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POLIS – THE EXPERIENCE OF THE TUSCAN INNOVATION CLUSTER IN THE FIELD OF SUSTAINABLE MOBILITY

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Abstract

Tuscany Region, in order to promote innovation and technology transfer according to the communication n° 323/2006 of the EU commission, constituted twelve clusters since July of 2011 within which POLIS – Pole of innovation on the technologies for the sustainable city – is the one focused on:

- Mobility, flow management and organization of transport processes.
- Cultural heritage, conservation, management and fruition.
- Sustainable construction, new building materials, energy consumption reduction systems.

Foundation for Research and Innovation (proponent and key-manager partner of POLIS) is highly active in the field of urban logistics, as a key sector where innovative solutions and policies could significantly ease traffic impacts and environmental implications.
Research and technological innovation can play a significant role in the improvement of competitiveness of the sector, for example by means of interventions on:

- Traffic and logistic flows reorganization and optimizing daily supplies to urban areas.

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- Spreading of networks of supply for low-emission vehicles and fleets.
- Systems and services for mobile information, organization and integration of public transport services, land use planning and traffic management (infomobility).

POLIS, born as grouping of 200 Tuscan SMEs, research centers, start-ups and associations, is now made of more than 600 partners (52% of them belonging to mobility sector) and it represents an Italian good practice, presently mentoring the start-up of other clusters in Spain, Portugal and Romania within the "Dorothy" (Development Of RegiOnal clusTers for researcH and implementation of environmental friendlY urban logistics) project, funded under the 7th framework Programme – Regions of Knowledge.

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Key words (Abbreviations): Innovation Cluster (IC), Urban Logistics (UL), Technology Transfer (TT), Sustainable Mobility (SM), SMEs competitiveness strategy, Cluster of Innovation (COI).

1. INNOVATION CLUSTERS (ICs), A BRIEF INTRODUCTION

1. From the 70's to nowadays, a chronicle of Innovation Clusters

The main industrial strategies, in the 70's and 80's of the XXth century, has been founded on the principle that, to pursue the employment growth for a specific area, was mandatory to push large firms to relocate. This "smokestack chasing" (A. Chatterji. Et al., 2013) led to many regional governments bidding against each other and providing substantial incentives to large plants, in order to making their location the first possible choice (e.g., Greenstone et al. 2010). The success of Innovation Clusters (ICs) in recent decades, however, has challenged this vision, and now many policy makers state that they want their regions to be the next Silicon Valley.

Innovation Clusters are frequently observed as concentrations of interconnected organizations including suppliers, service providers, universities, trade associations, and so forth, whereby proximity leads to shared advantages through the aggregation of expertise and specialized resources (Porter, 1990).

The European Union, in the 2006 due to the pronunciation of the Comm. 323 called "Community framework for state aid for research and development and innovation" defined, as follow, the ICs: *groupings of independent undertakings, innovative start-ups, small, medium and large enterprises as well as research organizations, operating in a particular sector and region and designed to stimulate innovative activities by promoting intensive interactions, sharing of facilities and exchange of knowledge and expertise and by contributing effectively to technology transfer, networking and information/dissemination among the members of the cluste*r.

Therefore, in a cluster, firms have free access to local information and networks simply because of their physical proximity (Gertler, 1995, 2003). However, the agglomeration of businesses by industry does not explain the ability of certain regions to support the high growth of start-ups almost independently of industry alignment. Several studies has demonstrated the presence of several factors that characterize ICs, one of them (Engel and Del-Palacio, 2009) identifies four main characteristics, namely:

1) Intra-and inter-firm mobility of resources

The most important of them have been characterized by Timmons (1994) as people, money, and technology; these are not tightly held within the firm. Mobility and rapid repurposing of resources within and among high potential entrepreneurial firms make innovation processes in a IC continuous and rapid (Freeman & Engel, 2007).

2) New firm creation as a rapid and frequent mechanism for innovation, technology commercialization, business model experimentation, and new market development

In a IC the entrepreneurial process is a mechanism for continuous and rapid innovation, technology commercialization, business model experimentation, and new market development, and the process is encouraged by a dense venture capital cluster and the related facility for the creation of well structured, funded, and connected startups. Startups benefit from being co-located with other companies, suppliers, and service providers specialized in or compatible with entrepreneurship (Engel and Del-Palacio, 2009).

3) Early global strategic perspective

Startups are born global when they consider from their inception the use of international resources and markets in multiple countries (Knight & Cavusgil, 1996; McDougall, Oviatt, & Shrader, 2003; McDougall, Shane, & Oviatt, 1994; Oviatt & McDougall, 1994). These companies plan their businesses based on global strategic perspectives; they look globally, and use global opportunities when suitable. For startups in a Cluster of Innovation (COI), global opportunities are increasingly not only a competitive challenge but also a business imperative. This predisposition contributes to the international mobility of resources, and supports the internationalization of startups at very early stages in their development (Engel and Del-Palacio, 2009).

4) Alignment of incentives and goals.

Certain traditional barriers to collaboration tend to be weaker in a COI. In fact, there is a bias toward collaboration both within and among firms. This culture of collaboration is anchored in an alignment of interests, fostered by unique equity compensation mechanisms characteristic of COI. The interest of all parties is the creation of value that is harvested principally through the sale of ownership interests in the venture. The reason for cooperation between suppliers and customers is clear. Cooperation among emerging competitors, is fostered by the innovation process due to the need to establish critical mass, formal or informal standards, and effective customer solutions in a competition with established incumbent practices. Similarly, venture capitalists share deal flow and co-invest as a regular practice. Their investments are staged in such a way that a creative tension is established: entrepreneurs are consistently challenged by investors, who may not make follow-on investments and may move to new opportunities if the agreed milestones toward greater value and an effective liquidity path are not achieved (Engel and Del-Palacio , 2009).

Thus, as a network, ICs lean on a matrix of relations, activities and expertise in which positive effect introduced by one of the partners could trigger a cascade of benefits for others influencing outputs, performances and quality. Moreover, increasing network density by facilitating interaction among network actors can have a direct impact on manufacturing employment over the short run (1 – 3 years), especially in non-urban and rural counties as well as metropolitan areas (Dempwolf, 2012).

As an evidence of what above mentioned, governments at all levels have now adopted the concept of ICs as a tool for promoting national and regional competitiveness, innovation, and growth (OECD, 1999, 2002; Government of Canada, 2001).

2. A system of evaluation for new performing ICs

In the absence of underlying theories and conceptual foundations, “a disparate array of indicators and measures” (Geisler, 2005) cannot provide a sound basis for rational policy action at the level of the cluster. Therefore, an underlying conceptual framework is necessary to structure cluster indicators.

A reliable example, dated 2009 (D. Arthurs et al., 2009), is offered by the National Research Council of Canada, that identifies two main frameworks:

1) Current Conditions, a set of elements useful to understand the cluster’s supporting organizations (including research centers, associations, instrumental agencies, etc.), to describe the competitive environment (populated by customers and competitors) and the factors with main influence, in the environment of the cluster, for all these actors (e.g., availability of HQP, business climate, etc.).

2) Current Performance, an array of factors useful to measure the cluster’s significance (number and typology of enterprises and their capacity to deal with abroad and internal markets); interactions (number of projects/cooperation of the firms within the cluster and with the rest of the world); and the dynamism (capability to develop innovative products/solutions and growth). The final output of the whole cluster is due to the success of each firm, but also from their capacity to deal with the uncertainty and the variations of the above mentioned elements (cluster factors, supporting organisations, customers and competitors, etc.).

Being dynamically evolving systems, innovation clusters are moving targets for policy interventions (Raines, 2003). In particular, clusters have life cycles and the needs and concerns of cluster players will differ depending on the stage of development of the cluster and its policies must evolve accordingly (Andersson et al., 2004).

Furthermore, if the firms of a cluster, thanks to the experience acquired within it, develop the capability to deal also in international markets, the need of hiring managers with the adequate skills to direct an enterprise during this phase could be a critical/limiting factor for the whole grouping.

Thus, is really important a continue monitoring of the abovementioned indicators, in order to provide promptly, when necessary, the requested solutions/corrections in the managing model of a cluster

2. POLIS AND THE BIRTH OF THE TUSCAN POLES OF INNOVATION

2.1 The Tuscan strategy for growth and innovation

One of the major themes of development policies of the Tuscany region is to support the processes of technology transfer and innovation in favour of the productive system, aimed at improving the competitiveness of enterprises.

The main programmatic references and consequently the main levers of intervention to support regional innovation poles relate to the 2007/2013 POR CREO and PRSE 2007/2010 and 2011 –2015 PRSE.

In particular, in the last act to address long-term research and innovation, the Tuscany region has allocated 521,7 M euro, 70% of which for industrial research, experimental development, innovation and technology transfer.

The qualification of technology transfer processes was pursued by means of the institution of "TECNOrete", the regional network of technology transfer to companies, formed by the Tuscany Region, provincial administrations and by operators of business service centers that carry out activities, direct and indirect, of technology transfer.

It was signed on 5 June 2009 through a memorandum of understanding and it is open to all institutional subjects present on the territory, that in any way wish to participate in processes of innovation and promotion of regional production system.

2.2 The Innovation Poles as strategic frames for technological transfer

The Innovation Poles are inspired by the EU guidelines for research, development and innovation (2006/C 323/1), and have the aim of coordinating research centers and companies initiatives and encouraging the dialogue between research and manufacturing world, to make the interventions for innovation more targeted, flexible and effective, and leveled with different productive systems.

The Innovation Poles, as defined by the regional strategy, represent structures of synergistic coordination among different actors of the innovation process, characteristic of a specific technological sector, and to provide services with high added value, with the following objectives:

- to develop, in the framework of the wider regional network for technology transfer (Tecnorete1), innovation activity, to play the role of specialized intermediaries in the field of research, and scientific and technological knowledge; as well as - through the delivery of advanced services - to act to encourage and support both the strengthening of links between the research and business systems, and the collaboration among companies in order to raise the inclination for innovation of the productive system;
- to organize and integrate, ensuring quality and common services standards, the current and future infrastructures for scientific research and technological innovation in the region with reference to a specific technological sector;
- to establish, in the framework of the regional system of technology transfer, an organized infrastructure able to collaborate in the development of Strategic Intelligence tools for the enterprises system, with particular reference to Innovation audit and benchmarking;
- to promote and implement the coordination among the different actors of the Pole in the innovation process of a specific technological sector;
- to provide to the enterprises system, primarily to those affiliated to the Pole, advanced services and infrastructures for innovation.

The Poles have the following operational objectives:

- to stimulate and accept the innovation demand of enterprises participating the Pole and, in general, of SMEs in the reference technological sector;
- to follow the companies in accessing to specialist services with high added value in order to support the diffusion of innovation among companies inside and outside the Pole;

- to facilitate companies access to scientific and technological knowledge with an industrial interest, to networks and to national and international resources in the scientific research and innovation field;
- to encourage the sharing of research equipments and laboratories, and of testing and certification.

2.3 The implementation of the poles and the management systems

The innovation poles/clusters creation was promoted through the launch, in January 2011, of a specific call (on European, national and regional resources) to support the transfer system qualification and to promote innovation processes within the business system. In order to ensure the coherence of the development of Innovation Poles with the current regional planning, the call - expiring in April 2011 - identified a list of technological sectors around which the clusters were built:

1. Fashion (textiles, clothing, leather tanning, footwear, jewellery etc.).
2. Paper.
3. Stone/Marble
4. Boat and Technology for the sea.
5. Furniture and Furnishing.
6. Technologies for renewable energy and energy saving.
7. Life Sciences.
8. ICT Technologies, Telecommunications and Robotics.
9. Nanotechnology.
10. Technologies for sustainable city (**POLIS**).
11. Optoelectronic and Space.
12. Mechanics, with particular reference to automotive and transport mechanical.

The management of each Innovation Pole - with operative office in the region –was identified among the following subjects:

- business service centers – with public or mixed public and private partnership's capital - participating in TECNOrete;
- Temporary Association formed by service centres and research organizations;
- Service centres, research organizations and companies participating in the Pole and constituted as a consortium with public holding.

Each Pole adopted its own three-year activities program of knowledge and technological and scientific skills transfer, with specific business plan for the achievement of the following operational objectives:

- to stimulate and accept innovation demand of enterprises in the Pole, and in general, of SMEs in the reference technology sector;
- to accompany companies to access specialized services with high added value and to support the diffusion of innovation among companies inside and outside the Pole;
- to facilitate enterprises access to scientific and technological knowledge, and to networks and resources at national and international level in the field of scientific research and of industrial interest innovation;
- to ensure the sharing of equipments and laboratories.

The Cluster management is structured according to a market logic trend. The Innovation Pole must be composed by:

a) at least one business services centre with operative office in the region and adhering to TECNOrete;
b) at least one research organization with operative office in the region;
c) companies working in the mentioned technological sectors and with operative office in the region.

Poles have to aggregate, also in relation to their technology sector, a significant number of companies both in the initial phase and afterwards. Depending on the number of aggregated companies, the Poles are divided into:

- First bracket Innovation Poles: more than 160 companies for a maximum contribution of € 800.000,00;
- Second bracket Innovation Poles: more than 80 companies for a maximum contribution of € 600.000,00;
- Third bracket Innovation Poles: more than 40 companies for a maximum contribution of € 400.000,00.

A company generally can participate to no more than three poles. Company participation is made through the submission of the participation letter and doesn't imply any cost. For a 3 years period (01/07/2011 – 30/06/2014) each Pole managing institution has guaranteed a decreasing grant (from 100 % to zero), depending on the semester of activities and on Poles bracket.

The Region support the affiliation of the companies and the grow up of the poles by extra points in evaluation and grant increasing of a Regional call for innovation projects. An example is the program "Por Creo 1.3b -Advanced and Qualified Services": the Call finances companies to acquire Advanced Services (feasibility studies, prototypes, measures, test, software development, certification, etc) provided by consultants (public bodies, research centres or private companies). The consultants are not obligated to be a cluster members (Note: All the regional calls are open to all the regional companies, even if they aren't members of a pole).

Exclusive calls for pole's members don't exist.

In Tuscany poles are temporary association, thus, aren't a legal entity and haven't a statute. After 2014 Innovation Poles could change their organization form and could became a real Legal Entity. Probably, will be created new consortiums, among the research centres and companies. In that case, companies will be a member of Consortium (presently not).

2.4 Targets, eligible costs and the role of technology agents

Tuscany Region has defined two typologies of targets, measurable and non-measurable, that if not achieved within the deadline of 06/30/2014 (concerning only the measurable ones) could imply the revocation of the funding recognized.

Concerning the non-measurable targets, each pole has to:

1) increase the access of the companies to research centers and lab;
2) increase the technological transfer
3) increase the development of research projects between companies and research center

Concerning the measurable targets, each pole has to:

1) Increase the number of companies member of the pole: more than 320;
2) Increase the number of companies contacted (each partner has to meet companies, understand their needs, identify instrument and resources, trying to solve the technological problem of the companies): more than 180;
3) Implement the number of services supplied (research projects, measures, prototype, etc): more than 40;
4) Implement the contractualization of services among partners: more than 80;
5) Achieve the total revenue final value of 500.000,00 €

The eligible costs shall be the personnel and administrative costs relating to the following activities:

- marketing of the cluster to recruit new companies to join the cluster;
- organization of training programs, workshops and conferences to support knowledge sharing and networking among the members of the cluster.

Partners are not paid to develop research project, i.e.:

- A partner goes to a company, shows the cluster activities or identifies the research needs of the company. The personnel cost is eligible;
- Partners organize a Workshop to present the cluster or to show the results of a research. The personnel cost spent for the organization is eligible;
- A partner develops a research project for a company. The cost isn't eligible;
- Travel costs, not eligible;
- The cost for the dissemination activities (brochure, catering), are eligible.

To develop the activities established by Tuscany Region and in order to achieve the measurable targets, each managing board of the poles has provided itself (due to the eligibility of their cost) with a specific personnel typology with the role of technology agent.

A technology agent has a research background and is familiar with the process of technological transfer, in order to facilitate experience of collaboration among research centres, enterprises and local bodies.

They are in charge of scouting new enterprises interested in joining the innovation pole, audit the innovation needs and match them with the expertise presents in other firms or within universities and research centres (private or public).

If the process comes to a positive result, this endorse the achievement or of the supplying of a service or to the simple contractualization of it.

3. INNOVATIVE EXPERIENCE IN THE FILED OF URBAN LOGISTICS: THE "DOROTHY" PROJECT

3.1 Why urban logistics is important for the sustainable development of our city

Except rare cases of excellence, the majority of the urban plans tend to ignore the impact that freights has on urban transport and, in general, on the daily life of cities.

If we consider the whole process of Urban Logistics, we can classify it in four main different typologies:

- the activity of collection and distribution of goods performer by professional transport operators;
- transport linked to public services (such as mail, waste collection, etc.)
- the transport generated by retailers, shopkeepers and artisans for their supplies by the wholesalers ;
- the transport of equipment used to carry out the professional activity (artisans, construction companies, professionals, etc.);

Therefore, sector provides, on one side, jobs and services that fosters urban economy, but on the other side, generate pollution and traffic congestion that burden the road network system that support human activities.

The difference among each city are huge, but in each of them operators continue, day by day, their challenge to provide goods at the right place in the right time and, in order to be successful, not all the solutions adopted are as much sustainable as they could be if clear regulations and dedicated plans would be developed.

Possible objectives to reduce the impacts and improve the environmental performance of urban logistics activities are:

1. Reduce the total number of vehicle-kilometres travelled daily;
2. Optimize the organizations and the position of warehouses and cross-docking terminals, in order to minimize segmentations in the freights supply-chain;
3. Support/incentive conversion toward green delivery vehicles in spite of traditional trucks and vans;
4. Support actions devoted to endorse unification and cooperation among urban logistics operators.

Therefore, as much freight transport serves a local economy as much it can play a vital role in support urban transformations, making urban freight more sustainable and cities safer and more liveable (L. Dablanc, 2009).

3.2 Analyzing urban logistics market

Different subjects constitute the network of actors involved in urban logistics activities, with different aims and purposes:

- professional transport operator; this class is very differentiated, as they are generally specialized in the transportation of particular type of goods. They constitute the most important part of the market from the dimensional point of view, but are very fragmented in size, so that only a part of this segment express a real demand. A large part of this class is represented by individual companies, managing a single vehicle and often working for the bigger companies for the last mile distribution;
- a particular type of professional operator is represented by the companies managing Urban Distribution Centres (or similar structures). These companies are often participated or owned by the Municipalities. Moreover they manage a specific process with respect to the other operators. They represent at now a limited part of the market;
- the Public Administrations, mainly the cities. They don't operate directly on the UL market but define the regulations and the constraints for this activity. Often the application of the regulation schemes is supported by technological systems, sometimes connected with the general traffic regulation systems. For this reason the Municipalities represent another important part of the UL market, with a specific main polarization on ITS systems.

But this role is mainly limited to the most important and large cities, where freight distribution regulation schemes can be implemented, while in the small cities regulations are simple and not generally supported by technological systems;

- the last category is represented by the shopkeepers, retailers, small and large selling structures. These subjects, which are the final links of the distribution chain, have never been traditionally considered as subjects expressing demand for assets in this field. The emerging e-commerce technologies could produce a modification in this situation. In fact they could be active users of these kinds of platforms both for selling and for their supply needs.

All these subjects express different needs and play a different role in the logistic supply-chain and is fundamental understand them in depth (also carrying out specific surveys and interviews), in particular highlighting the technology needs/opportunity to foster experience of technology transfer.

Urban logistics, indeed, is becoming a field with an high-tech intensity, related to:

- Engineering, in the specific case mainly related to modeling, simulation and design – new models, methodologies evaluation
- Information technology - Information systems for the freight and fleet management, planning and scheduling, real time traffic information management, among others
- Electronic equipment – fleet management, on-board equipment for tracking, planning, communication, real time applications
- Electrical vehicles – new technologies for clean vehicles; special purpose vehicles, embedded on-board equipment
- Mechanic and mechatronic – packaging and handling equipment, warehouse equipment and solutions, loading/unloading systems

Understand the combinations/intersections among actors, technologies and needs represents a reliable point of departure for each in-the-making clusters, focused on mobility and transport, and with the aim to develop innovative solutions to address the impacts generated on urban quality of life.

3.3 The experience of Polis in the "DOROTHY" project

Dorothy Project (financed within the 7th framework programme) is targeted to develop the potential of innovation and research in the four Regions Tuscany (Italy),Valencia (Spain),Lisbon and Tagus (Portugal) and Oltenia (Romania) composing the Consortium in the field of Urban Logistics, one of the main focus of attention of the Flagship Initiative. In fact UL could reach 40% of the total cost of transportation and has great relevancy for energy consumption ad for town environmental quality. Research and technological innovation can play a significant role in the improvement of competitiveness of the sector. The Project organization shows a "two level" structure:

-the Consortium partners, qualified in their specific role, experienced in the field, capable of developing the work required, be representative of the realities of the local Clusters, cover the essential roles in the Project.

-The Stakeholders group, composed by all the initial partners of the Clusters and by other significant stakeholders (representatives of Associations, Chambers of Commerce, etc.) which can address and support the actions foreseen by the Project.

The specific objectives of the Project can be synthesised as follow:

-To define lines of research and innovation for the Clusters compliant with the specific technological and territorial specialisations.

-To address the research-driven clusters in the four Regions toward common developments and collaboration through networking activities.

-To set up the better conditions for the full exploitation of the results of the researches.

-To ensure the spread of knowledge through high quality dissemination and stakeholders involvement.

-To support the internationalisation of the Clusters through specific actions (Albania and Brazil already interested).

-To define Joint Action Plans (JAP) for the four Regions, with the active involvement of the Regional Authorities and Agencies

-To mentor the start-up of the research clusters
-To monitor the start-up of the activities defined in the JAP.

Polis, thanks to its experience on urban logistics (more than 60 projects of research and innovation has been developed by Polis members in the last three years), is in charge of mentoring the start-up of the new three clusters and to coordinate, through the Foundation for Research and Innovation (proponent and key-manager partner of POLIS), the whole project.

The presence of members belonging to a mature cluster is an added-value for the project, from a methodological point of view, for the expertise in developing:

1. a detailed analysis of the R&TI activities carried out on urban logistics within the Regions, both by the forming clusters and by other eventual subjects;
2. an identification of the research areas to be developed and included in the research agendas;
3. a comparative analysis of these activities with respect to the state and the research trends recorded at European level, to define the current "competitive position" of the forming Clusters;
4. an analysis of the demand of innovation in the specific area expressed by the territories, as a reference element for the further analysis;

From a procedural point of view, considering the necessity to support the implementation of all the measures and actions foreseen in the JAP, developed (objectives, nature, development)

- the subjects (RCs or specific partners or Institutions) involved
- the forms of the co-operation and the specific conditions to be achieved
- the timing
- the financial framework
- the expected impact
- the eventual framework conditions for their implementation.

4. CONCLUSIONS

Over all it is possible to infer that, especially in those regions with a high-level of research activities and knowledge, the experience of poles/clusters of innovation has been very positive and it contributed to increase the resilience of industrial areas, especially in a particular period of crisis like nowadays.

Thanks to the set up of a cluster is possible to strengthen cooperation among different subjects, with different experience, culture and objectives (i.e. enterprises and universities) with positive fallout throughout the territory and the industrial sectors present within it.

To set-up a cluster correctly is mandatory to analyse the potential of a specific area, in terms of innovation and research, taking into account possible market implication of the technological transfer processes.

The legal framework, performing indicators and strategies are very different among western countries experiences and, therefore, this gives to each region the possibility to develop its own model according to the peculiarity and the corresponding culture. The specific regional development of a cluster it is also interconnected to S3s (Smart Specialisation Strategies) and the cluster itself it represents an ideal channel to access S3, operate within S3 and benefit from S3. Of great importance is also the possibility that a cluster offers in terms of Smart Specialisation Strategies and Roadmap definition, by means of a tight collaboration among the regional stakeholders, first and foremost Regional authorities.

At the beginning, according to the Italian experience of Tuscany Region, it is important to define a structure as much flexible and "light" as possible, in order to ease the participation among subjects and to make them responsible of the achievements of the groupings. The structure, however, have to allow for a successive modular growth, mandatory for the successful and natural evolution of a cluster of innovation.

Overall, clusters of innovation represent the mean to access new technologies, to perform networking activities with stakeholders at a different level (region, national and international), to raise funds and mainly to trigger an innovation mechanism throughout the regions of belonging, also and especially by means of a better definition of Smart Specialisation Strategies within the references territories.

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