IMPLEMENTING S3 WITH CLUSTERS – AN INNOVATION MODEL FOR TRANSFORMATIVE ACTIVITIES

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ABSTRACT

The ongoing debates on updating Smart Specialisation Strategies (S3) in the European innovation policy framework mainly focus on practical implementation challenges. This paper draws on the specific experience from the Interreg Alpine Space project S3-4AlpClusters, which put the interplay between S3 and clusters at the core of its conceptual and practical study of S3-implementation across the Alpine Space. While overlaps between the two concepts are evident and cluster initiatives are acknowledged in the relevant literature as tools in the context of S3, practical implementation of S3 with cluster initiatives is found to be far from trivial and involves specific challenges. We therefore introduce an innovation model as a practical effort to better integrate cluster initiatives in the S3 process. The model is a systematic process for the regional and cross-regional identification and development of transformative activities (TA). Tools and methodologies for S3-implementation, such as S3-synergy diamonds, entrepreneurial discovery workshops (EDW) or action development workshops (ADW) are valuable individual contributions for future policy designs. Nevertheless, it is only by putting them into the context of a systematic innovation model, with a strong focus on transformative activities, and by making them the levers for cross-regional cooperation and a systematic involvement of cluster initiatives in regional economic development, that they become fully relevant for smart transformation processes leading to innovation within businesses, new value chains and jobs in innovative new areas.

INTRODUCTION

In the context of regional economic development, there is an increasing interest to identify industrial transformation processes that lead to the emergence of new value chains and related industries. Such processes can provide competitive advantage for regions if they are timely identified and properly supported and represent huge potentials for regions to develop and ultimately to create jobs in innovative new fields. In its communication on Strengthening Innovation in Europe's Regions, the European Commission highlights that globalization requires regions to tackle the transformation of existing economic structures, *inter alia* by designing Smart Specialization Strategies (S3) and cluster policies (European Commission, 2017). This paper draws on the recent experience from the Interreg Alpine Space project S3-4AlpClusters[i], which put the interplay between S3 and clusters at the core of its conceptual and practical study of S3-implementation across the Alpine Space. While overlaps between the two concepts are evident and cluster initiatives are acknowledged in the relevant literature as tools in the context of S3 (see Ketels, 2013a), there is, to our knowledge, no comprehensive study on how clusters are currently involved in the practical development and implementation of S3. Moreover, practical implementation of S3 with cluster initiatives is found to be far from trivial and involves specific challenges. We therefore propose a novel focus on the interplay between S3 and clusters (Chapter I) and introduce an innovation model as a practical effort to better integrate cluster initiatives in the S3 process (Chapter II). The model is a systematic process for the regional and cross-regional identification and development of transformative activities (TA), which is currently implemented across the Alpine Space in the regions participating in the S3-4AlpClusters project[ii]. We provide insight into this practical experience to illustrate the proposed innovation model with examples (Chapter III) and conclude the paper with recommendations for current and future policy debates on S3-implementation.

I. SMART SPECIALIZATION STRATEGIES AND CLUSTERS

THE S3 FRAMEWORK

Smart Specialization Strategies (S3) play a crucial role in European regional development and innovation policy. Article 2(3) of the Common Provisions Regulation for the European Structural and Investment Funds (EU, 2013) defines S3 as intended *"to build competitive advantage by developing and matching research and innovation own strengths to business needs in order to address emerging opportunities and market developments in a coherent manner"* (p. 338). As a practical matter, S3 are of fundamental importance for the thematic objective of *"strengthening research, technological development and innovation"* within the common strategic framework of the European structural and investment funds (ESI Funds) (EU, 2013, pp. 347 ff.). As an *ex ante* conditionality for funds of the European Regional Development Fund (ERDF) in the 2014-2020 programming period (see EU, 2013, p. 438), they have become a common policy lever at national and regional levels within the European Union. While concrete implementation agendas for S3 strongly depend on regional and thematic contexts, some recognized basic principles guide the overall S3 process. The challenge at the heart of Smart Specialization Strategies (S3) approach is the need for regions to use their limited

resources effectively to become and remain competitive in the global economy (see *inter alia* Foray *et al.,* 2009; Foray *et al*., 2012; Foray, 2015). Based on a principle of targeted spending (see *e.g.* Enos, 1995), regions need to achieve diversification by specializing on a limited number of prioritized economic activities to take advantage of knowledge spillovers and economies of scale and scope. Successful diversification is contingent on exploiting existing related variety (see Breschi *et al.*, 2003; Frenken *et al*., 2007; Boschma, 2017). In other words, regions should aim at tapping into opportunities for transformation to meet structural challenges by combining their existing capacities into unique innovative activities (smart specialization). Opportunities for transformation are critical in the S3 framework. Regional competitive advantage is created when opportunities for transformation are exploited by regions to combine their existing capacities into unique new domains (see Foray *et al,* 2012). As an ultimate goal, these activities in new domains of opportunities should translate into structural transformation within the economy in an "accumulative process that links the present and future strengths of a regional economy in a particular domain of activity and knowledge" (Foray and Goenaga, 2013, p.6).

Based on the finding that innovation requires prioritization and the provision of specific capacities and coordination devices (see *e.g.* Hausmann and Rodrik, 2006), Foray *et.al.* (2012) conclude that *"smart specialisation involves making choices, leading to priority setting and channelling resources towards investments with a potentially higher impact on the regional economy"* (p. 114). Specialization priorities are best identified through an entrepreneurial discovery process (see Coffano and Foray (2014). The bottom-up character of this approach is crucial. As noted by Foray and Goenaga (2013), *"Entrepreneurs […] are in the best position to discover the domains of R&D and innovation in which a region is likely to excel given its existing capabilities and productive assets"* (p.5). The term entrepreneurs is understood in a very broad sense and includes actors such as innovative firms, research leaders from academia, representatives of the regional innovation system or specialists from tech-transfer with knowledge of the scientific and technological domains covered in the region (see Foray *et al.*, 2012). Once identified, priorities need to be implemented. Foray and Goenaga (2013) note that "new options" for diversified regional systems and *"emergence and early growth of new activities, which are potentially rich in innovation and spillovers"* should be enabled through the generation of *"critical mass, critical networks [and] critical clusters"* (p.9). In this process of creating critical mass, connectivity is decisive. Cross-sectoral links are key drivers of specialized technological diversification. It has to be noted, that such links in related variety are not limited by regional borders. Cross-regional cooperation is a decisive element in the endeavour to generate critical mass in the presence of economies of scale and scope and indivisibilities in infrastructures and other assets. To quote Foray *et al.* (2012), *"match what you have with what the rest of the world has!"* (p.17).

As this short conceptual introduction hints at, there is obvious common ground between the principles underpinning S3 and the abundant literature on economic geography. Economies of agglomeration are widely acknowledged as a key driver of diversification and specialization processes (see Rosenthal and Strange (2004) and Cortright (2006) for a comprehensive review of the economies of agglomeration literature). The positive impact of agglomerations of related economic activity on regional innovation performance has been studied extensively (see *inter alia* Feldman and Audretsch, 1999; Porter, 2003; Feser *et al.,* 2008; Glaeser and Kerr, 2009; Delgado *et al.,* 2010 and 2014; Neffke *et al.,* 2011). More particularly, the work of Michael Porter (Porter, 1990; Porter, 2003; Porter, 2008, Ketels and Keller, 2015) established the concept of clusters and cluster initiatives as a cornerstone for regional innovation policies. Given these apparent conceptual overlaps, clusters are also acknowledged as tools in the context of S3 (see Ketels, 2013a). Nevertheless, there is, to our knowledge, no comprehensive study on how clusters are currently involved in the practical development and implementation of S3. We therefore propose a novel focus on the interplay between S3 and clusters.

A BENEFICIAL INTERPLAY

As a *"geographical proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and externalities"* (Porter, 2011, p.215), clusters are of apparent interest in the development and implementation process of S3. More specifically, we understand clusters as groups of companies, mainly SMEs, and other actors (government, research and academic community, institutions for cooperation, financial institutions) co-locating within a geographic area, cooperating around a specialized niche, and establishing close linkage and working alliances to improve their competitiveness (see Ketels, 2011; Delgado *et al.,* 2012). A cluster initiative is the organized effort aiming at fostering the development of the cluster either by strengthening the potential of cluster actors or shaping relationships between them. They can be compared to regional networks and are usually organized by a cluster management (see Christensen *et al.,* 2012; Ketels, 2013b; Lindqvist *et al.,* 2003).

The interplay between S3 and clusters implies a two-way relationship with reciprocal benefits between the two concepts (Figure 1). The reliance on specific regional capacities in S3 emphasizes the importance of existing local resource concentrations. Cross-sectoral connectivity, inherent in the cluster concept, is a crucial determinant for the creation of critical mass for Transformative Activities (see Foray *et al.,* 2012). Moreover, clusters typically reunite the actors of the quadruple helix, crucial for cooperative leadership in an entrepreneurial discovery process. Strongly paralleling the definition of clusters, Foray (2015) concludes that preference in the process of developing and implementing S3 should be given to a *"mid-grained level of aggregation – the level at which activities group together a certain number of firms and partners that collectively explore and discover a new pathway to transformation"* (p.3). Finally, clusters are not limited to borders, but often stretched over several regions, which facilitates the cross-regional cooperation often beneficial for creating critical mass (see Foray, 2012). These considerations emphasize that cluster initiatives, as an organized form of the cluster concept, are ideal tools to use in the process of developing and implementing S3. On the other hand, clusters are also recognized as typical beneficiaries and direct recipients of S3-enhanced innovation. Indeed, *"generating a vibrant innovative cluster"* is considered *"a logical outcome"* of S3 (Foray, 2015, p.59). The whole process of establishing and collectively exploring new areas of opportunity, *"will possibly form the basis for [new] local resource concentration"* (Foray, 2015, p.15), by sparking entrepreneurship, spillovers and innovation at the cluster level. In this perspective, clusters are vehicles transmitting S3-enhanced innovation processes to the business level, ultimately contributing to establish new value chains and create jobs in innovative new fields. Translated to the policy level, this means that cluster policies benefit from being driven by S3 (see Foray, 2015, p.59), a view confirmed *inter alia* by Ketels (2013a) stressing that in relation to

S3, cluster policy becomes fully relevant at a later stage. In other words, meaningfully integrating clusters in the process of developing S3 opens

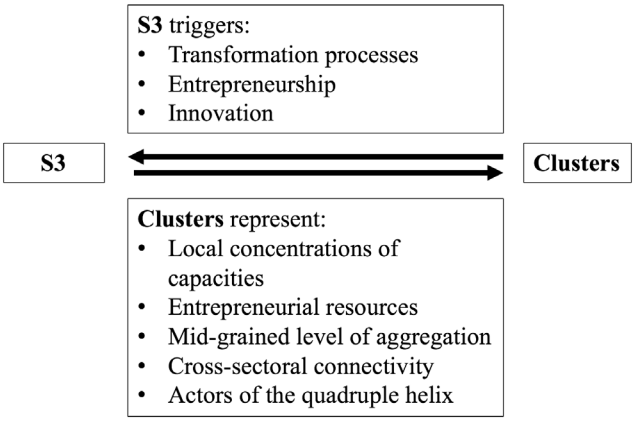

Fig. 1: Beneficial Interplay between S3 and Clusters
Source: Authors' elaboration.

up vast new perspectives for clusters in regional development policy.

As a practical consequence, the interplay between S3 and clusters represents a huge potential for implementation of S3. In a nutshell, the involvement of clusters into S3 helps to identify entrepreneurial resources and areas of strategic potential. Located at an intermediate level between individual firms and broad sectors, clusters typically reflect strong partnerships, vibrant communities and relevant connections between related businesses, suppliers and associated institutions. Clusters embrace all relevant actors of the innovation process and provide important information about needs, opportunities and ongoing transformations – all essential elements of S3. In addition, clusters are not limited to any border, but often stretched over several regions where they can facilitate the implementation of actions through interregional cooperation. In short, clusters are ideal vehicles to transmit S3-enhanced transformation processes to the business level and to give S3 real impact in terms of innovation within enterprises, new value chains and jobs in innovative new fields with high growth potential. Nevertheless, recent experiences from the Alpine Space, backed by studies from other regions (*e.g.* Nögel *et al.,* 2018), show that the potential of the interplay between S3 and clusters is not fully exploited in current S3-implementations efforts (see Meier zu Köcker *et al.*, 2017; Bersier and Keller, 2018).

IMPLEMENTATION CHALLENGES

We have gathered and analysed extensive experience of real-world S3 development and implementation with clusters during the last two years within the Interreg Alpine Space project S3-4AlpClusters[i]). All 11 regions participating in the project have set up cluster initiatives and developed S3 or similar regional strategies[iii]). For all participating regions, we studied the role of clusters in the implementation process of S3 and compared it with experiences from outside the Alpine Space in a stress test approach based on an online survey of regional stakeholders, consisting *inter alia* of regional clusters and policymakers concerned with regional development and innovation policy (Meier zu Köcker and Dermastia, 2017). In addition, a thorough synergy analysis of regional S3 documents resulted in a report on strategic Alpine Space topics for interregional cooperation (Meier zu Köcker *et al.,* 2017). The analytical process was paralleled by strong interactions in several series of workshops with all regional stakeholders, including cluster managers, enterprises, SMEs, policymakers and academia (see Foray, 2017; Foray *et al*., 2018).

The real-world experience with cluster initiatives within the project provides strong evidence on how the interplay between S3 and clusters is currently being implemented at regional level. Overall, the results of the project activities confirm the relevance of the interplay between S3 and clusters. Clusters are well-acknowledged tools in the context of S3 and cluster-based regional development policy is recognized to yield good results. However, ways and extent to which clusters are involved in the development and implementation of S3 vary significantly between the studied regions and reveal untapped opportunities for cluster initiatives in the process (see Meier zu Köcker and Dermastia, 2017). Two elements in particular have been identified as critical:

a. Lack of focus on transformation
The role clusters can play to trigger real transformation processes in the transmission of S3 to the real-world business level remains insufficiently exploited because of a lack of focus on real transformation processes. The investigations revealed that the scope of priority areas defined in S3 tends to be very broad and driven by a focus on existing specialization, rather than opportunities for real transformation. If priorities are defined too broadly, connections, synergies, and spillovers will hardly happen and critical mass will not emerge. As a result, many regions tend to end up with similar broad priority areas and the intended diversification across regions is hampered (see Meier zu Köcker *et al.,* 2017). The practical experience with S3 development in the regions of the Alpine Space demonstrates that the identification of priorities and the generation of critical mass is far from trivial and requires appropriate processes and tools (see also Coffano and Foray, 2014; Nögel *et al.,* 2018). In a context of innumerable potential combinations of existing capacities and diffuse hopes of bonanza behind any new trend, the identification of transformation opportunities requires a solid base of evidence to guide the entrepreneurial discovery process. Sticking to broad priority areas, regions systematically neglect to focus on transformation processes in their S3 documents (Meier zu Köcker *et al.,* 2017).

b. Lack of need-based cross-regional cooperation
Clusters are crucially lacking tools for need-based interregional cooperation, which would enable them to contribute critical mass, connectivity and cross-sectoral links across regional borders. While the focus on related broad priority areas across Alpine Space regions impedes the identification of real transformation opportunities, it also represents an untapped potential and common ground to jointly tackle Alpine Space related challenges (ranging from issues such as economic globalization over demographic change to energy) through the development of cross-regional activities. Regrettably, the analysis conducted within the S3-4AlpClusters project[ii]) revealed a quasi-total absence of cross-regional cooperation to exploit such synergy potentials within the Alpine Space. Indeed, the business environments and framework conditions for cross-regional cooperation tend to be weak, poorly aligned between regions

and completely lacking focus on need-based cooperation (see Meier zu Köcker and Dermastia, 2017 and Meier zu Köcker *et al.,* 2017). A need-based approach to cross-regional cooperation would be particularly vital for regions that are too small to implement structural transformation on their own. Tapping into external capacities and bundling regional competences would allow them to generate necessary critical mass, especially for resources confronted with economies of scope, scale and indivisibilities. Opportunities for transformation are often present at the intersection between different existing traditional industries. Regions lacking a strong and broad industrial base crucially depend on need-based cooperation to succeed in gaining sufficient critical mass to implement S3 (see Meier zu Köcker *et al.,* 2017).

The lessons learned from the S3-4AlpClusters project reveal clear challenges in current development and implementation of S3 in the Alpine Space (see Figure 2). The systematic identification of priorities is a complex exercise requiring new tools to support the entrepreneurial discovery process. The development of concrete actions is in many cases hampered by the lack of critical mass. Cross-regional cooperation based on complementary needs is critically missing from the given framework conditions. Given the huge potential of cross-regional cooperation and cluster-based processes, these challenges represent a clear call for action to enhance practical implementation of S3. Regions and their cluster initiatives need to be equipped with a systematic process for the development and implementation of S3 to boost their impact on businesses, new value chains and job growth in innovative new fields.

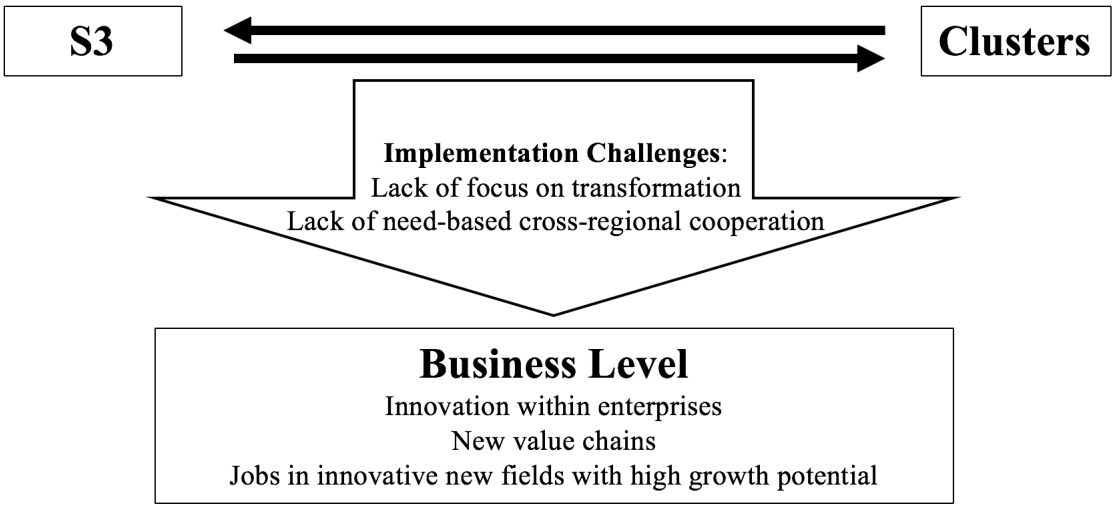

Fig. 2: Implementation Challenges
Source: Authors' elaboration.

II. AN INNOVATION MODEL FOR TRANSFORMATIVE ACTIVITIES

OBJECTIVES

To address the identified challenges, we introduce an Innovation Model as a systematic approach to implement S3 with clusters. The model has three core objectives:

1. Ensure a focus on transformative activities (TA)
2. Provide a process to implement S3 with cluster initiatives
3. Enable cross-regional cooperation

In a nutshell, the model offers a new perspective for cluster initiatives and regions to explore capacities and opportunities for transformation and to develop actions to create critical mass in innovative new fields both regionally and cross-regionally. The approach is a timely and innovative contribution because it directly addresses main obstacles in current S3 implementation (see Chapter I above).

A NOVEL FOCUS ON TRANSFORMATIVE ACTIVITIES (TA)

The idea of transformative activities (TA) has been inherent in the concept of S3 since the latter was first formalized in 2009 by Foray *et al.* as a result of the reflections of the Knowledge for Growth Expert Group, established by the European Commissioner for Science and Research Janez Potocnik. Nevertheless, it has been the intense practical experience with S3-implementation in European regions (as evidenced *inter alia* in the Interreg Alpine Space project S3-4AlpClusters[ii]) that really put the spotlight on the importance to focus the S3 process on TA. Recently, the concept of TA has been more solidly grounded and is now recurrently referred to in the academic literature (see Foray *et al.* 2018; Foray 2018). Foray *et al.* (2018) note that *"S3 should be understood as a process aimed at transforming the economic structures of a region or any other geographical unit through the formation and development of new activities based on a combination of existing capacities on the one hand and opportunities for structural transformations on the other"* (p.3). The focus of S3 should

not be on *"sectors but on modes of transformation of sectors or of establishing new ones"*. The outcome of the S3 process should neither be *"an individual project nor a sector as a whole"*, but a transformative activity (TA), understood as a *"collection of innovation capacities and actions, that have been extracted from an existing structure or several structures, to which can be added extra-regional capacities and that is oriented towards a certain structural change"* (Foray *et al*. 2018, p. 1).

An example of what a focus on TA means in practice is provided by Foray (2017), documenting the experience from an entrepreneurial discovery workshop organized within the S3-4AlpClusters project (Milan, 30.05.2017). Existing policies in Lombardy currently support *"a bunch of great start-ups […] inventing new high-tech products and services with strong application potentials in the agrifood sector"* (p.98). Instead of prioritizing a high-tech sector as such, the idea of S3 suggests to seek opportunities for transformation at cross-sectoral intersections in a policy *"aiming at supporting the development of a* ***real transformative activity*** *[emphasis by Foray, 2017] which would likely drive structural changes – not only in the high tech but in the huge agrifood sector"* (p.98). In the case of Lombardy, a stringent transformative activity should focus on innovation capacities for high-tech innovations in agriculture and integrate a collection of concrete actions to *"support the absorption and adoption of new knowledge and technologies offered by [high tech] start- ups"* (Foray, 2018, p.13).

Viewed through this novel TA lens, S3 can be described as regional strategies aiming at transforming the economic structures of a region through the identification and development of transformative activities, based on a reflection about existing capacities on the one hand and opportunities for change on the other. Hence, regional implementation of S3 ultimately consists of two fundamental practical aspects: on the one hand the identification of the innovation capacities through which opportunities for structural change can be tackled, and on the other hand the definition of actions to develop these activities in a given region (Figure 3). The aim of the innovation model can thus be summarized as a process for the identification and development of transformative activities (TA), as defined in Box 1.

BOX 1: TRANSFORMATIVE ACTIVITIES

TA: Transformative Activities can be understood as a collection of ***innovation capacities*** and ***actions*** of a group of actors, derived from an innovative combination of existing structures, targeting related areas and having the potential to significantly transform existing industries.

Source: Authors' definition based on Foray et al., 2018.

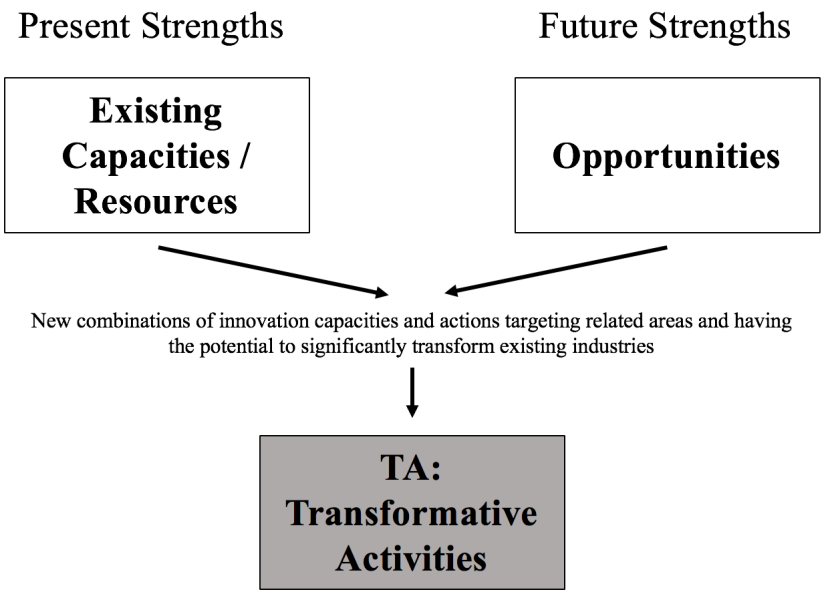

Fig. 3: Transformative Activities (TA) for Smart Specialization
Source: Authors' elaboration.

A PROCESS FOR THE IDENTIFICATION AND DEVELOPMENT OF TRANSFORMATIVE ACTIVITIES

In order to operationalize the focus on transformative activities for cluster initiatives and cross-regional cooperation, we consolidate the fundamental questions of S3 development and implementation into a systematic process for the identification and development of TA (see Figure 4). Faced by global competition, regions need to distinguish themselves (diversification) in order to create competitive advantage. Limited resources compel them to specialize on a limited number of prioritized innovative activities, which should meet structural challenges and translate into structural transformation. Thus, the overall goal of S3 can be modelled as the successful regional or cross-regional development of TA, understood as a collection of related innovation capacities and actions with sufficient critical mass to lead to a structural transformation within the economy and the creation of new value chains and jobs in innovative new fields. To reach this goal, TA first need to be identified in an entrepreneurial discovery process based on a solid base of evidence. They then need to be developed into concrete actions whose implementation generates the necessary critical mass for structural transformation in the region. Generating critical mass presupposes to exploit cross-sectoral links (connectivity) and cross-regional cooperation. In order to evaluate the outcome of the process, the development of TA has to be monitored. The whole process should be a collective endeavor including all relevant actors of the innovation process. From identification to monitoring of TA, cluster initiatives are thus key players. They are located at a level of granularity between individual firms and broad sectors, reunite actors of the quadruple helix, reflect connectivity and are predestined to benefit directly from S3-enhanced innovation processes. Therefore, the model includes methodologies to involve cluster initiatives and enable cross-regional cooperation at each stage of the process (Figure 4).[ii]

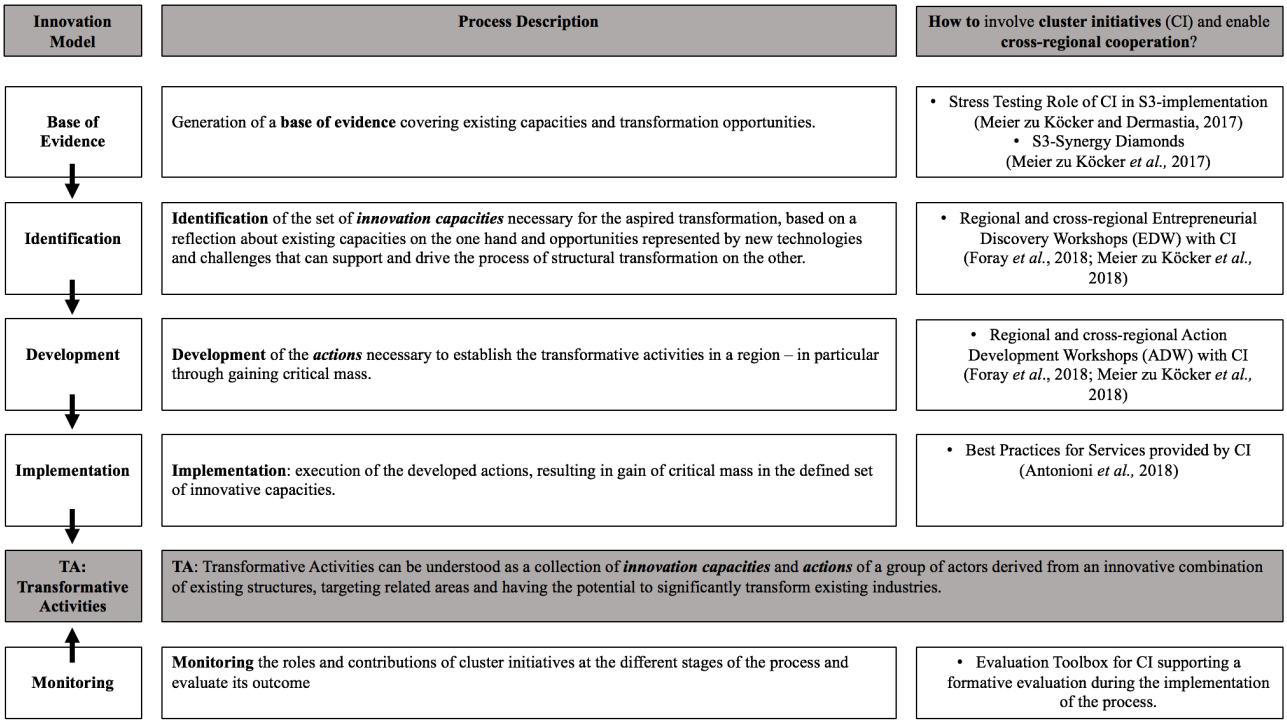

Fig. 4: Innovation Model for the Identification and Development of TA and the Potential Role of Cluster Initiatives
Source: Authors' elaboration.

The process starts with the generation of a base of evidence based on qualitative and quantitative analytics. Solid information on existing capacities, clusters, entrepreneurial resources and opportunities for transformation is crucial to guide the subsequent entrepreneurial discovery process for the identification of transformative activities. An analysis of the current role of cluster initiatives in S3-implementation is a useful element of such a base of evidence to set the basis for a systematic involvement of cluster initiatives in the complete process. The experience from the S3-4AlpClusters project[i] has shown that the stress test approach outlined by Meier zu Köcker and Dermastia (2017) is a valuable contribution to this effort (see section *Implementation Challenges* in Chapter I above). Foray *et al.* (2018) provide a comprehensive overview of the necessary data for a regional analysis to include in a useful base of evidence, notably *"employment per sector / industry, sectoral location quotients (LQ), sectoral productivity data, sectoral exportation data, sectoral innovation data, and regional cluster portfolios"* (p.5). Foray *et al.* (2018) further note that the entrepreneurial discovery process will benefit from a *"pre-determination of the covered field"* (p.7). A way to limit the covered field and disclose existing capacities and opportunities for transformation that are particularly contributory to evidence-based entrepreneurial discoveries is provided by Meier zu Köcker *et al.* (2018) by means of S3-synergy diamonds. Based on an analysis of existing S3

documents, regional priority areas are depicted as the cornerstones of the diamonds. Potential new combinations between priority areas form the axes and thus illustrate where relevant transformative activities can emerge from. The diamonds also disclose complementarities between regions with similar priority areas and thus contribute to facilitate need-based cross-regional cooperation in the subsequent process (see *e.g.* Figure 5 in Chapter III).

The generated evidence is used as an input for the identification and development of transformative activities (TA) in an entrepreneurial discovery and action development process. Per definition, TA consist of ***innovation capacities*** and ***actions*** of a group of actors derived from an innovative combination of existing structures, targeting related areas and having the potential to significantly transform existing industries (p.8 above, based on Foray *et al.*, 2018). In consequence, identification of TA means to identify, based on a reflection about existing capacities on the one hand and opportunities represented by new technologies and challenges that can support and drive the process of structural transformation on the other, a set of ***innovation capacities*** needed for the aspired transformation process. As noted previously, clusters represent local resource concentrations of specific regional capacities and provide, embracing the actors of the quadruple helix, important information about opportunities and ongoing transformations. Entrepreneurial discovery workshops (EDW) are acknowledged tools to involve cluster initiatives in the discovery process (see Coffano and Foray 2014). Foray *et al.* (2018) propose a workshop methodology for the identification of TA, which includes *"representatives of clusters with a comprehensive knowledge of the regional cluster-ecosystem"* as relevant actors (p.6). The methodology is designed to assess novel combinations of *"existing capacities and opportunities"*, to evaluate *"the relatedness of projects well located in this capacity/opportunity space"* and to prioritize and select a TA (or multiple thereof) *"consisting of a set of projects based on related innovation capacities"* (p.10). Meier zu Köcker *et al.* (2018) document how to implement EDW cross-regionally by using the S3-synergy diamonds as a basis for jointly identifying *"similar transformative activities which are of relevance to several regions"* (p.14) (see *e.g.* Figure 6 in Chapter III). In order to further develop the identified TA, the innovation capacities need to be completed with the ***actions*** necessary to enhance structural transformation in a region. As noted by Foray *et al.* (2018), *"developing and ultimately establishing a TA in a region requires building and gaining critical mass (capacity building)."* This can involve a broad range of actions, such as the "identification of missing critical inputs which need to be privately or publicly provided (specific training, research, infrastructure), the development of coordination devices (such as platforms or networks) to connect firms, suppliers, buyers, technology and research, the support of R&D projects or the inclusion of potential adopters of the innovation through training, integration of novel management practices or adoption of new technologies" (p.11). Again, cluster initiatives are key actors in such a process. Foray *et al*. (2012) assert the crucial importance of cross-sectoral connectivity, inherent in the cluster concept, for the creation of critical mass for transformative activities. Meier zu Köcker *et al.* (2018) lay out a methodology for action development workshops (ADW) aiming at developing action plans to create critical mass for TA both regionally and cross-regionally, if access to extra-regional capacities is needed (see *e.g.* Figure 6 in Chapter III).

Further down the process, the developed actions need to be executed regionally or cross-regionally (implementation). As noted above, cluster initiatives are ideal vehicles to transmit S3-enhanced transformation processes to the business level because they typically embrace all relevant actors of the innovation process and can facilitate the implementation of actions resulting in gain of critical mass in the defined set of innovation capacities (see Foray *et al.,* 2012; Foray, 2015). Since both the identified transformative activities and the concrete developed actions are unknown *ex ante* the way in which cluster initiatives can contribute to the implementation of transformative activities can take a multitude of different forms and concretizations. Best practices for cluster initiatives are abundantly available in the literature (see *e.g.* Lindqvist *et al., 2013).* More specifically, based on an analysis of innovation processes within cluster initiatives across the Alpine Space, Antonioni *et al.* (2018) provide a broad set of best practices of cluster services in support of different kinds of potential implementation actions, covering transversal fields such as education, technology, growth, research or collaboration. As noted by Foray *et al*. (2018), an entrepreneurial discovery and action development process typically involves *"success, failures and surprises"* and requires *"strong monitoring and flexibility mechanisms"* (p.3) (see also Coffano and Foray, 2014). Therefore, our innovation model for S3-implementation with cluster initiatives finally proposes to systematically monitor the roles and contributions of cluster initiatives at the different stages of the process and evaluate its outcome.

The systematic process for regional and cross-regional identification and development of TA, described in the present innovation model, is currently implemented across the Alpine Space in the regions participating in the S3-4AlpClusters project[ii]. In order to further illustrate the proposed process, we provide an insight into this practical experience in the next chapter.

III. PILOT EXPERIENCE FROM THE ALPINE SPACE

Since its start in November 2016, the S3-4AlpClusters project[i] has been gathering experience with a broad range of issues related to practical S3-implementation. In particular, the project served as a testbed for the systematic identification and development of transformative activities (TA), as sketched out in the innovation model in the previous chapter (see Figure 4). 30 cluster initiatives from 11 regions of the Alpine Space are currently involved in these pilot activities. A solid base of evidence was produced for all regions. Synergies in regional S3 were identified and represented in 4 S3-synergy diamonds (Figure 5) targeting opportunities for transformative activities related to major challenges for the alpine macro-region, as outlined in the EU Strategy for the Alpine Region (EUSALP)[iv]:

1. Economic globalization that requires the alpine region to distinguish itself as competitive and innovative by developing a "knowledge and information" society
2. Demographic trends characterized particularly by the combined effects of ageing and new migration models
3. Climate / energy change and its foreseeable effects on the environment, biodiversity and on the living conditions of its inhabitants
4. The specific geographical position in Europe as a transit region and as an area with unique geographical and natural features, which will set the frame for all future developments, notably with respect to mobility (Meier zu Köcker *et al.*, 2017).

Drawing on the generated evidence, all regions identified and developed new TA in a series of entrepreneurial discovery (EDW) and action

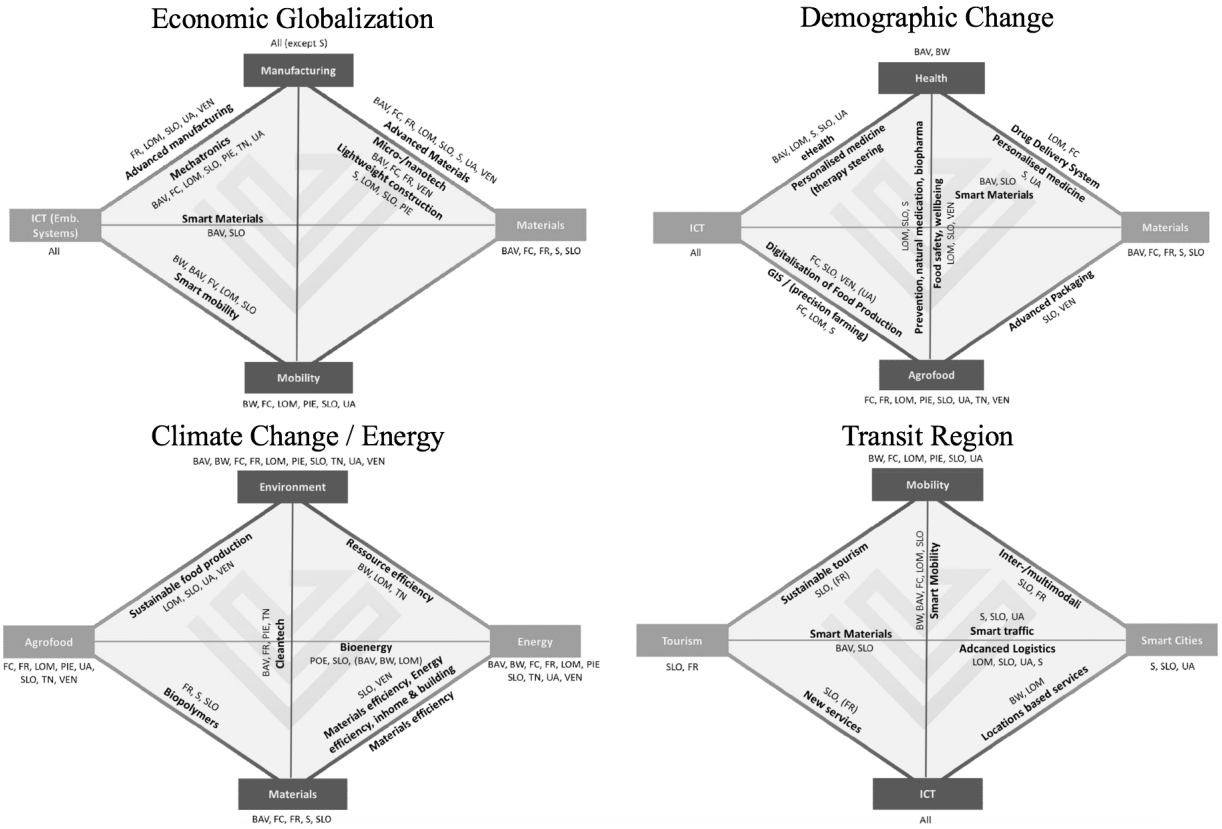

Fig. 5: S3-Synergy Diamonds for the Alpine Space Macro-Region
Note: BAV: Bavaria, BW: Baden-Württemberg, FC: Franche-Comté, FR: Canton of Fribourg, LOM: Lombardy, PIE: Piedmont, S: Salzburg, SLO: Slovenia, TN: Trentino, UA: Upper Austria, VEN: Veneto
Source: Meier zu Köcker et al., 2017.

development workshops (ADW), each involving 10 to 30 regional key actors including cluster initiatives, firms, policymakers and representatives of the regional innovation system (Bersier and Keller, 2018). The participants of the EDW assessed existing capacities and opportunities for transformation and prioritized a set of related innovation capacities to constitute a TA. Action plans were then developed in a series of ADW to complete the TA with the concrete actions necessary to gain critical mass in the identified innovation capacities and ultimately establish the TA in the concerned regions.

The character of the EDW and ADW and the applied methodologies varied among the different pilot activities and were shaped by specific regional demands. All workshops had in common however, that they followed the general process of the innovation model with a strong focus on TA and an active involvement of cluster initiatives. In two instances, the pilot activities were carried out cross-regionally. First, Upper Austria collaborated with Veneto on the development of safety, quality and food traceability along the food value chain. Second, Upper Austria also engaged in a cross-regional process of EDW and ADW to identify and develop TA together with Bavaria, Franche-Comté and Slovenia. The identification and creation of a common understanding on the TA to be further developed into concrete cross-regional actions and need-based cross-regional cooperation is a complex exercise. The use of S3-synergy diamonds (Meier zu Köcker *et al.*, 2017) proved valuable to detect similar priority areas in current S3 and identify TA for which the regions possess complementary strengths and needs. Based on the S3-synergy diamond targeting the EUSALP challenge of economic globalization (see Figure 5, upper left quadrant) a potential was identified for cross-regional cooperation between Bavaria, Franche-Comté, Slovenia and Upper Austria in the priority areas of manufacturing and new materials, and more particularly in new technological fields that may arise in combination of the respective priority areas. The cross-regional effort drew on complementarities in regional strengths (lightweight materials / Bavaria, lightweight technology / Upper Austria, circular-economy (materials circle, *e.g.* cascade use of materials/waste) / Upper Austria, second materials technology / Slovenia) and shared challenges and opportunities in lightweight materials, clean-technologies, bio-based composites and wood materials linked to the circular economy. Specifically, the entrepreneurial discovery process led to the identification of particular innovation capacities for the design, production and recycling of fibre composites for new lightweight materials as a TA to be developed cross-regionally based on complementary capacities and needs. In order to prepare the development of concrete actions for this TA the participating regions established in advance a brief documentation that was shared among the regions to establish an overview on the involved clusters and further stakeholders, current activities and initiatives, specific know-how, new developments, specific problems and challenges. The concerned cluster initiatives then met for an ADW to elaborate a joint action plan. The process consisted of 4 interactive rounds (round 1: identification of challenges and competences; round 2: matching challenges and solutions and prioritization; round 3: action development phase; round 4: drafting of action plan including

next steps). At each step, participants were asked to document their contributions and ideas. The inputs were discussed after each round in a fruitful working atmosphere where ease of interaction was created. The cross-regional experience resulted in an action plan focusing on education efforts for mind-set change, training on company level and mapping of available technical solutions (Figure 6, left side).

In the Swiss canton of Fribourg, an EDW was conducted with regional cluster initiatives (Swiss Plastics Cluster, Cluster Food and Nutrition, Building Innovation Cluster), research institutions (such as the Plastics Innovation Competence Center of the School of Engineering and Architecture), enterprises and policymakers using the S3-synergy diamond addressing climate and energy challenges (see Figure 5, lower left quadrant). Strong existing capacities were identified in the fields of materials, food and nutrition and the construction sector. A systematic discussion of opportunities for structural transformation offered to these traditional strongholds by the trend towards a circular bio-economy led to the identification of a specific TA to prioritize in the regional development strategy[ii]: the TA should draw on and build up related innovation capacities necessary to develop bio-based inputs for the plastics industry. In the subsequent ADW, the key actors met to work on concrete actions to further develop the TA in the canton of Fribourg. An action plan was drafted to mount collaborative R&D projects, networking activities and development of critical skills between the clusters, research institutions and regional and extra-regional enterprises, *e.g.* to use waste-streams from the local food industry for protein-based barrier film packaging. Figure 6 (right side) summarizes this process. Note, in line with the definition of TA proposed in Chapter II (p.7), that the TA in question neither corresponds to the food sector, nor the plastics industry as such, but to the collection of innovation capacities from groups of companies, suppliers and research partners associated with these existing sectors and the concrete actions they need to undertake to specialize in the development of bio-based inputs for the plastics industry.

Both examples show instances of aspired cross-regional cooperation for the development of TA. In the case of Upper Austria, Bavaria, Franche-Comté and Slovenia, actions were specifically elaborated to make use of the complementarities among the four regions with respect to existing resources and needs. In the case of Fribourg, capacities from extra-regional actors were found crucial for the development of collaborative R&D projects. Both experiences also emphasized the difficulty to actually implement actions for the development of TA on a cross-regional basis. Neither between the regions from different European countries, nor between different regions of Switzerland did the participants of the workshop estimate the existing funding schemes to be sufficient to support the developed cross-regional actions. This finding is in line with Meier zu Köcker and Dermastia (2017) asserting that *"aligning S3 and related policy instruments among neighboring regions is still a challenge"* (p.24) and Meier zu Köcker *et al.* (2017) lamenting the absence of *"dedicated support schemes"* synchronized across regions for the development of cross-regional TA (p. 27).

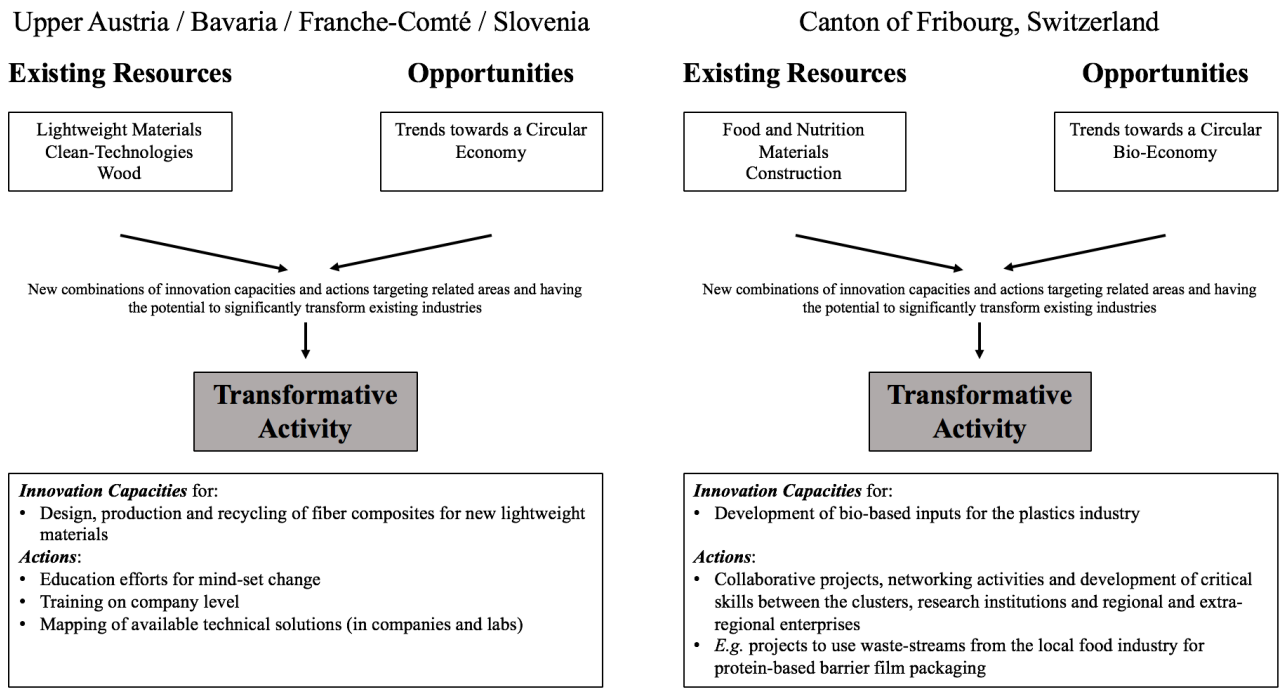

Fig. 6: Regional and Cross-Regional Entrepreneurial Discovery and Action Development
Source: Authors' elaboration.

CONCLUSION AND RECOMMENDATIONS

This paper draws on the recent experience from the Interreg Alpine Space project S3-4AlpClusters[i], which put the interplay between S3 and clusters at the core of its conceptual and practical study of S3-implementation across the Alpine Space. While overlaps between the two concepts are evident and cluster initiatives are acknowledged in the relevant literature as tools in the context of S3 (see Ketels, 2013a), there is, to our knowledge, no comprehensive study on how clusters are currently involved in the practical development and implementation of S3. Moreover, practical implementation of S3 with cluster initiatives is found to be far from trivial and involves specific challenges (see Meyer zu Köcker and Dermastia, 2017). We therefore propose a novel focus on the interplay between S3 and clusters and introduce an innovation model as a practical effort to better integrate cluster initiatives in the S3 process. The model is a systematic process for the regional and cross-regional identification and development of transformative activities (TA). We define TA as a collection of innovation capacities and actions of a group of actors, derived from an innovative combination of existing structures, targeting related areas and having the potential to significantly transform existing industries (see Foray *et al.*, 2018). Cluster initiatives are recognized as key actors in the entrepreneurial discovery and action development process of the innovation model.

The ongoing debates on updating the S3 efforts in the European innovation policy framework and related regional innovation strategies focus mainly on practical implementation challenges. Potentially critical elements are identified at various levels ranging from a lack of understanding of the entire S3 concept to missing compatibility between S3 and policy tools for implementation, missing political commitment to focus on a limited field with high transformative potential, or a lack of critical mass in terms of innovation actors and public investments. New methodologies and tools are developed for future-oriented regional analysis and implementation of smart industrial transformation processes (see *e.g.* Nögel *et al.*, 2018). In a similar vein, the innovation model outlined in this paper is currently implemented with cluster initiatives across the Alpine Space within the S3-4AlpClusters project[ii]. Based on these first experiences, we conclude the paper with three recommendations we suggest to consider in current and future policy discussions on S3-implementation:

- The locus of S3-implementation should shift from existing priority areas to new transformative activities (TA)
- Cluster initiatives should be used as levers for regional economic development and take over active roles in a systematic process to identify and develop TA
- Cross-regional cooperation in the identification and development of TA should be further supported by cross-regional synchronized funding schemes

Tools and methodologies for S3-Implementation, such as S3-synergy diamonds, entrepreneurial discovery workshops (EDW) or action development workshops (ADW) are valuable individual contributions for future policy designs. Nevertheless, it is only by putting them into the context of a systematic innovation model, with a strong focus on transformative activities, and by making them the levers for cross-regional cooperation and a systematic involvement of cluster initiatives in regional economic development, that they become fully relevant for smart transformation processes leading to innovation within businesses, new value chains and jobs in innovative new areas.

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APPENDIX A

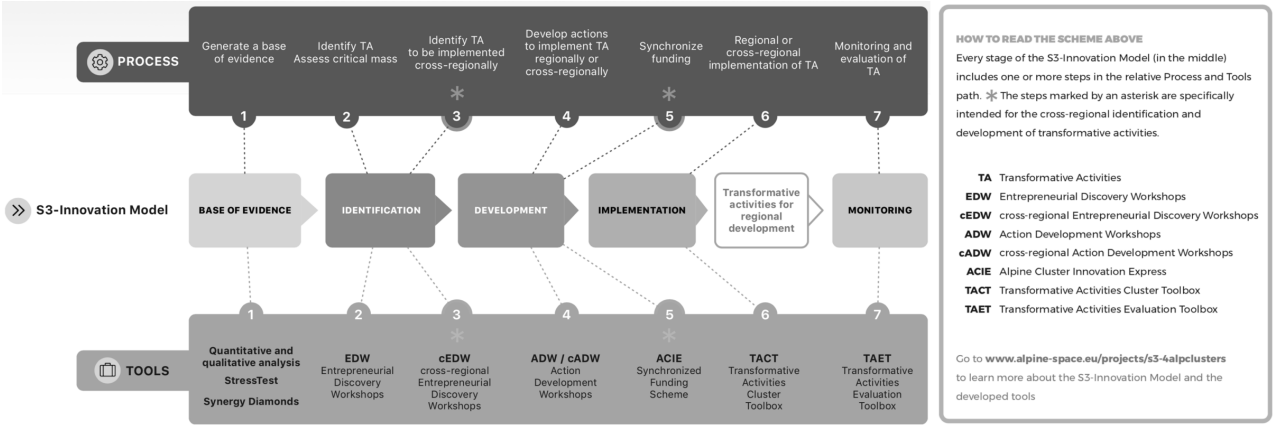

Fig. A1: The "S3-Innovation Model" of the S3-4AlpClusters Project
Source: ©S3-4AlpClusters

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i **S3-4AlpClusters**
The project is co-financed by the European Regional Development Fund through the Interreg Alpine Space programme. It brings together 15 partners from 11 Alpine Space Regions (Piedmont, Lombardy, the Autonomous Province of Trento, Venetia, Slovenia, Upper Austria, Salzburg, Bavaria, Baden-Württemberg, Bourgogne-Franche-Comté, and the canton of Fribourg), as well as their clusters and 10 observers. Partners include private and public actors from business organizations, SMEs, regional and national authorities, sectoral agencies and academic and research institutes.

S3-4AlpClusters is led by Innosquare Clusters, the cluster platform of the School of Engineering and Architecture of Fribourg, member of the University of Applied Sciences of Western Switzerland.

All project reports cited in this paper are available on the project website:
http://www.alpine-space.eu/projects/s3-4alpclusters

Additional information is also available on the project's YouTube channel:
www.youtube.com/channel/UCXf4dSJMZiTRCSSmaEGmMNg

ii The process laid out in this paper is currently implemented both regionally and cross-regionally under the label "S3-Innovation Model" in the 11 regions participating in the S3-4AlpClusters project (see Endnote i) above). For each step of the process, dedicated tools are tested and fine-tuned into a comprehensive toolkit for cluster initiatives. Appendix A, Figure A1 represents the "S3-Innovation-Model", as it is currently tested in the project. The final toolkit will be published in March 2019 and presented at an international conference on March 14 in Venice.

iii The Swiss canton of Fribourg, as the only project partner outside the European Union, does not have a formal Smart Specialization Strategy (S3). Nevertheless, certain aspects of the cantonal strategy for competitiveness do reflect priorities similar to an S3. The latest specific formulation of this ongoing quest to define a cantonal competitiveness policy can be found in the cantonal implementation program for the 2016-2019 phase of the Nouvelle Politique Regionale (NPR; French for New Regional Policy), a nationwide policy framework for regional development (Etat de Fribourg, 2016).

iv More information on the EU Strategy for the alpine region (EUSALP): https://www.alpine-region.eu.