



D.T1.1.3

Development of a Co-operative Manufacturing 4.0
support strategy

Version 1

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Abstract

This deliverable presents the transnational support strategy and implementation actions for innovation projects in the fields of advanced manufacturing. The focus is on improving targeted linkages of existing initiatives and schemes in Central Europe with a common vision. A developed roadmap is also included in order to give guidelines that support the connection to other initiatives outside of the region.

The motivation of this deliverable is to support project partners in AMICE in the process of sharing their knowledge and expertise on SME support to enable specific opportunities and applications. The strategy aims to assess the needs of SMEs and then develop a support scheme that fulfil those needs, through defined training and educational programmes or individual tailored mentoring. To aid this process, relevant policies and innovation instruments are also considered since they could contribute SMEs in their journey to adoption. Therefore, the development of a cooperative manufacturing innovation 4.0 support strategy and action plan is necessary.

This Deliverable processes information of the Deliverables D.T1.1.1 State of Play, D.T1.1.2 Foresight Study and its attachment Foresight Scenarios.



Abbreviations

AM	Additive Manufacturing
BSO	Business Supporting Organisations
CE	Central Europe
CIRC	Circular Economy
IPR	Intellectual Property Rights
KS	Knowledge share-point
LE	Large Enterprise
RTO	Research and Technology Organisations
SME	Small and Medium sized Enterprises
SWOT	Strength Weakness Opportunity Threat analysis
3DP	3D printing

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1. Introduction

SMEs act as facilitators for supplying parts and components to large enterprises (LE). They play a key role since they are able to boost market prosperity through high rates of employment, flexible organization structure, short decision-making processes, more efficient responses to clients (compared to LE) and outstanding innovation capabilities. This is especially relevant to manufacturing, in which the whole value chain relies in ecosystem of SMEs along and across sectors. There is no doubt that advanced manufacturing technologies will have a significant impact on manufacturing within the next years.

SMEs should have a prepared plan for adopting new manufacturing technologies in order to improve the effectiveness and productivity as well as strengthen their roles in the manufacturing industry and product development processes. This plan is made tangible in a strategy and it takes into account the barriers and limitations that hinder the use and adoption of new technologies within SMEs, as it was presented in the last deliverable (D.T1.1.2) for the regions that are part of the AMiCE consortium.

The cornerstone for the development of the AMiCE's strategy is the focus on **business-related and technological barriers and solutions** to be analysed for our Central European scope.

The present strategy document is intended to act as a reference document for currently involved and future partners and actors involved in the adoption, including large companies, research institutions & universities, and end-users as well.

Leveraging the regional and interregional analysis performed in previous deliverables and resulting specific scenarios, we will give a list of focused action recommendations for Central Europe. The main ultimate objective is to provide a toolbox for SMEs to remain competitive in the upcoming years.

The strategy is structured in three pillars: 1) Quality standards and processes; 2) Cooperation with the main sectors, involve them and inform; 3) Alignment of activities with other European networks.

2. Initial position

Past deliverables showed that advanced manufacturing technologies have a bright future due to numerous advantages compared to traditional technologies. Market projections agree that they will play a significant role in economic development, especially for industrial manufacturing. Although currently novel technologies face different challenges those should be taken as opportunities towards innovation.

In order to remain competitive, Europe has to keep up in advancing towards an effective development and implementation of these technologies in key sectors. In this aspect, the role of SMEs is considered essential, since they are considered the gear assembly of Europe. They represent a large share in the economic activity in Central Europe, which is the focus region of this deliverable. The regions of Central Europe are facing the adoption of novel manufacturing technologies very unevenly. Central Europe could play a key role in contributing to position Europe as competitive hub if the challenges and opportunities offered by these technologies are tackled in a regional framework, in order to make it feasible.

The deliverable presents the strategy tailored for Central Europe in order to adopt successfully novel technologies.



3. Objectives/ Vision

The Alliance for advanced manufacturing in Central Europe actively supports the adoption process of AM and CIRC technologies in manufacturing processes in Central Europe by linking more effectively science with SME support. It furthermore has the vision to collaborate and execute all activities that have and will be defined within the framework of the AMiCE project beyond the project's scope and duration.

AMiCE aims to form the alliance as a platform for innovation actors in the manufacturing sector by connecting research and business-supporting organisations in CE with the targeted SMEs. The following objectives are part of this scheme:

1. **Closing the knowledge gap:** To a large extent SMEs in Central Europe face difficulties to be aware and stay informed about novel technologies and new developments in the industry. This is related to the lack of resources both financially (attending conferences) and in terms of availability of personnel (staff is indispensable for core business activities). Therefore, the risk to lag behind developments is higher for SMEs than for LEs due to this disparity/lack of knowledge about novel technologies and their ecosystem.
2. **Promoting the uptake of new technologies:** SMEs lack often the motivation to consider or try-out new technologies due to high financial risks and in investments of staff and time. The Alliance believes that through the demonstration of best-practices and access to demonstrators this mindset can be changed. The objective of the Alliance therefore is to connect SMEs with those demonstrators and innovation actors.
3. **Integration of novel technologies in new value chains:** AMiCE will connect innovation actors, material and technology providers with SMEs in sectors that are not yet reached by advanced technologies. This will benefit both sides and creates the need for further innovations and advances of novel manufacturing technologies that fulfil the requirements of these new-to-the-technology sectors.
4. **Support companies in becoming factories of the future:** Many SMEs in Central Europe are stuck in their hard-wired, hierarchical structures and are struggling to create flatter approaches to be able to think in terms of the whole business environment (connectivity etc.). AMiCE wants to support SMEs in how they should react to changing circumstances at technical, organisational and business model level.

To achieve this vision the Alliance will follow the strategy defined in this deliverable which will serve the fulfilment of the AMiCE project goals and the ambition to build sustainable partnerships beyond the scope of AM and CIRC.



4. Strategy for Central Europe

4.1. Methodology

A single strategy for the Alliance is developed, which is based on the interaction between and within regions. The main objective is to link the actors in Central Europe to support SMEs in the development of innovation projects and the uptake of new technologies.

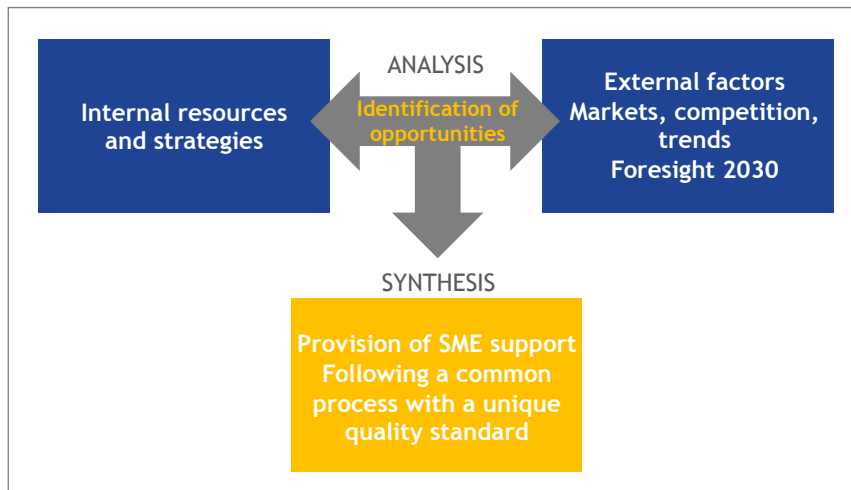


Figure 1 Key elements of the strategy.

The key elements of the strategy are the development of the innovation ecosystem and a **standard process for the SME-specific support** developed specifically for this purpose, and for the AMiCE partners and Central Europe as a whole. That process considers the findings of the analysis of the external opportunities of the SMEs as well as of the external factors, which build the innovation ecosystem.

Therefore, the strategic activity fields of AMiCE refer to the development of the innovation ecosystem as well as to the support of innovation activities o SMEs in the fields of advanced manufacturing.

ALLIANCE

	INITIATE & ANALYSE	CREATE A NETWORK	GET ACTIVE	IMPLEMENT
EXTERNAL (Alliance)	SWOT analysis, scenario development	Form and expand the alliance	Action plan for the alliance	Implementation, define KPIs for monitoring
INTERNAL (SME-specific)	Diagnostic process	Create specific support network	Support plan	Implementation strategy, monitoring

Figure 2 Internal and external aspects of the strategy of AMiCE.



The strategy process comprises **different external and internal steps that together act as mechanisms** to be more effective supporters to SMEs, **leveraging the capacities of all regional actors**. These steps will allow linking the actors and expertise of partners to the network of pilot lines and demonstrators (referred as infrastructures). Developed support tools for the actors will facilitate the support from expression of interest to final adoption and monitoring.

The implementation of the strategy should be linked specifically to the focus topic (type of technology etc.) and therefore derives from **specific foresight scenarios and other analysis** developed per region and for Central Europe as a whole. The scenario planning approach is standardised and explained in this deliverable.

Previous deliverables showed that the uptake of novel technologies is being hampered by three bottlenecks related to innovation management: knowledge, investment, capability and resources for international projects. Furthermore, the weaknesses of RTOs to identify future market opportunities and to follow the innovation pull in a systematic way is a challenge that the Alliance wants to tackle.

4.2. Strategy for the Alliance

In the following chapters the external and internal (SME-specific steps) and their methodology will be explained. These steps are not supposed to follow a step by step approach but overlap and even influence the success or impact of other steps. E.g. the specific SME support methodology is not possible without the external framework that will be developed at the same time.

4.2.1. Standard process for SME support

The standard process is a key element of the the AMiCE’s strategy for SMEs in CE which is aimed for to be an efficient and effective support in value chains, which are being organised cross-border or even globally. In order to guarantee the best fit of the provided services the partners follow this process with commonly agreed quality criteria and standards. This way the supported companies and their cooperation partners can be set in the context of the value chain and of their business development opportunities at European markets.. The Alliance will follow this process based on different steps that will ease the uptake of any novel technology by SMEs, as it is described in Table 1. In this process the Alliance tackles the entrepreneurial challenges as well as the related factors of the regional and European innovation ecosystem that currently prevent or accelerate the uptake.

Table 1 The mechanisms of the strategy (Source: Liu and Evans, 2016¹).

Step of adoption	Description
1 Establish the initiative: SWOT analysis and/ or scenario development	At first, a SWOT analysis and the development of foresight scenarios allows to identify the current situation of the market, the trends and the effects of the technology on the business as well as reliable projections on future developments. These tools are standardised which allows the Alliance to carry out this step while fulfilling the high quality standards. (compare ANNEX A)
2 Diagnostic process	SMEs in particular need to know what specific hardware or software is required to adapt new technologies in their business activity, and to what extent it is necessary. Then, the financial

¹ Liu, Wen., Evans, Steven. How companies respond to the emergence of 3D printing technology? ECEEE INDUSTRIAL SUMMER STUDY PROCEEDINGS.



	resources that should be invested based on the company size and capability are analysed. The diagnostic process is a standardised tool that will support BSOs and RTOs to support SMEs in this step and is displayed in ANNEX B.
3 Create the network: connecting the actors	It is beneficial for SMEs to obtain key partnerships with RTOs, large companies and suppliers in order to attract competitive resources and capabilities. Innovation will come hand-to-hand with this type of collaborations since SMEs don't have all resources in-house. Moreover, SMEs can overcome financial scarcity by interacting with regional authorities and through funding programmes. The creation of a network specifically related to the needs of the SMEs will be a task carried out by related innovation actors of the Alliance. Since this step is considering specific needs and requirements it is hard to standardize.
4 Change the organization: support plan	Considering the barriers faced, SMEs should then figure out which key skills and knowledge capabilities should be obtained. Based on their internal and external reality, SMEs should be supported to identify the measures that are needed to effectively adopt and use new technologies. In addition, the companies need to know how to engage key actors in order to create value (e.g. suppliers, end-users). Guidelines that will support this step are displayed in ANNEX C.
5 Implementation at regional level	This is the last part of the strategy for the SME and it should be seen as a cross-cutting mechanism interacting with the rest of steps. It refers to how the SMEs in the regional context should implement their strategy. Here as well it is true that the implementation and monitoring of the adoption process requires specifically tailored plans and can therefore not be standardised.

4.2.2. Create the network: connecting the actors

To create a network - locally and across Central Europe is seen as the precondition for all other steps. It is beneficial for SMEs to obtain key partnerships with large companies and suppliers to solicit competitive resources and capabilities. In this aspect, Business Supporting Organizations (BSO) are key entities for facilitating the interaction of the different actors and the starting of collaboration and networks. But also, the research organisations (RTO) cooperate with an established network.

BSOs usually reach SMEs by means of different kind of events and personal contact. In the case of AMiCE, BSOs and RTOs in each of the regional tandem are in contact with a different number of SMEs, as it is depicted in Figure 3.

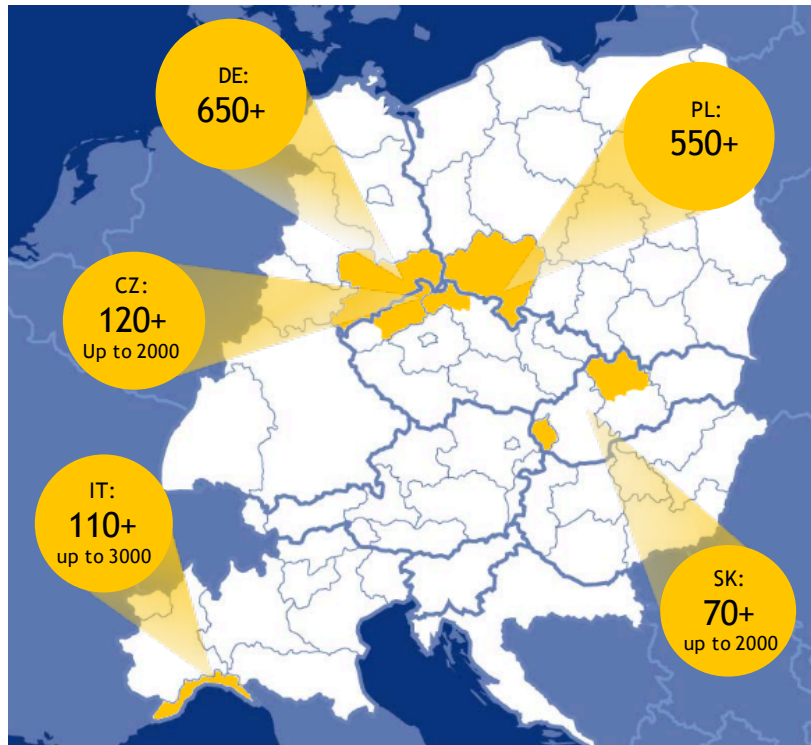


Figure 3 Number of SMEs at reach (direct or extended) for each AMiCE region.

The number of SMEs currently in reach of BSOs and RTOs through ongoing projects or other cooperation is summing up to 1,500 across Central Europe. It is expected that more than 8,000 SMEs could be reached by the AMiCE consortium by means of the strategy and due to the partner's extensive network and dissemination activities.

The impact of the network of actors in CE relies to a large extent on the competences at hand in each of the regions under consideration, represented by each tandem partner in the consortium. The further opening to other partners will extend the reach of the Alliance significantly and is therefore not only favoured but will be actively promoted.

The Alliance considers the Knowledge share-point (see Deliverable D.T1.2.1) to be an important enabler of this step.

4.2.3. Action plan for the Alliance

The development of an action plan that highlights all actions that will be undertaken to connect the actors in Central Europe and beyond that area is critical for the success of the AMiCE project and the Alliance. Those actions include several activities towards achieving the objectives e.g. the organisation of events, dissemination actions, trainings, development of monitoring systems, marketing measures, analysis of specific sectors, etc. The action plan is tailored according to the information gathered from each partner region as well as the tasks that are related to the implementation of the standard process for SME support. Furthermore, foresight scenarios developed by the regions for the next 10 years and the resulting scenarios for Central Europe were leveraged for the action plan.

This action plan therefore entails a perception of the future linked to conditions in the present. By understanding the present reality in each of the regions (central Europe) and the factors that have shaped the current situation, an understanding of what could happen in the next ten years and how to counterbalance or support trends is feasible. This allows regions to be prepared for the future and adopt the required measures to do so (these measures are integrated in what we call the action plan).



The infographic shown in Figure 4 includes: actions aiming at the development of the ecosystem and of the AMiCE-support quality as well as the joint actions, aiming at the support of the development of the innovation capacities of SMEs. The infographic is set up according to the following scheme:

- i) Objectives outlining the key elements of the strategy.
- ii) Sub-Objectives stemming from critical uncertainties in this region.
- iii) Activities to counterbalance the critical uncertainties in the region to address challenges and to support the successful adoption
- iv) Tasks needed (including services).

The action plan is preconditional for the successful implementation of the standard process for SME support within project duration and in a long-term vision. It tackles all tasks that will be undertaken by the Alliance or that will be outsourced to lead SMEs in Central Europe to the adoption of new advanced manufacturing technologies with the focus on the challenges faced in Central Europe and the driving forces that are still uncertain. However, not all tasks will be carried out in the specific support scheme of each SME but can be more of general character to facilitate tailored services.

The linkage with other regions outside the Central European region (e.g. Catalonia) and other initiatives, projects or networks will be part of the action plan.

- INNO-INFRASHARE: The goal of this project, part of Interreg Europe, is to improve the accessibility and the exploitation of local Research and Innovation infrastructure (RII) assets by SMEs. This would be especially relevant to the diagnostic process that is part of the strategy as well as for complementing the expertise and capabilities of regions.
- ELCA network: A pan-European cluster network that gathers the most important actors (cluster associations) in lightweight materials and related technologies. The ultimate objective is to strengthen the position of lightweight in Europe, through building relationships between academia and industry, exchange of equipment & knowledge, and find solutions to challenges.
- The Vanguard initiative: Which aims to exchange information, find business partners, build investments, and connect interregional pilot projects in advanced manufacturing. These are aligned to many of the objectives of the AMICE consortium, especially those related to connect the main actors among regions.



Action Plan	
1 DEVELOPMENT OF THE ECOSYSTEM	
Sub-Objective 1.1: Raise awareness	#SMEs reached
<p>Activity 1.1.1: Connecting actors</p> <ul style="list-style-type: none"> Task 1.1.1.1: Matchmaking tool on the knowledge share-point Task 1.1.1.2: Organise events (e.g. matchmaking) Task 1.1.1.3: Involve regional and local authorities in (European) projects Task 1.1.1.4: Engage with academic institutions (EU projects, events, trainings, roadmaps) <p>Activity 1.1.2: Information and education</p> <ul style="list-style-type: none"> Task 1.1.2.1: Dissemination activities (e.g. publications, social media etc.) Task 1.1.2.2: Database per region including scenarios, roadmaps, SWOT analyses (BSO) Task 1.1.2.3: Develop training tools (webinars, workshops) Task 1.1.2.4: Access to demonstrators/ showcasing of Use-Cases 	
Sub-Objective 1.2: Promote the creation of synergies	#collaborative projects
<p>Activity 1.2.1: Connecting actors</p> <ul style="list-style-type: none"> Task 1.2.1.1: Connect SMEs and the AMiCE consortium to other initiatives and clusters Task 1.2.1.2: Initiate an expert group on advanced manufacturing (Enterprise Europe Network) Task 1.2.1.3: Open up the alliance to new actors <p>Activity 1.2.2: Collaborative (EU) projects</p> <ul style="list-style-type: none"> Task 1.2.2.1: Create consortia (networks) and development of proposals (external service) <p>Activity 1.2.3: Overcome language barrier</p> <ul style="list-style-type: none"> Task 1.2.3.1: Facilitate the dialogue between actors regardless of language Task 1.2.3.2: Grant access to information in specific languages 	
2 SUPPORT OF DEVELOPMENT OF SME INNOVATION CAPACITIES	
Subobjective 2.1 Support access to funding/ legal compliance	#projects funded
<p>Activity 2.1.1: Support to funding</p> <ul style="list-style-type: none"> Task 2.1.1.1: Identify funding opportunities (diagnostic process, BSO) Task 2.1.1.2: Support the application process to public funding (BSO, external service) <p>Activity 2.1.2: Legal support</p> <ul style="list-style-type: none"> Task 2.1.2.1: Support in legislation and tax interpretation (BSO) Task 2.1.2.2: Consult on IPR (BSO) 	
Subobjective 2.2 Identify new opportunities in the market	#revenue
<p>Activity 4.1: Business support</p> <ul style="list-style-type: none"> Task 4.1.1: Business modelling (part of diagnostic process, BSO) Task 4.1.2: Create foresight scenarios based on the developed methodology Task 4.1.3: Develop market studies or roadmaps per sector (external service) Task 4.1.4: Identify tax incentives (BSO) <p>Activity 4.2: Technical support</p> <ul style="list-style-type: none"> Task 4.2.1: Feasibility studies/ benchmarking (diagnostic process, external service) Task 4.2.2: Develop guidelines for the implementation per sector/ topic (external service) 	

Figure 4 Action plan for the Alliance of advanced manufacturing.



4.2.4. Implementation

The implementation of the activities explained in the previous chapter will be agreed on by the members of the Alliance and is displayed in Figure 5.

Implementation	
1 DEVELOPMENT OF THE ECOSYSTEM	
Sub-Objective 1.1: Raise awareness	#SMEs reached
<p>The Knowledge Share-point: relates to Activity 1.1.1 and 1.1.2 The implementation of the knowledge share-point (KS) is made online. Prior to the online publication (1 month, 15 days) the KS is announced using social media. A minimum number of articles are set to be published monthly. The authors are relevant speakers of events, members of the Alliance or a cooperation between several stakeholders. A screening of the most relevant events is made 6 months prior to the KS publication and will be updated monthly. A guideline document is made available to the users (the 3 types of users we are targeting, SME, RTOs and public administration) in which some basic steps for navigating through the KS are given. This consists of a 2 to 3 page document in the form of an infographic. The effectivity of the KS is measured by monitoring the number of accesses in the platform: first daily, then weekly or monthly.</p>	
<p>Events (matchmaking): relates to Activity 1.1.1 A minimum number of events per region and for entire CE are specified. The objective of these events is to raise awareness among SMEs. For this purpose, several documents are prepared (training tools) in the form of talks, reports (webinars, workshops) and participation of relevant oral speakers is planned.</p>	
<p>Involvement of regional and local authorities: relates to Activity 1.1.1 A screening is made for identifying the authorities that will participate. The engagement is made through the regional BSO and made tangible through LOIs. A list is then made of all entities willing to participate in related projects.</p>	
<p>Dissemination: relates to Activity 1.1.2 Social media is seen as an important tool to reach SMEs and to disseminate about events, trainings and recent developments in the landscape of advanced manufacturing. The Alliance foresees as minimum 3 social media channels e.g. LinkedIn, Facebook, ResearchGate. The campaigns are organized through external expertise (ideally) and involving the local/regional authorities (sponsor) and will serve to make public selected topics (this is also connected to the task of KS and training tools, events as well). The role of cities is key.</p>	
<p>Training tools: relates to Activity 1.1.2 Two webinars are prepared monthly by the AMiCE consortium and one workshop every two months will be carried out after the action plan is launched. The themes are agreed on and prepared jointly by the consortium. The drivers and barriers identified in the foresight study are used as a guideline since they show the main interests of SMEs.</p>	
<p>Access to demonstrators: relates to Activity 1.1.2 A procedure to access the demonstrators is made by the consortium and later made available through the KS.</p>	
Sub-Objective 1.2: Promote the creation of synergies	#collaborative projects
<p>Open up the Alliance: relates to Activity 1.2.1 The AMiCE consortium will not only actively promote and disseminate their work towards SMEs but will also contact innovation actors in CE to expand the network to guarantee best possible support to SMEs across different regions and sectors. The alignment of AMiCE with other initiatives as previously explained, would be made tangible by organising common events and engaging in joint projects.</p>	
<p>Engagement with academic institutions: relates to Activity 1.2.2 A procedure of engagements is made: first a screening of the EU projects, events, training tools and roadmaps that exists. Special attention should be made at regional level; then the engagement is made through direct contact, oral speakers and participation in training tools, dissemination and campaigns</p>	
<p>The Knowledge Share-point: relates to Activity 1.2.3 The Guidelines and the platform itself will be available in the languages used in the regions covered by the Alliance as well as in English these guideline documents will be sent to the targeted users through the BSO, the dissemination channels mentioned before, to users included in a specific mailing list (which should be created at early stages of dissemination, 6 months prior publication). This document will be constantly revised related to feedback received.</p>	
2 SUPPORT OF DEVELOPMENT OF SME INNOVATION CAPACITIES	
<p>The implementation of the activities under Objective 2 relate to case-specific tasks that are dependent on the specific organisation (SME) and the specific technological field (novel manufacturing technology). The standard process and the standardised support tools explained previously and in the ANNEXES are part of the implementation.</p>	

Figure 5 Implementation of the Action Plan



5. Validation of the process & Evaluation criteria

In the action plan for the Alliance indicators are presented below each objective. These target KPIs are included in order to ease monitoring over time and evaluate the grade of success of the action plan. These KPIs were defined as:

- i) Number of SMEs reached through dissemination activities.
- ii) Number of projects (collaborative or single) that received funding due to the support of the Alliance.
- iii) Number of collaborative projects that very developed and accepted stemming from the activities of the Alliance that linked these actors in these partnerships.
- iv) Revenue that the SMEs generate additionally after adopting.

In **Figure 6** the expected impact of the activities carried out by the Alliance and associated partners and networks over the time (10 years) is indicated. The figure furthermore highlights several milestones with substantial impact on the development of these target indicators. The milestones will allow the AMICE consortium to validate the process proposed for the strategy. This should ensure the high quality of the tools and people implementing the strategy.

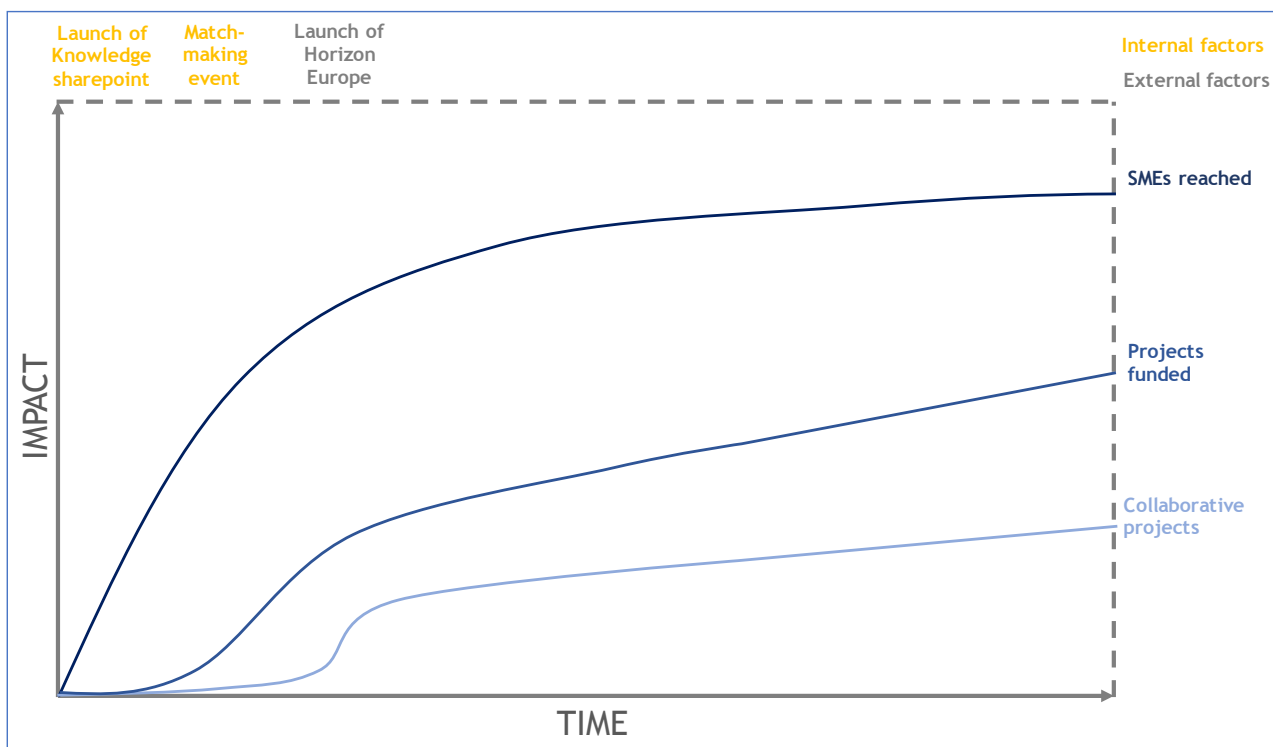


Figure 6 Impact over time presented and measured with defined KPIs.

It is foreseen that the reaching out towards SMEs will start with the launch of the knowledge share-point. A continuous growth in the number of SMEs reached although flattening (due to higher awareness related to) over the time is expected.

Especially match-making events are expected to have an influence on the development of proposals for collaborative projects. Additionally, the knowledge share point is expected to support the search of suitable partners for collaborations. The first results related to this indicator will not be expected right away since collaborative projects are time- and resource-intensive in the application-process. Especially the launch of *Horizon Europe* the succeeding model to the *Horizon 2020* Framework will be expected as a big push.



Due to the link between business supporting organisations and SMEs the number of SMEs that will apply for funding and receive it due to the support of the Alliance will increase significantly. By gaining more experience over the years in this field it is expected that the success rate of the BSOs will also increase.

According to Forbes Magazine 93% of companies that used 3D printing in 2018 were gaining competitive advantages such as reduced time-to-market and flexing for shorter production runs for customers². These competitive advantages will have a positive impact on the revenue. However, the impact is hard to foresee since it is very reliant on the specific sector, the manufacturing activity and the organization itself.

6. Conclusions

This document indicated the main ideas behind the Alliance and how the AMiCE consortium sees the relevance of its aspiration and activities for the support of SMEs in CE. The internal and external aspects of that should be covered by the strategy of the Alliance have been pointed out and standardised support tools have been defined and explained.

It has been highlighted that the key to the successful implementation of the strategy evolves around the connecting of relevant actors in CE, mainly represented by target users. All activities and services that are required and will be offered to promote the adoption of novel manufacturing technologies is dependent on suitable and extensive networks. In these regards, the support capacities of BSOs is considered essential.

This strategy outlines several aspects that are of importance for the following deliverables especially connected to the knowledge share-point. The connections drawn in this Deliverable will therefore be implemented in the following deliverable in order to serve as the basis for connecting the main actors following the intervention logic planned within the project.

Moreover, this document is aimed for serving as a reference document beyond the project's completion. The AMiCE alliance should be built upon the work carried out in the project and serve as a reference for the future work, in which the implementation of new technologies by SMEs will be aided. High quality standards are given in order to offer the best possible support to SMEs in CE.

The perspective of the AMiCE consortium to open-up the Alliance in the future for new members and to include new regions will increase the effectiveness and the reach of the Alliance. It has the potential to create a Pan-European Network including business supporting and research organisation equally as well as any other innovation actor related to novel advanced manufacturing technologies.

A vision beyond the goals of the AMiCE project would be to integrate this Alliance into and to align the activities with bigger initiatives in Europe.

Many partners of the Alliance are currently already part of the Enterprise Europe Network which results in the perspective to create a cross-sector group within this well-established network.

² <https://www.forbes.com/sites/louiscolombus/2018/05/30/the-state-of-3d-printing-2018/#38ed7a27b0a8>



Annex A Establish the initiative

SWOT analysis for Central Europe

This study is an easy but effective tool to identify strengths and weaknesses, as well as the opportunities and threats that are faced by SMEs in a certain regional context related to a novel manufacturing technology.

The current situation in Central Europe is presented in the form of a SWOT analysis (Table 2). Here the main economic factors and the innovation framework in Central Europe is considered. The information was obtained from the last deliverable (D.T1.1.2) and from the literature and can be seen as a starting point for this first step of the standard process.

The specific field of technology in the Central European context has to be included in the SWOT analysis for the personalisation of this step.

Table 2. SWOT analysis for Central Europe (Source: D.T1.1.2; European Commission, 2013).

Field	Strengths	Weaknesses
General	<ul style="list-style-type: none"> ■ There is a large mass of SMEs, with a strong manufacturing tradition, especially in automotive and mechanical engineering sectors. ■ An overall consensus on the regional priorities exists, with levels of innovation that ranges between moderate and strong. ■ Long tradition of interregional, transnational and cross-border cooperation on institutional, political and administrative level and within projects. 	<ul style="list-style-type: none"> ■ Compared to Western Europe, there is a relatively low expenditure on R&D and insufficient technology transfer, which affects especially SMEs. ■ Sectorial and spatial inequalities of ICT infrastructure. ■ Strong economic disparities between regions (particularly between old and new Member States) and between peripheral and central areas. ■ In some cases, the implementation of small specialisation is limited to a national level, in which poor progress has been observed.
Field	Opportunities	Threats
General	<ul style="list-style-type: none"> ■ The region has a large mass of potential consumers: 146 million inhabitants. ■ There is a strong tradition of exports/imports among regions, which has resulted in a very well-established commercial network. ■ Promotion of innovation and an attractive investment climate. ■ Enhancement of competitiveness and deregulation for triggering SME development. ■ Policy support for cooperative economic activities, development of clusters and network. 	<ul style="list-style-type: none"> ■ Strong dependence on the German manufacturing sector. ■ Permanent emigration of research staff to Western Europe.



Scenario development

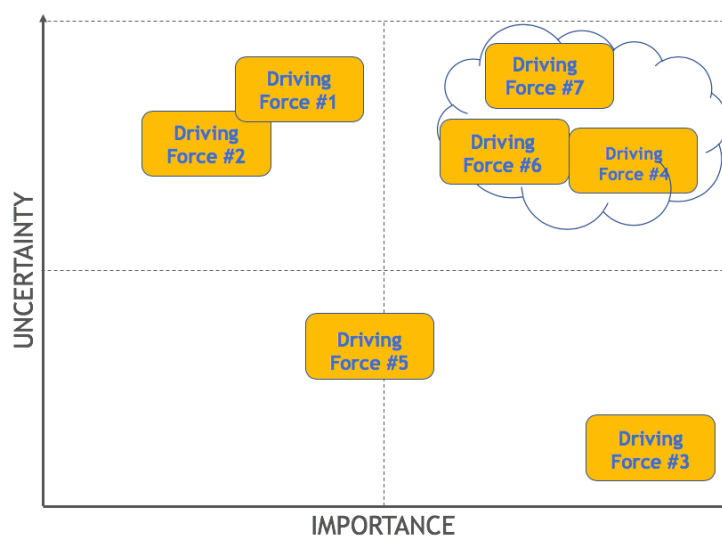
For the development of the foresight scenarios for each region and the scenarios for whole Central Europe, the Alliance follows the method used by Shell Company³. It consists of interactive sessions between several interest groups mainly research and business-supporting organisations but an involvement of SMEs, sectoral agencies, clusters etc. is favourable.

The assessment of the regional factors e.g. external environment, trends and behaviour of the different actors involved within and across regions is a precondition for the analysis of critical uncertainties as it has been carried out in our previous deliverable for each partner in AMiCE.

A successful scenario development should follow the steps as followed:

Table 3 Steps for the foresight scenario development.

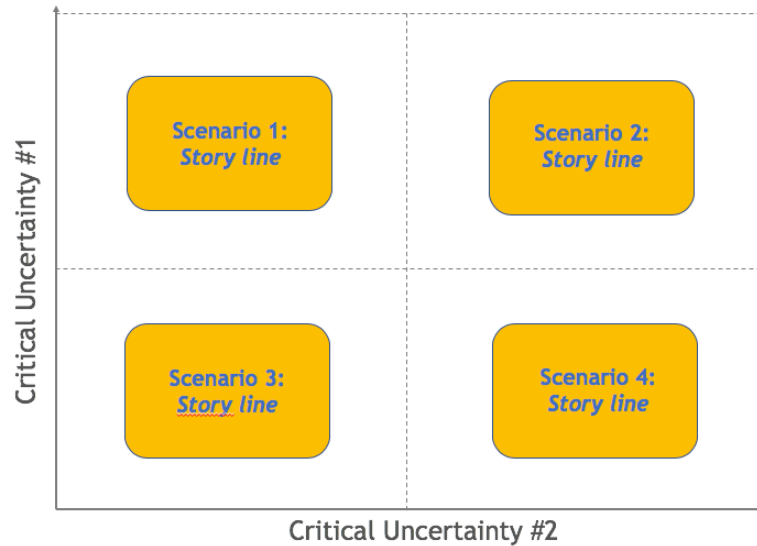
Step in foresight scenario development	Description
1 Formulation of the topic	A title that covers the essence of the challenge is defined: What are the major driving forces for the adoption of CIRC and AM by SMEs in Central Europe in 10 years?
2 Driving forces identification	Each tandem identifies the driving forces both currently already seen and those necessary for AM and CIRC for their region(s).
3 Clustering of change drivers	The clustering of the driving forces leads to a set of manageable key variables that will be the basis for the following exercises.
4 Ranking of variables in terms of importance and relative uncertainty or predictability	The identification of the most critical uncertainties is the goal of this exercise (compare annex). Those are seen as the forces with the greatest impact on the topic and will be the primary focus of the scenario creation process.



³ Blyth, M. Learning from the future through scenario planning. [internet] Scenario Planning. 5 (3), 1-12, 2005



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- 5** Development of scenarios With a prioritisation technique four scenarios are created by using the two most critical uncertainties as the axis. The storyline of each scenario is created by including the other variables identified in step 3.



Titles for the four scenarios are created which show the essence of the scenario.

-
- 6** Testing of scenarios The testing relates to the inclusion of KPIs (in this case adoption by SMEs). Here the scenarios are also tested by looking at the current situation.
-



Annex B Diagnostic process

A standardised SME diagnostic process allows the consortium to follow uniform quality standards within the AMiCE project. This diagnostic process consists of an analysis of the SME’s current manufacturing activities in order to understand challenges and opportunities for each organisation and to test and validate those opportunities before enabling investment activities in this area.

As shown in Figure 7 the process foresees six diagnostic steps with different objectives.

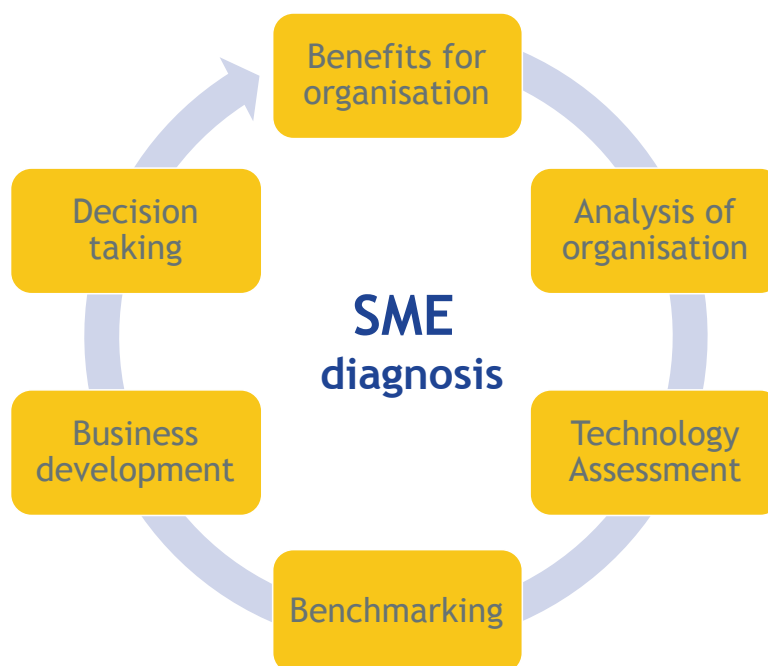


Figure 7 The six steps of the diagnostic process for SME analysis (Source: AMiCE`s workshop in Genoa (IT) in September 2018).

The process for the diagnosis of SMEs will be standardised and fixed within the order of the steps. This process could be applied for the uptake of any new technology. Yet the process differs in the specific actions and questions that need to be addressed depending on the primary topic.

In the following table the diagnostic process is explained in specific.

Table 4 The steps of the diagnostic process.

Step	Actions and Questions
Benefits	<ul style="list-style-type: none"> In which step of the value chain does the SME see a potential profit or another opportunity from the new technology (Design, Prototyping, Production, Repair)?
Analysis	<p>Performing of audits, conducting interviews etc.</p> <ul style="list-style-type: none"> What products does the company produce and which market(s) does the SME serve? Which materials are used in the current manufacturing process? What requirements has that product to fulfil? The standards that apply to the product or the production process should be at all times considered. Resource analysis: water, energy, staff. Output analysis: emissions, waste.



- Business analysis: annual revenue/ profit, amount and qualification of employees.

Technology Assessment

- Which technologies are available, most promising and fit best to the organisation?
- What materials can be processed, and which are available?
- What is the production size and time? What are the costs related to the new process?
- Is there latitude for the implementation of novel design considerations?

Benchmarking

- Testing and validation

Business development

Technological support:

- End-to-end solutions: design and implementation
- Economical support

Business support/ funding opportunities

- Business plan
- Market studies
- IP rights

Decision taking

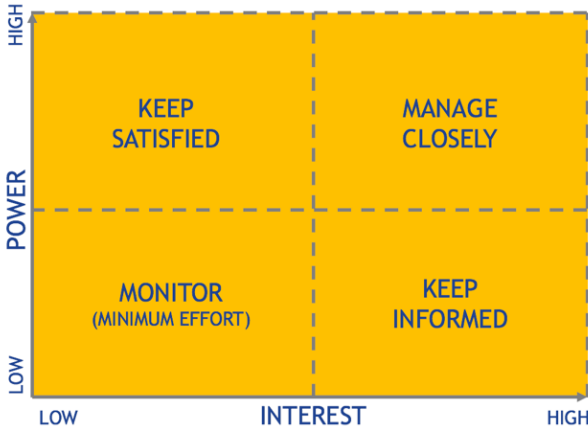
- Support in the decision for implementation or outsourcing



Annex C Support plan for SMEs

The support of SMEs should not end with the decision for adoption. Especially the transitional period involves certain challenges and risks. The steps explained in Table 5 will guide the phase to guarantee the successful adoption.

Table 5 Important steps and aspects to consider during adoption.

Step	Explanation
1 Identify all stakeholders	<p>All external and internal stakeholders need to be identified to assure that the implementation of new technologies is promoted and carried out in a joint effort.</p> <p>For this a power-interest-matrix as follows is a useful tool.⁴</p> <div style="text-align: center;">  </div>
2 Key dates	<p>The adoption of novel technologies requires several more or less time-intensive steps. The definition of certain key dates will enable the monitoring of the progress of adoption.</p> <p>Important aspects to consider are:</p> <ul style="list-style-type: none"> ■ When will the novel technology be ready to for the implementation? ■ When will you require your staff to be able to switch and when to switch over fully? ■ When will the current manufacturing technology be turned off completely? (Optional)
3 Training opportunities	<p>The identification of the types of trainings and the involved staff that requires this training is an important step. Different departments or groups of employees require different trainings and maybe even different training styles. Specialised training for specific groups might even be require trainings outside of the organisation.</p>
4 Expectations	<p>Just as for the technology itself it is true that there will be early adopters and laggards among the staff of the organisation. The expectations for adoption should be kept realistic, given the diversity of the staff.</p>

⁴ <https://www.interact-intranet.com/blog/5-strategies-to-help-employees-adopt-new-technology/>