



Erasmus+

CLUSTER SMART

CLUSTER MANAGEMENT ABILITIES, CAPACITIES, SKILLS AND COMPETENCES TOWARDS A SMART INDUSTRY (Cluster 4.0 and Industry 4.0)

Short version

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Introduction, rationale

The technological, social and business paradigm changes of the fourth industrial revolution (Industry 4.0) directly impact the business environment and the ecosystems where clusters and companies operate. Small and Medium-sized enterprises (SMEs) and start-ups face difficulties to keep up with the pace of technological development and digitalisation processes. Likewise, firms of all sizes face important challenges such as substantial additional costs and risks that digital security entails. A lack of skills and willingness to adjust to the Digital Single Market prevails and the skills required for the adaptation to Industry 4.0 are enormous. There are new emerging ways of work that demand a supply of specific skills and capabilities for Industry 4.0. In addition, companies participating in Industry 4.0 supply chains also face important challenges in terms of costs, risks and reduced flexibility and strategic independence. The implementation of Industry 4.0 at large scale also faces the challenge of standardisation.

Cluster organisations can strengthen their ecosystems to help firms in the process of transitioning to Industry 4.0. However, these disruptive changes also require that clusters adopt new business models to take on the new opportunities of Industry 4.0 and to mitigate the threats under this new industrial revolution. Such a model would enable them to provide their members with value added cluster services to become drivers of innovation, acceleration, and collaboration. In this regard, as part of the process of shaping Industry 4.0, clusters need to be able to foster cross-border and cross-sectoral cooperation together with interregional collaboration and investments towards smart specialisation strategies. Clusters will induce cross-sectoral (e.g. digitalisation in a specific sector) global value chain development and creation to maintain their key role as integrators in national and regional ecosystems, and as drivers of regional development (Cluster 4.0).

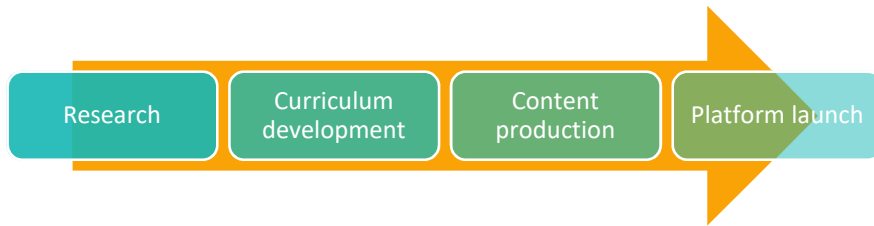
This was the premise that provided the inspiration for the Cluster4Smart project. In this cooperation clusters (SCS, France – lead partner, AMUEBLA, Spain,) ArchEnergy and IKOSZ, Hungary, a university (University of Strasbourg, France), and business stakeholders (European Business and Innovation Center of Burgos, Spain, Gnomon, France) have teamed up to bridge the perceived gap between the current state of play and the future needs with regards to cluster management and staff abilities, skills and competences. The final goal of the project is to create a novel and innovative training course/tool for current and future cluster managers that helps improve their employability and to foster the competitiveness of their associated industry sectors.

This training tool will have a strong capillary effect towards hundreds of both SMEs and large companies of different sectors across Europe since it will provide potential learners and users with relevant cluster management skills knowledge and offer the opportunity to acquire other transversal skills and competences. The capillary effect will be enhanced as the training course will boost the use of online platforms, entrepreneurship, and self-learning, fostering the development of new regional cluster organisations and the creation of new enterprises. The training course will be conceived as an innovative training tool adapted and deployed in an online platform for interactive use that will also contribute to a more strategic and integrated use of ICT and open education resources by education and training.

In this respect, this study is the first intellectual output of Cluster4Smart project. It identifies the knowledge and expertise gaps currently faced by cluster managers in order to define their need for skills and competences for them to face and address the challenges that the transformation to industry 4.0 entails. Cluster organisations need to give support and advice to their members and partners on how to adapt their industry to be more competitive and modern in today's fourth industrial revolution or smart industries.

Project Methodology

The Cluster4Smart project operates with a 4-phase workplan, with a relevant public output document produced at the end of each phase.



1. Project Methodology

The complete version of the current study, available for download at the project's website (www.cluster4smart.eu) and deposited in the public library of the European Cluster Observatory is the final product of the **Research** phase. It includes a review of key analytical studies, reports, and survey results in the area of Industry 4.0 skills and cluster management skills and collates the results with a survey designed and completed within the project, identifying the relevant, specialised, and high-quality skills and competences as perceived by cluster actors themselves.

This study is the basis for the subsequent phases. It defines key learning outcomes for the development of the Cluster4Smart Joint **Curriculum**, which designs the comprehensive set of core/modular training paths to address the specific needs for cluster managers and regional developers.

A series of e-learning modules is the output of the **Content** production phase, with the key areas identified within the Curriculum defining the composition of the expert groups. During the production phase, all materials are to be cross-referenced with the skillsets identified in the current study, streamlining the learning experience.

The final phase involves the technical development, public trial and official launch of the e-learning **platform**, after which the courses will naturally be made freely available for all interested parties.

Research sources

To provide the survey respondents with a comprehensive skillset to rank, the following four sources have been consulted.

- ESCO database
- 'CMQ – Cluster Manager Qualification', a survey conducted within the PRO-INNO EUROPE initiative in April 2009,
- 'The Future of Jobs, Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution' report of the World Economic Forum of January 2016, and
- 'Skills Needs Analysis for Industry 4.0 Based on Roadmaps for Smart Systems' conducted by Institute for Innovation and Technology of Berlin in 2006 and 2009

The abilities, capacities, skills and competences required for the management of a world-class cluster driving towards a smart industry were defined after analysing the results and findings of the above-mentioned surveys, considering the own endorsement survey and considering the current trends defining the European cluster ecosystems.

ESCO (European Skills/Competences, Qualifications and Occupations) is an online database focused on the classification of occupation-related skills and competences. Collating the

activity portfolios, three occupations were found to be overlapping to that of a cluster manager to a significant degree – and together the three mostly cover cluster management as well. These occupations are “Membership Administrator”, “Membership Manager”, and “Special Interest Groups’ Official”. The intersection of the three occupations provide a list of essential and optional skills. Due to its nature the list focuses more on the internal processes of network coordination, and member management, and less on interacting with other aspects of the ecosystem, which are typically unique to one of the three component occupations. Yet, this overview still provides valuable insight to both the complexity of the task of a cluster manager and the priorities of cluster management as a whole.

The **CMQ Survey** was conducted within the CEE-Cluster Network project of the Pro INNO Europe initiative, and with 159 respondents, two third of which were cluster managers and one third cluster coordinating organisations from 17 different European countries, it was the closest a similar effort has ever approached representativity. On a methodological basis it separated the tasks from the skills necessary to carry them out and the possible training interests of the respondents. The survey not only examined the correlation between the two sides, but it also set up a model for developing tools to foster skill improvement, assigning efficient training methods to each skill category. The model identified three such categories, organising them in the coordinate system of skill depth and wideness of discipline: “Management Tools, Policies and Project Management” and “Communication, Leadership and Team Management” are the categories of Generalist/horizontal skills, and can be best developed through training courses and personal coaching respectively. “Knowledge of the Sector” on the other hand comprises a diversity of Specialist/vertical skills, which are expected to be acquired via prior experience or on-the-job exposure/training.

On the level of individual tasks and skills, the four of the five top tasks ranked very important by more than 70% of the respondents focus on trust development and exchange enabling – the fifth being strategy development. This corresponds well with the top skill/training requirements of communication skills, sectoral knowledge and leadership capacities/team management, and to the results of the ESCO analysis too. From a course development perspective, it is important to understand that some skills can be better addressed through measures at both the regional or national level, but there is also scope for educational offerings at international and/or cross-border levels.

Topics for international trainings are:

- EU cluster policies
- EU subsidies and support programmes
- Know-how on international co-operation
- Knowing other cluster organisations abroad
- Innovation policies
- Innovation management tools

In the context of any international training, there were no overwhelming demands for any specific characteristics, although the top three choices (“study visits to other clusters”, “training with colleagues and peers from other countries” and “trainers should be cluster practitioners”) suggest a strong bias toward practical experiences.

The Future of Jobs report focuses on the dynamics of maintaining and adapting skills amid disruptive changes. It focuses on bridging the skill gap not only between current supply and demand, but also between today’s skills base and future skills requirements. The keywords of this survey are therefore “reskilling” and “retraining”. Focusing on a core set of 35 work-relevant skills and abilities the report finds that these practical skills will also be subject to accelerating change and significant disruption in the immediate future. On average, by the year 2020, more

than a third of the desired core skill sets of most occupations will be comprised of skills that are not yet considered crucial to the jobs of today.

| 2020 | 2015 |
|----------------------------------|----------------------------------|
| 1. Complex problem solving | 1. Complex problem solving |
| 2. Critical thinking | 2. Coordinating with others |
| 3. Creativity | 3. People management |
| 4. People management | 4. Critical thinking |
| 5. Coordinating with others | 5. Negotiation |
| 6. Emotional intelligence | 6. Quality control |
| 7. Judgement and decision making | 7. Service orientation |
| 8. Service orientation | 8. Judgement and decision making |
| 9. Negotiation | 9. Active listening |
| 10. Cognitive flexibility | 10. Creativity |

2. Top 10 Skills as regards Industry 4.0 (source: Future of Jobs Report, World Economic Forum)

Overall, social skills—such as persuasion, emotional intelligence and teaching others—will be in higher demand across industries than narrow technical skills, such as programming or equipment operation and control. Content skills, which include ICT literacy and active learning, cognitive abilities such as creativity and mathematical reasoning, and process skills such as active listening and critical thinking are expected to be a growing part of the core skills requirements for many industries. All in all, the respondents of the survey anticipate that a wide range of occupations will require a higher degree of cognitive abilities, such as creativity, logical reasoning and problem sensitivity, as part of their core skill set.

Beyond the analysis of the situation the report indicates that business leaders are aware of the challenges but have been slow to act decisively. Companies and clusters can play a crucial role in acquiring the work-related practical skills or competences that employees or prospective new hires can use to perform various job tasks successfully. They can also promote reskilling and retraining as regards cross-functional skills, like complex problem-solving skills, social skills, interpersonal skills etc.

Besides, they can proactively collaborate with education providers as regards the acquisition of advanced basic skills, like content skills (i.e. ICT literacy and active learning) and process skills (i.e. active listening and critical thinking).

Skills Needs Analysis for Industry 4.0 is much more specific in its focus than the previous papers. It identifies its targets in a German context and emphasises strategies towards a competitive digital skillset. The method, Visual Road-mapping uses a foresight-based tool, which places skills in a coordinate system of time versus process, the latter of which consists of 4 consecutive dimensions:

- Socio-economic factors (legal, economic, social conditions),
- Enabling Technologies (scientific and technical progress),
- Development of the topic itself (central aspects and milestones),
- Effects and implications (economic and social effects as well as new products and services)

The roadmaps drawn up for Pervasive Computing and then Production Technologies allow a juxtaposition of the respective skillsets and reinforce the findings of the previous approaches. Key among these are the convergence between mechanical, electronic, software-based components or systems, and the growing role of bionics in robotization. It is then concluded that new vocations and roles need to be developed, like Industrial ICT Specialist, with an academic background in Industrial Cognitive Sciences.

Findings summarised

Considering the results of the above efforts and following the identification of the set of skills required for Industry 4.0, an **endorsement survey** has been conducted with 150 participants across different European clusters. The methodology used a cross between the CMQ survey and the Future of Jobs research, utilising O*NET Content Model's 35 core skills as a structured basis from the latter and the three-way (knowledge – (management) competences/skills – communication) skill grouping from the former.

Seven large activity areas have been identified, which include the core set, the ubiquitous language capacities plus entrepreneurship, digitalisation, enhancement of leadership capacities, or innovation and internationalisation management skills. Within each large group, the respondents ranked their tasks/objectives, and the corresponding knowledge fields and skills. This multi-level structure allowed for a detailed insight into the overlaps and relative priorities among the different task groups. As a result, the following top 20 ability, capacity, skills, and competence needs have been identified for a world-class cluster driving towards a smart economy, and will be used to develop the Cluster 4 Smart training course:

| |
|---|
| Work-related core skills and abilities |
| <ul style="list-style-type: none"> • Creativity • Complex problem-solving skills • Judgement and decision-making skills • People management: Motivation • Critical thinking |
| Leadership |
| <ul style="list-style-type: none"> • Knowledge on Cluster 4.0 and Industry 4.0 • Skills in strategy development and implementation along the related values chains • Fostering teamwork within the ecosystem and enabling others for collaboration |
| Internationalisation |
| <ul style="list-style-type: none"> • Knowledge on global megatrends, internationalisation • Knowledge on financing opportunities • Specific skills on joint collaboration with worldwide industry and research leaders |
| Entrepreneurship and Innovation |
| <ul style="list-style-type: none"> • Knowledge on innovation policies and innovation management tools, • Knowledge on funding opportunities and private VC know-how, and • Skills to be able to identify opportunities for business development projects along the value chain gaps within and across clusters and targeting industrial modernisation, cross-sectoral, and cross-border value chain development or development of emerging industries. |
| Management |
| <ul style="list-style-type: none"> • Knowledge on value chain management and cluster development and fostering value chain management skills and value chain analysis and the definition of the cluster role through for instance working groups and/or the involvement of cluster members, • Skills on steering team meetings, mediation and related soft skills. |
| Digital skills |
| <ul style="list-style-type: none"> • Skills in new technologies (i.e. IoT, big data, Fin Tech), • Developer and manager skills to spot the wider business opportunity, • Skills to tailor AI applications to enhance companies and optimise business processes. |
| Language capacities |
| <ul style="list-style-type: none"> • Proficient knowledge of English for daily work, meetings and related interactions |

3. Key Cluster Management Skills List