ D2. Adaptive and smart manufacturing systems	Innovative manufacturing equipment at component and system level, including mechatronics, control and monitoring systems
	☐ D3. Digital, virtual and resource-efficient factories	Factory design, data collection and management, operation and planning, from real-time to long term optimization approaches

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	☐ D4. Collaborative and mobile enterprises	Networked factories and dynamic supply chains
	☐ D5. Human-centric manufacturing	Enhancing the role of people in factories
	☐ D6. Customer-focused manufacturing	Involving customers in manufacturing value chain, from product-process design to manufacturing associated innovative service
	☐ Other	
Industrial sectors supported	☐ Aerospace	☐ Logistics
	☐ Automotive	☐ Mechanical
	☐ Chemical	☐ Medical & Pharmaceutical
	☐ Construction	☐ Marine
	☐ Electronics	☐ Metal working
	☐ Energies	☐ Nanotechnologies
	☐ Defense	☐ Print
	☐ Food&Beverage	☐ Other

INDUSTRY 4.0			
What is your motivation?	☐ Not concerned	☐ Concerned	☐ Active
What is your position on IoT?	☐ Beginner	☐ Intermediate	☐ Advanced

- What are your members' barriers ? (Lack of awarness, high initial investment, lack of skills, space, company culture…)

II. Cluster Manufacturing State of the art: your assessment

This section's objective is to find out the cluster's global vision on "Industry for the future", then to get more precise topic on IoT.

- **Future of Industry: What is your vision for Europe?**

Advanced manufacturing processes	Collaborative and mobile enterprises
Adaptive and smart manufacturing systems	Human-centered manufacturing
Digital, virtual and resource-efficient factories	Customer-focused manufacturing

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- According to you, which topics are the most important?
  - In which cases?
  - What are the benefits?

- What are the priority topics for IoT?

- **IoT for Industry**

  - What are the priority trends for :
    - European Industry
    - Your members

  - What are the limits of these current solutions
    - Technological
    - Uses
    - Economic
    - Regulation

  - What are the main manufacturing needs of your members?
    The objective of this question is to get specific topics.

Theme	Uses	Target product	Targeted sector
Simulation / Modelling			
Artificial Intelligence			
Communication protocols			
Big Data and analytics			
Sensors			
Cyber security & ethics			
Virtual & augmented reality			
Additive manufacturing			
Robotics and automation			
Cloud based platforms			
Others			

  - What are the future needs and expectations that you have already identified between your members?

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