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# On Knowledge Usage and Innovation in Aeronautics Clusters Management

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## Abstract

*Recent studies focus on the knowledge transfer in industrial clusters with regard to innovation. Research results highlight various factors impacting overall and innovation performances, like for instance the industrial domain, the type of networks and the amount of knowledge generated in a cluster… This paper proposes to examine how clusters are managed, and the impact of the cluster management on the knowledge and innovations in the cluster. To do so, we examine three clusters from different European countries and from the aeronautic field, by analyzing their best practices in term of knowledge generation and sharing as well as innovation. Results tend to show that each cluster undertake specific actions according to its environment, and highlight key innovative initiatives which may be transferred for cluster development purposes.*

## 1. Bibliography

Scientific research about clusters has started since the eighties, with regional economists analyzing the industrial concentration and location choice [1]. Interests towards industrial groups have then exploded following the work of Porter [2]. Industrial clusters are now commonly defined as a geographically close group of firms and institutions, active in a specific field, and sharing information and technologies across horizontal and vertical networks [3].

Over the last two decades, clusters have been keystones for economic development, and hence intensively studied by the scientific community. Diverse types of work have emerged, from case studies to global approaches. Above all, two types of studies distinguish themselves by their number: studies about the network structure and anatomy, and more recently about performances of the cluster regarding innovation.

The network structure firstly depends on the conditions the network was founded. First industrial clusters have grown according to a bottom-up approach, with the main motivations being to take advantage of strong local demand to ease the organization of the supply chain and to be economically more competitive.

Nowadays, clusters have emerged according to diverse motivations and diverse approaches. Top-down approaches have been motivated by governments or local stakeholders, to either strengthen the economy of a region, or to bond industrials actors already in place. Even if the competitiveness is still the main reason for cluster initiative, various motivations have emerged to tackle this problem, including business, R&D, cost sharing, knowledge sharing, joint venture, strategic alliances… Each motivation will give rise to a new, and to some extend to a different cluster, in term of organization. For instance, cluster motivated by technology development will work closely with universities, while joint venture motivated clusters will work closer with venture capitalists and investors.

Each context and motivation give rise to a unique industrial network, which can be pictured with nodes, which are organizations members of the network, and links, which represent the interaction between members. This kind of anatomy opens the door to the imaging of different properties of a cluster. For instance, the notion of centrality illustrates the presence of a hub generating a high density of links with itself and members and between close members. Those hubs are hence major contributors to the networks dynamism. As opposed to the concept of centrality, structural holes indicate a part of the network with a low density of links, i.e. with an absence of direct information channels between some cluster members. As pointed out by [4], this network feature tends to break the homogeneity of the information flow in a network, hence easing the access to innovation in some part of the network, as discussed below.

Recent research has highlighted the information and knowledge flow inside industrial clusters being the two basics resources for innovation development [5]. Not only being a fertile ground for innovation, information flow contributes to shape the cluster anatomy. For instance, the density of information and knowledge in a hub can generate spill-overs, which facilitate the creation of more knowledge by the community, which is then feedback into the hub, leading to a cumulative process [6]. This cumulative process will tend to bring and bond hubs and nodes in proximity closer together. As a counter part, this phenomenon increases the density of information flow around hubs, confining knowledge in a very bounded part of the network only. However, the information, and more especially the knowledge, does not remain bounded to hubs and spill-overs, as knowledge can be discriminated into two types: either tacit of explicit. Explicit knowledge is the most dominant in dense sub-networks like hubs, is a codifiable and formal information, and occurs mostly in business motivated ties between organizations in and around hubs [7]. The tacit knowledge, in contrast, is the non-codifiable one, and occurs more in informal and social ties in networks. Both types of knowledge play a role in the dynamism of the network structure. Explicit knowledge will favor a dense sub-network with very close relations between members, and is of high importance to maintain the cohesion of the network. Even if geographical proximity will encourage tacit knowledge, the latter is not generated systematically, but relies more on social interactions, based on friendship and sympathy. This type of knowledge won't bring the nodes of a network closer together, but will create more and stronger ties between nodes. In particular, because of their randomness nature in an industrial network, they will play a role in the creation of structural holes. Structural holes, in turn, will slow down the information transfer and keep innovative information in remote parts of networks, giving an inhomogeneous access to innovative informations, as individuals will have the opportunity to break the information flow to act as entrepreneurs [8]. In consequence, some scientific works underline the fact that structural holes ease the access to innovative information in remote parts of the network [4].

The geographic proximity of members is a more commonly adopted feature to draw on performances of a cluster regarding innovation. For instance, firms in clusters are more innovative [9]. However, the link between the proximity of firms and their innovation capability has been discussed in some particular technological domains like opto-electronic [10], making difficult the task on drawing a global framework on the benefits of clustering regarding innovation. Moreover, the innovation capacity of small firms, like start-ups, has been observed to decrease with the firm size [11]. To open the doors to a more systematic innovation scheme in clusters, [12] argues that geographical proximity should be combined with organizational proximity, which relates to the domain of activity, or the affiliation of individuals. Both forms of proximity should encourage the emergence and the sharing of tacit knowledge in the innovation process. However, geographical proximity seems not to be a mandatory condition to boost innovation: [13] showed in a national study in New-Zealand that even if firms are scattered, they can still maintain a high level of innovation by offering ‘knowledge-embedded solutions’ combined to costumed solutions. This behavior relies strongly on intra and inter-sectorial interfaces like scientific events, and require the connection to much specialised knowledge sources.

The literature showed that the performance of industrial networks regarding innovation is a complex phenomenon. General ideas and concept have been proposed to build a framework as a support to policies makers, to point to a systematic clustering approach, or to underline which the factors are linking clustering to innovation. However, the literature continues to show that performances of a cluster strongly rely on the context and environment, on the cluster itself, and on inherent factors like the way informations flow between nodes of a cluster. Case studies tend to show that each cluster is a unique answer to its ecosystem. In fact, many different European clusters have hence been set-up as a common approach to improve competitiveness, whether driven by governmental initiative, or industrial motivations. Each cluster has then adapted to the local needs, demand and the local policies, giving a unique offer and structuring approach for its ecosystem.

However, each cluster has to be directed, either by board meetings or by a managing team, and most often by both. The management of a cluster, driven by a commonly called ‘animation team’, is a commonality to almost each cluster, and influences directly its performances. Decision taken at the top level by board meetings with stakeholders are translated into actions by the animation team. The quality of these actions, the way they fit the industrial needs for clustering, and how they structure and strengthen links in a cluster impact its overall performances. Because each cluster is unique, each animation team is in turn unique as well, but the scientific literature has shown scares attention to this part of cluster.

This paper hence proposes an insight into different management units in three different clusters. The remainder of this paper is as follow: the next section presents the project which is the framework in which this study has been carried out. Section 3 then describes three selected clusters, give an understanding of their clustering approach, and present their managing unit. Based on the clusters description, section 4 presents and compares their management, with an emphasis on their relation to innovation and knowledge. The last section concludes this paper.

## 2. Context of the study: the TRANSNETAERO project

The TransNetAero project aims at enhancing the competitiveness of small and medium enterprises (SMEs) members of six clusters involved in the aerospace sector, and located in North Western Europe. Despite the globalization of large aerospace companies, many aerospace SMEs remain regionally (or at best nationally) focused. Those SMEs located in 'hidden' aerospace clusters have limited knowledge available to them in their local cluster networks. This is often due to the presence of a prime contractor, like Airbus in France or Rolls Royce in England, which secures the positions of SMEs in their activities. In fact, SMEs involved in very local aerospace supply chains are rarely reactive when facing new challenges, either because their engagements do not allow them to diversify, or because they rely on the stability of the local market. This stability blinds local market players which in turn do not feel the need to continuously improve their competitiveness to face, for instance, challenges brought by globalization. Furthermore, the European aerospace sector is facing a dramatic skills shortage, which is already a limiting factor for future regional development and a threat for competitiveness, especially compared to emerging market countries. Meaning that the aerospace industry faces a shortage of qualified workers, and companies are challenged to better train employees or attract new employees. Across North Western Europe aerospace, usually only bigger companies have a vocational training system. SMEs are generally less attractive to employees and are forced to seek for new ways to attract and develop them.

The TransNetAero program is an added solution to the clustering approach to tackle challenges described above. This program focuses on the 'hidden champions' clusters, *i.e.* small or medium clusters (in comparison with internationally renowned clusters like the Aerospace Valley in Toulouse), to creates a new transnational cooperation and a common road map for both SMEs and cluster managers, on the short and long term. Solutions developed in this project incorporate customer requirements and technology forecasts that are transnational across North Western Europe. It injects knowledge from a wider set of potential industry and research centres of excellence than is normally available in the local “comfort zones” of these suppliers. Knowledge is also disseminated to set up a high-quality skills development program orientated towards the needs of aerospace SMEs so that they can adapt to new technology and business challenges in the supply chain. It also starts members of this program on a journey to making their capabilities available to customers transnationally. By introducing project members to transnational research centres of excellence which help them develop their technology roadmaps, it is an excellent foundation for clusters to participate in future transnational research-based Framework Programs. Finally, this program proposes a common agenda with long and short term goals for collaboration between clusters, building the foundations of a sustainable collaboration between cluster managers, motivate by innovation and knowledge sharing.

## 3. Case study: the presentation of 3 different clusters and their managing unit

### 3.1. Research setting

The present study examines 3 industrial clusters management organizations. The three clusters are located in different countries, *i.e.* in Germany, Netherlands and England. They are all involved in the aeronautic activity. They have a similar geographic size, with the Netherlands cluster being the only national one in this study (the two others being regional). Informations about these clusters and their animation teams have been collected via interviews with clusters managers. The data resumed in this paper comprises two main types of informations: informations about the cluster itself, in order to qualify the ecosystem of the cluster management team, and a comparison of management teams. This comparison is based on best practices which are seen as innovative in their context, and the knowledge qualification in each cluster.

The following three paragraphs present the ‘big picture’ regarding three European clusters active in the aeronautic field. They present the context for the understanding of the cluster management activity.

### 3.2. Midland Aerospace Alliance

The Midland Aerospace Alliance (MAA) is a regional cluster based in Midlands, UK. It has been setup by a government initiative, to face the recession in the aerospace industry following November 2001. The regional supply chain, driven by Rolls Royce acting as a prime, joined up with the MAA in 2003. The cluster management started with governmental subsidies, with the aim of being financially independent 5 to 10 years later. It now counts about 300 members, with an increase of 5% in the member number during the last years. Apart hosting a prime contractor, the Midland region hosts all the tiers of the aeronautic supply chain, from material suppliers to five tiers one (BAE system, Thales, GE Aviation, Goodrich and Meggitt). The main activity of the supply chain is specialized in large civil aero-engine technology development, manufacture and assembly; this activity being led by rolls Royce. Goodrich and GE Aviation also organize a supply chain which activity is focused on global engine control and actuation systems, as well as electrical system business.

The cluster comprises a broad range of flexible supply chains, and as a strength is competing in the worldwide and global aeronautic market. Supply chains are supported by the presence of local skills with an active labour market. They comprises various expertises in design, manufacturing and assembly, and can count on a strong research base with partnerships with local universities (Universities of Birmingham, Loughborough and Nottingham) and centers of excellence (like the Manufacturing Technology Center in Coventry). However, because of the stability and the localism of the supply chain, traditional companies are unprepared to compete to the global market, preferring to rely on the stability of the local supply chains. Another weakness is, like in many other regions, some skills and knowledge gaps, as well as poor vertical supply chain relationships.

### 3.3. Forum Luft- und Raumfahrt Baden-Württemberg

The Forum Luft- und Raumfahrt Baden-Württemberg (LRBW) was setup by aerospace industrials to support and represent the aerospace activity in the south of Germany, Baden-Württemberg hosting the second highest concentration of Airbus suppliers in Europe. The cluster was funded in 2005 without government subsidies, and now counts 78 members, number which is growing every year. The Baden-Württemberg aeronautic supply chain is specialized in almost every technology and products which are common to space products, as the space activity is well developed in the region. For instance, the supply chain aims at manufacturing systems to equip aircrafts like cockpit equipment (on board computers, navigation systems, flight and engine control system), hydraulic and fuel systems, cabin fitting and safety equipment. The supply chain gathers one prime which is Astrium and five tier 1 (Diehl, Liebherr, Rockwell, thales, Tesat). The rest of the supply chain is mostly SMEs occupying the rank of tier 2 to 4, and supplying as well the space industry.

The research and development activity in Baden-Württemberg is strongly supported by the presence of an EADS research center, as well as 22 Universities of applied sciences, 14 institutes of the Fraunhaufer society, 2 national research centres of the Helmholtz Association, the Steinbeis foundation and 13 contract research institutes. In consequence, the region can count on a pool of highly innovative SMEs, targeting very specific market niches and competing at the international level. The entrepreneurship is also well supported in the region by finances scheme for high risk projects and low interest loans. In the other hand, the aerospace industry is shadowed by the highly competitive automotive activity in the region. The attractiveness of the automotive industry results in a lack of qualified employees in the aerospace industry and generates a very competitive access to venture capital. Moreover, the aeronautic industry of Baden-Württemberg has to compete with the other regions of Germany where this activity is more represented, like Hamburg and Bavaria, due to the presence of primes like Airbus or MTU and Eurocopter, respectively.

### 3.4. Netherlands Aerospace Group

The Netherland Aerospace Group is a national network of industrials specialized in the aeronautic field. Its aim is to coordinate the key players and interested third parties with their trading and export activities, as well as to promote the local aerospace field nationally and internationally. It gather a stable number of companies, about 109, and among them are a few foreign companies. The region has a strong heritage in designing and building the Fokker aircraft, but Fokker stopped building aircrafts in 1996 and continued as a supplier of mainly structural parts and wiring systems. The national aerospace industry is now positioned around products for the A380 and products and Maintenance and Repair Operations (MRO) services for the follow up of the F16. The supply chain is still organized around one tier one, Fokker, and KLM Engineering and Maintenance, as a maintenance and repair operator. However, the supply chain is not located inside the country but is sprayed in Europe, as a consequence of the high export ratio of the Netherlands. Other activities of the supply chain are focused on aerostructures, landing gear, as well as the development of composites parts.

The Netherlands have a long history in trading. The NAG can now count on an active cluster in export activities. The aeronautic industry is now turned towards upcoming markets like China or South America, and maintains a key customer position in Airbus and Boeing programs. However, including upcoming countries in their development program generate a very strong price competition at the national scale. Regarding technical innovation, the Netherlands hosts the largest aerospace university in Europe in Delft, and high technology centres like the National Aerospace Laboratory of the Netherlands or the ThermoPlastic Composite Research Center. The technological focus of the country on high technology systems and materials also benefit indirectly to the aerospace sector. However, the country would benefit from the presence of a prime contractor, to stabilize the supply chain and to stand for the aeronautic activity. This weakness limits the access to finance, particularly public funds and limit the R&D budgets. The Netherland aerospace industry, also suffers from a lack of qualified personnel, like the two other clusters described above.

### 3.5. Clusters management presentation

Each cluster is nowadays managed in a different way. The aim of the managing unit is to strengthen the position of the cluster in its environment, by proposing some actions related to the main activity of the cluster. For instance, each cluster has its own aim and specificities, and clusters which are active in the same field do not necessarily work with the same aim: some clusters might focus their global activity on business whereas some other would focus on collaborative projects. However, even if the strategic orientation of clusters is decided by key members during boards meetings, the way decisions are implemented is left to the cluster manager initiative. In a context where each individual and group is encourage to be innovative, the following paragraph presents actions undertaken by each cluster to structure their management and to encourage their innovation and manage their knowledge flow.

#### 4.5.1 MAA management

The cluster management unit consists of three staff member (a chief executive, an operation director and a marketing manager) and no administrative support. The chief executive ensures the transition of decisions from the board meetings to the management unit. Board meetings consist mainly of 16 firm's directors with a majority of SME directors. The interactions with the cluster members are supervised by the operation director and the marketing managers, and are ensured by independent consultants working with the members on projects led by MAA. The global objective of MAA is to strengthen and develop the aeronautic industry and the labour work force in the region. To do so, the managing unit defined three work streams (business development, manufacturing improvement and technological support) which are developed during regular meetings with the interested companies. These work streams aim at:

- Help companies to improve their performance in term of quality, cost, services with an expert consultant identified and hired by the MAA team.

- Maintain a high quality network to ensure a real-time knowledge diffusion, particularly to maintain a vertical knowledge flow in the supply chain.

- Organize supply chain collaborative projects focused on technology development and supported by government funding.

To ensure the knowledge diffusion among members, MAA organizes about 20 events a year. These events aim at informing members about current and futures challenges for the aerospace industry, organizing members meetings, connecting and exhibiting with international events, meet stakeholders and informing members with opportunities.

The top three MAA best practices, which are seen as innovative and distinguish the cluster from the others, are:

- Working closely with small companies on technological projects as well as getting involved in those projects. The authors note that these projects are government funded, and my not be reproducible on the long term.

- The edition of a magazine. The magazine has the dual function of communication and marketing. It contains facts and features about the aeronautic industry, interviews of stakeholders, advices and projects descriptions. It is released three times a year and designed with a journalist.

- The marketing of companies, and more especially the web site, which is used as a comprehensive database in open access and stored in a data cloud on internet. A white book is updated every year, and editable by every member in real-time, giving up to date details about every members.

### 4.5.2 LRBW management

The Forum Luft- und Raumfahrt Baden-Württemberg being a very young cluster, it does not have its own employees. Its management team at the land level comprises two persons, who also works with the industry association of Baden-Württemberg: a CEO and an operations officer. The cluster does not benefit from government subsidies. The operation officer mainly acts as a link between members, by pointing out new partnerships, and provides on-demand services like analysis of the local aerospace industry. Hence, the cluster management is very centralized around one person. However, the CEO also act as an active contact with the industry ministry, ensuring the knowledge flow from the government to SMEs. The clustering activity mainly consists of three working groups (defense and security, Aerospace supply chain, satellite technology) held three times per year, keeping the SMEs knowledge up to date and helping them to foster collaborative projects. The interaction with members happens mostly by direct contact and emails, or via events organized by the LRBW (about 11 a year). These events either consists in working groups, or meetings co-organized with other institutions.
The best practices undertaken by this cluster are the following:

- The cluster is organizing a series of events to encourage the technological transfer from the aerospace industry to other industries like the automotive one. Companies are invited to speak about their involvement in cross fertilization projects and to share their experiences.

- Companies are involved in the organization of events to make the young public (14-18 year old) sensitive to the aerospace industry. Companies also open their doors to this public to increase the attractiveness of the aerospace industry.

### 4.5.3 NAG management

NAG is a business oriented cluster, managed by an association consisting of five persons: One director, one operation manager, one project manager, one secretarial and communication position and one administrative staff. The aim of the cluster management is to provide business opportunities and services to the cluster members as well as business opportunities for the association itself. Decisions are taken during board meetings where the government, stakeholders and SMEs are represented. Importantly, each SME counts for one board member, such that SMEs feel well represented. The cluster as an organization does not involves itself in projects. Moreover, the cluster is divided into four main divisions: aircraft manufacturing and engineering, maintenance Repair and Operations, services (logistic) and airport infrastructures. The service and actions of the NAG management team are fully controlled by the market, and adapt every few years to new market opportunities. However, a systematic approach is proposed to structure the actions of the cluster: based on a yearly survey, the management team identify needs, demands and common interests and trends. Based on the results they discriminate companies, and organize meetings to raise issues, find solutions and rise collaborative projects. The organization also interacts with members by organizing trade missions, working groups (business or technology oriented), tools for business development, a permanent link to the government, and events organizations.

The best practices qualified as innovative by the managers are:

- The composition of a full time employed team to animate the cluster, with a very diverse range of skills.

- The trade missions organized by the cluster. NAG helps members to identify identified a common region of interest, and then organized trade missions in partnership with the embassies. The connections to the latter ensure a link in every country of interest.

- NAG also uses international business representatives, who are employed by key members and are working abroad. They are paid by a commission on the turnover they generate to the cluster.

## 4. On knowledge and innovation in the clusters under study

### 4.1. Tacit knowledge in cluster activity

Each cluster has its own unique approach regarding the knowledge management. Table 1 summarizes the three different approaches of each cluster, and the way they manage knowledge to develop their activity.

| Cluster | Main motivation | Knowledge management | Knowledge diffusion |
|---|---|---|---|
| **MAA** | Cluster development | Vertically in the supply chain | Open access via internet and magazine |
| **LRBW** | Networking | On demand | Event and on demand |
| **NAG** | Business | Centralized | Networking |

*Table 1: relation between cluster motivation and knowledge management*

For instance, the MAA encourage vertical knowledge flow to help developing the cluster as an industrial group. To do so, the cluster management organize events to gather all tiers of a same level. During these events, a special attention is given to the tacit networking: tacit information sharing is encouraged by 'networking breaks', during which members can exchange and make informal links. This method has been proved to favor vertical innovation in the supply chain and is according to the cluster manager essential to provide opportunities. In the same vein, MAA built a twinning relationship with other national and international clusters. This relation is intentionally informal, without any contract, to maintain all degrees of liberty the clusters need to exchange and interact with each other. On the other hand, the knowledge generated by the MAA cluster is quickly diffused via a real time update of the web site, which make this cluster management team very reactive to transfer knowledge.

The LRBW forum is more formal in its way to manage knowledge, and acts as a clearing house: the main role of the LRBW is to take a request and provide information about the right resources to respond to the request. Informations generated by this activity are not in open access but may be diffused during events if the demand is growing. The LRBW build up adding value knowledge by sharing its employees with the industry association of Baden-Württemberg. The knowledge is hence transferred from the industry association to the LRBW, ensuring a continuous valuable input.

One of the main objective of the NAG is to generate information in order to use it for business purposes. Knowledge is the keystone of their activity, and the main source of their revenues. To generate a value adding knowledge, the NAG management is in very close proximity with other industrial association, as they share offices in the same building. This geographical proximity allows them to exchange informations about the development of the national industry, giving to the tacit knowledge a very valuable place in their activity. However, the NAG management unit maintains a balance of tacit and explicit knowledge by building systematic knowledge via a yearly survey. This survey is used to generate knowledge which is in turn used to animate the cluster, by building groups of common interests, for instance. Finally, like the LRBW cluster, the NAG management staffs also secure its income of knowledge by being involved in other activities. For instance, NAG is involved in two other levels than the cluster: in a quality and certification organism, which allows NAG to interact with other fields than the aeronautic one, and in a foundation which aim is to provide a collective bridge to the government, for lobbying purposes.

The nature and the use of knowledge in the clusters under study are diverse. This paper shows that knowledge sources should not only be internal and external, tacit and explicit, but also transverse to other fields. Because aeronautic and aerospace are linked to many other activities like certifications, quality management or technology development, knowledge from these sources is an acknowledged lever for the cluster development. Any cluster activity also benefits from a balance between tacit and explicit knowledge, the first one being used for cluster development (at the industrial or management level), and the second one as a marketing and communication material. Finally, as geographical proximity with partners fosters tacit knowledge sharing, national and international knowledge sourcing and management is also a useful lever to provide opportunities for the industrial cluster.

### 4.2. 'Innovative' practices

This section analyses the levers which led to the best practices of each clusters that are seen as innovative. From a cluster management unit, innovative actions are interpreted as actions which distinguish the cluster from the other, and which have a direct added value to the cluster at every level. Three innovations setup by the clusters listed above are presented in Table 2.

| Innovation | Context |
|---|---|
| **Data base in the cloud** | Stable local supply chain |
| **Cross-fertilization events** | Involvement in other industrial and transversal activities |
| **Setup of a managing team** | Business approach, incomes oriented, no subsidies |

*Table 2: Actions identified as innovative*.

The database in the cloud is used as a show case for the MAA actions and members. It allows the cluster and the members to communicate their actions and details in real time, providing a very efficient tool to market the cluster as a whole. The data base is linked directly to every member, such that each member can update its content. Such a tool being very flexible in usage, it will be efficient if its content is stable and provide a unique, structured and up to date message. This data base is an innovative example as a communication tool adapted to an industrial network.

Cross-fertilization events are a mean to share and generate transversal knowledge to the benefit of the cluster as a whole. They consist in getting together professionals of one transversal field, like quality management and certifications for instance, so that they can exchange about their practices in different application fields like aeronautic and automotive. This type of event allows to communicate the best practices and difficulties, as well as to generate groups of expertise. It however requires the synergy and implication of people from different fields.

Finally, few clusters managers are able to finance an animation team of five people with the cluster management revenues. To do so, a business and marketing approach is mandatory. However, the cluster managers needs to constantly prove the value they add to the cluster. This is done by generating knowledge, which is then diffused during events organized by the cluster. The knowledge generation can be fostered by the proximity with other industrial actors, from the same and transverses fields, via contacts from ministries or government, and national and international representatives. The marketing of the knowledge then requires business skills which are often unusual in a cluster management unit, but prove here its efficiency.

These three 'innovative' practices fits to different contexts. It is not straightforward to ensure the success of one practice if it is transferred from one country to another, due to cultural considerations. They however gather actions which can be taken as independent independently from their context and adapted to other networks.

## 5. Conclusion

This paper examines the impact of clusters management on the knowledge flow and innovation performances of clusters. Three industrial clusters have been selected in the framework of the TransNetAero project, which aims at creating a new transnational cooperation scheme between aeronautic clusters. The three clusters are presented, and their best practices are compared in term of knowledge and innovation. Results tend to show that each cluster evolves in a unique context, and undertake a development process which is unique to its background. However, by analysing their best practices in term of knowledge generation and sharing, one can isolate practices which may be transferable from one cluster to another, with minor adaptations to the ecosystem. Because each cluster is unique, and undertake very different actions, a prospect of this paper would be to propose a common roadmap to the clusters.

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## 7. References

[1] Dorfman, N., Route 128: the development of a regional high-technology economy. In: Lampe, D. (Ed.), The Massachusetts Miracle: High Technology and Economic Revitalisation, MIT Press, Cambridge, pp. 240–274 (1988)

[2] Porter, M.,The Competitive Advantage of Nations, Macmillan, London (1990)

[3] Porter, M., The Economic Performance of Regions. Regional Studies, 37, 549–578 (2003)

[4] Burt, R. S., Structural holes: The social structure of competition. Cambridge, MA: Harvard University Press (1992)

[5] Huggins, R., Johnston, A., Knowledge flow and inter-firm networks: The influence of network resources, spatial proximity and firm size. Entrepreneurship & Regional Development, 22, pp. 457–484 (2010)

[6] Grossman, G., Helpman, E., Innovation and Growth in the Global Economy, MIT Press, Cambridge (1992)

[7] Casanueva, C., Castro, I., Galan, J.L., Informational networks and innovation in mature industrial clusters, Journal of Business Research, 66, pp. 103-613 (2013)

[8] Rost, K., The strength of strong ties in the creation of innovation. Research Policy,40, pp. 588–604 (2011)

[9] Baptista, R., Swann, P., Do firms in clusters innovate more?, Research Policy 27, pp. 525–540 (1998)

[10] Beal, B., Gimeno, J., Geographic agglomeration, knowledge spillovers, and competitive evolution. In: Best Paper Proceedings of the Academy of Management Conference, Washington (CD/ROM) (2001)

[11] Almeida, P., Dokko, G., Rosenkopf, L., Start-up size and the mechanism of external learning: Increasing opportunity and decreasing ability?, Research Policy 32, pp.301–315 (2003)

[12] Lemarié, S., Mangematin, V., Torre, A., Is the creation and development of biotech SMEs localized? Conclusions drawn from the French case, Small Business Economics, 17, pp. 61–76 (2001)

[13] Davenport, S., Exploring the role of proximity in SME knowledge-acquisition, Research policy, 34, pp.683-701 (2005)