TRIGGERING FACTORS FOR CLUSTER EMERGENCE: CASE STUDY FROM ALGERIA

المدينة الجديدة سيدي عبد الله

WASD
WORLD ASSOCIATION FOR SUSTAINABLE DEVELOPMENT

Abdelkader Hamadi

Researcher associate at CREAD (Algiers) and Clersé (Lille); Maghtech Network, France.
abdelkader.hammadi@gmail.com

Younes Ferdj

Food Safety Manager, Food Researcher at the Center for Research in Applied Economics for Development (CREAD), Maghtech Network, Algeria.
y.ferdj@cread.dz

Aimad Datoussaid

Lab Innovation Management and Marketing, University of Djilali Lyabes, Sidi Bel Abbes, Maghtech Network, Algeria.
datou_imad@yahoo.fr

Abstract

Purpose

The objective of this paper is to discuss and analyse the triggering factors for the emerging biotech cluster *Sidi Abdallah*. We mainly focus on the innovative clusters concept in the area of biotech as a mode of organisation and agglomeration of innovation actors.

Design/Methodology/Approach

The study uses data from fieldwork conducted in the Sidi Abdallah biotech cluster involving several institutions (enterprises, ministries, research centres, public institutions) together with secondary data mostly from private and public organisations.

Findings

Results reveal a form of cluster emergence that we call a peripheral cluster. The concept of the *peripheral cluster* is that such non-core clusters did not benefit from a path-dependency or historical factors that can help them emerge like the big European and American clusters. We have come to the conclusion that cluster policy is often ineffective in peripheral regions because of the scarcity of some determinants, such as:

1. intermediary institutions;
2. regulatory framework;
3. coordination between the different actors involved in the project;
4. local demand;
5. anchor firms;
6. cluster critical mass; and
7. slow cluster life cycle.

Originality/Value

The originality of this work stems from two aspects: first, that we use for the first time the "emergence" rather than the catch-up paradigm (Djeflat, 2006) in the Arab World to analyse biotech clusters. Second, this study represents one of the very few empirical studies conducted in biotech clusters in Algeria and, as such, may offer some insights into the importance of territorial dynamics in the field of biotechnology in developing countries.

Keywords

Peripheral clusters, emergence, territorial dynamic, biotech, Algeria.

Introduction

In the recent economic and geographical literature, the phenomenon of local industrial clusters has attracted much attention under the headings of 'industrial districts' (Marshall, 1930), 'local industrial clusters', 'innovative milieu' (Aydalot, 1986), and 'national and regional innovative systems' (Edquist and Johnson, 1997; Freeman, 1987; Lundvall, 1992; Nelson, 1993). The reasons why certain regions are successful while others are not have been extensively studied (Cooke, 1998; Morgan and Nauwelaers, 1998; Florida, 1995). Porter (1990), where he takes and develops the idea of Marshall (1930, 1890), devoted much of his time to analysing industrial districts and Silicon Valley. It is thought that clusters are instruments of public policy used to promote growth and competitiveness at the sectoral and territorial level. In the words of Schmitz (1995), a cluster is defined as a sectoral and geographical concentration of enterprises. According to Ahedo (2004), regional development depends on the presence of public and private actors who play a catalytic role: regional and local governments; universities; research institutes; chambers of commerce; training organisations; financial institutions.

The cluster literature has paid less attention to the question of how clusters emerge in developing countries. Clustering research originally focused on developed countries, but the concept is now increasingly applied to emerging and developing countries. Cummings and Djeflat (2015) argue that territorial innovation systems emerging in the diverse territorial contexts of the developing south, such as Central America and the Maghreb countries in North Africa, have qualitatively different dynamics from the regional innovation systems that are of reference in the Regional Innovation System (RIS) literature. Significantly less attention has been paid to analysing territorialised innovation dynamics and the emergence of different systemic organisational and institutional configurations to support innovation in these territorial contexts.

Brenner and Muhlig (2013) consider that three kinds of approaches dominate the literature about cluster emergence: case studies of regions identified as being economically successful (around 200 such studies are included in this meta-study); approaches generalising the findings in case studies in order to identify some of the causes why regions are successful (Becattini, 1990, Porter, 1990, Scott, 1992, Camagni and Capello, 1995; Markusen, 1996); and approaches explaining the existence of local industrial clusters by mathematically modelling or simulating economies of location (Krugman, 1991; Fujita and Thisse, 2002; Maggioni, 2002; Brenner, 2004). Our study is part of the case studies among the studies of the second approach.

The above literature addresses the questions of why local industrial clusters exist, how they emerge, and why they are successful in comparison to other locations. Although many of the case studies under review have addressed the question of how local clusters emerge, they have come to different conclusions. The case studies are conducted on the basis of different concepts

and assumptions. It is therefore difficult to grasp a clear picture of what really causes the emergence of local industrial clusters.

The purpose of this article is to analyse the less researched issues of cluster emergence. It also aims to define the factors of the process of emergence of the biotech cluster of Sidi Abdallah. The study uses data from fieldwork conducted in the Sidi Abdallah biotech cluster; this involves several institutions (enterprises, ministries, research centres, public institutions) together with secondary data mostly from private and public organisations. We were able to determine the key factors of the cluster emergence process, which we have adapted to the case of the Sidi Abdallah biotech cluster. Trigger factors are very important for the development of clusters. They are path-dependent and based on previous historical events including:

- the minimal role of intermediary institutions;
- weak local demand;
- the absence of anchor firms;
- lack of expertise regarding the regulatory framework;
- insufficient cooperation inside-outside clusters;
- slow but long-sighted cluster life cycle; and
- insufficient cluster critical mass.

We have come to the conclusion that the Sidi Abdallah cluster reveals a form of cluster emergence that we call *peripheral cluster*.

The remainder of the paper is organised as follows: the next section presents salient characteristics

of the biotech cluster of Sidi Abdallah. This is followed by a review of the conceptual literature regarding emerging clusters, a section describing the research methodology and data, and that presents the detailed results of the empirical study. The final section provides a discussion of our results and the conclusions.

Conceptual and Analytical Framework of Emergence: Literature Review

We use the notion of emergence when referring to the first stage of cluster development, the evolution of firms and institutions until their number reaches a critical mass. The emergence concept itself, introduced for the first time in the literature on National Innovation Systems in the south by Djeflat (2006), aims to better understand how system

innovation emerges in "pre-catch-up" countries that are in a different stand and trajectories from "catch-up" countries. According to Djeflat (2006), all North African countries, and notably the four main ones (Algeria, Tunisia, Morocco and Egypt), are experiencing a "falling behind" in their innovation systems. Innovation output in terms

of registered patents at the United States Patent and Trademark Office (USPTO) are dismal, with serious problems regarding the absorption of R&D funds. It seems the "emergence" paradigm is more appropriate to characterise innovation systems in neo-peripheral countries than the catch-up paradigm. Cummings and Djeflat (2015) argue that territorial innovation systems emerging in the diverse territorial contexts of the developing South, such as Central America and the Maghreb countries in North Africa, have qualitatively different dynamics from the regional innovation systems that are of reference in the RIS literature. The emergence and sustainability of a cluster and the evolutionary path it is susceptible to follow are eminently idiosyncratic (Hamdouch, 2011). Our conceptual and analytical framework is twofold: the study of forms of emergence and the factors of this emergence.

Forms of Cluster Emergence

In most works devoted to clusters, their dynamics of emergence and structuring seem to belong to two relatively dichotomous logics that are relatively antagonistic (Bresnahan et al., 2004; Fromhold-Eisebith and Eisebith, 2005; Chiaroni and Chiesa, 2006; Casper, 2007). The first category of clusters associates strong entrepreneurial dynamism and broad autonomy vis-a-vis government: Silicon Valley, Boston, Cambridge. These "mature" clusters, of large scale and with a wide international visibility, are often in "bottom-up logic" (Dicken et al., 2001; Bathelt and Taylor, 2002). It should be noted that most of these large clusters, e.g., Boston biotechnology, were created because of the strong will of the public authorities. They are dependent on public portage, very innovative and attractive internationally.

The second category of clusters, e.g., Munich biotech, follows a different model with an important role of public authorities in top-down logic. The public authorities were able to give a decisive boost to the creation of these clusters and were able to follow them up effectively in their development and maturation phases. These clusters have created a real endogenous dynamic while maintaining important links with the public authorities. Their main medium-term challenge is to develop entrepreneurial dynamism.

A third approach may exist, when the emergence of the cluster is due to a combination of both the two previous approaches (Hendry et al., 2000). Fornahl et al.'s (2010) results contributed to the current discussion about the link between new clusters and established regional paths, the generation of institutions and endogenous dynamics, as well as the patterns of emergence of successful clusters. The literature made a difference between the genesis of a cluster and those guaranteeing its functioning, as is suggested by the studies by Orsenigo (2006) and Bresnahan et al. (2001). In the same vein, Cummings and Djeflat (2015) propose two types of situations through which dynamics might come to emerge: first, Territorial System Innovation (TSI) emergence is based on recent historical processes of emergence and strengthening of innovation capabilities in the territory's economic fabric, promoted by certain networks of actors providing innovative knowledge and other key resources for innovative initiatives. These networks have a varied territorial embeddedness, but frequently actors providing key knowledge and other resource inputs are exogenous, intervening in the territorial context with development interests. Second, TSI emergence is an endogenous approach to the construction of a territorial institutional and organisational set-up, with public and private actors that prioritise the construction of innovation capabilities within the context of a coherent territorial economic development strategy.

Triggering Factors of Cluster Emergence

In this section, we will analyse the factors that are at the origin of the emergence of industrial clusters or, on the other hand, can constitute barriers to it. Andersson et al. (2004) emphasise that the most important factors for a cluster's emergence are localisation, cooperation, life cycle and a critical mass of clusters. Among the important factors in the emergence is the presence of multinational firms with know-how. Fornahl et al. (2010) distinguish three factors at the origin of emerging clusters. First, the emergence occurs by accident or can be traced to some seemingly historical accident (Krugman, 1991), leading to a number of new firms at a certain location. Second, the emergence comes from endogenous cluster dynamics (Scott, 2006). This means that the genesis of cluster dynamics does not only depend on the number and size of the firms and generic assets, but also on the local capability to form specific assets, even at a very early stage.

A large company, or some large companies, might be acting as an anchor for attracting smaller companies (Markusen, 1996; Pickernell et al., 2007; Elola et al., 2012). This can be explained by the fact that national companies are not attractive enough to be flagships due the lack of assets (Gupta and Subramanian, 2008), and/or because of a disregard of interests in small companies (Rosenfeld, 2003). In this case, scientific literature emphasises the importance of attracting multinational companies in the region (Elola et al., 2012; O'Gorman and Kautonen, 2004; Arbuthnott and von Friedrichs, 2013). It is evident that government should play its role by creating opportunities for multinational companies to enter the market (O'Gorman and Kautonen, 2004).

Latecomer countries face a problem of science and business cooperation. On the one hand, small and medium-sized enterprises (SMEs) possess poor capabilities for self-organisation and self-regulation (Johannisson et al., 2007). On the other hand, trade/business associations are not strong in latecomer countries (Pietrobelli and Barerra, 2002; Pickernell et al., 2007). Cooperation inside the cluster matters a great deal, especially in the case of SME clusters (Markusen, 1996; Pickernell et al., 2007; Brenner, 2000; O'Gorman and Kautonen, 2004; Shin and Hassink, 2011; Giblin and Ryan, 2012; Arbuthnott and von Friedrichs, 2013). In this situation, governmental institutions can participate in non-obligatory self-regulation schemes by giving all the necessary resources and this influences cooperation in implicit ways (Ahedo, 2004; Saurwein, 2011). Cluster emergence could occur via local business entrepreneurs (Da Rocha et al., 2009; Arbuthnott and von Friedrichs, 2013; Brenner and Mühlig, 2013). In the case of latecomer countries, there is a lack of entrepreneurial activities and cooperation of entrepreneurs because of harsh competition due to small markets, large numbers of competitors, and a lack of trust (Pietrobelli and Barrera, 2002; Kowalski and Marcinkowski, 2014). Cluster emergence could also occur via institutional entrepreneurs (Ritvala and Kleymann, 2012). The latter authors analyse the cases of clusters whose catalysts were scientists, who emphasised the problems to be solved and united various representatives from public and business sectors, and society. In the next section, we review the methodology and data.
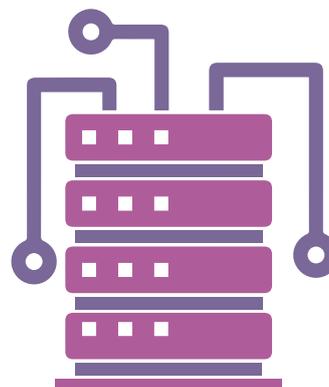
The Case of the Biotechnology Cluster of Sidi Abdallah in Algeria

Methodology and data material

The purpose of this empirical study is to analyse the development dynamics of a cluster in order to determine the determinant of emergence and the role played by public institutions in this growing process. For the choice of the methodological approach, we give priority during this research to the use of an exploratory analysis. Kaufmann (1996) points out that qualitative methods aim to understand, detect behaviours, processes or theoretical models that describe, measure or compare. First, we did a preliminary exploration of grey literature (press articles, websites, etc.) completed by specialised literature (books, articles, ministerial reports). This choice is justified by the fact that during our investigative research on the development of the cluster, we found that it was under construction and few companies were located in the Techno Park. The qualitative study is more appropriate to the objective of our research.

In terms of data collection, we triangulated a multiplicity of data sources to enhance the validity of research: questionnaire, semi-structured and open-ended interview, and documentary studies were our main methods of data collection. The qualitative data used in this discussion were provided by key stakeholders involved in Sidi Abdallah's biotech cluster projects, such as SME managers, consultants, and ministerial officers. The selection of the studied companies was made from a list provided by the Ministry of Health; it contains a total of 21 projects. According to an official in the Ministry of Health, the choice of companies was made on the basis of a call for tender launched and managed by the Ministry of Health. The complete distribution of companies whose investment projects are the production of pharmaceutical products, and which will constitute the Sidi Abdallah cluster in Algiers, is presented in Table 1.

Table 1: Investment projects in the production of the pharmaceutical products constituting the Biotech Cluster of Sidi Abdallah, Algiers

No.	Companies	Planned activities
1	Remede Pharma	Manufacture of non-antibiotic dry forms (tablets, capsules) Manufacture of dry betalactamic antibiotic forms (tablets, capsules)
2	Cypress Algérie	Manufacture of laboratory reagents
3	Sigmamed	Manufacture of dry non-sterile antibiotic and non-antibiotic oral forms, pasty and semi-pasty and injectable sterile forms
4	Imedial Production	Manufacture of injectable forms of the cytotoxic family
5	BAC Pharma	Manufacture of dry non-antibiotic forms, non-sterile liquids for oral and external use
6	MPI	Manufacture of shapes: Unit 1: Dry antibiotics cephalosporins, Unit 2: Non-antibiotic dry, Unit 3: Penicillinic antibiotic driers, Unit 4: Non-antibiotic dry
7	Vecopharm	Manufacture of non-antibiotic dry forms and non-sterile liquid for nasal use
8	Petra Pharm	Manufacture of non-ATB dry forms, non-sterile liquid for oral use, sterile injectable, pasty and semi-pasty liquids. Extension: Liquid of non-antibiotic injectable waste rock and ophthalmic (eye drops)
9	Middle East Pharmaceutical Company Algeria (MID)	Unit ATB: Manufacture of dry forms cephalosporin for injection and for oral use. Non-ATB unit: Injectables (ampoules in solution) - Dry - Non-sterile liquid for oral use - Pastes
10	G B Pharma	Manufacture of dry forms: Bat1: Antibiotics Cephalosporins. Bat2: non-antibiotics
11	Pharmethic	Manufacture of aerosol forms
12	Saidal Norah (Spa)	Manufacture of oncology products in injectable and dry oral form
13	Cial Farm	Manufacture of forms: Non-ATB dry, non-sterile liquid for oral, pasty and semi-pasty use
14	El Kendi	Manufacture of dry non-antibiotic oral forms and powder for inhalation DPI, non-sterile oral, pasty and semi-pasty liquids
15	Biolab	Manufacture of non-sterile liquid forms for oral and external use (antiseptics) pastes and laboratory reagents
16	Sanofi Aventis	Manufacture of non-ATB dry forms, non-sterile oral and semi-pasty liquids
17	Promipharm	Manufacture of non-ATB dry forms
18	Veprod	Manufacture of dry non-ATB forms and non-sterile oral fluids
19	Dar El Arabia	----
20	Ceva Laval	Research, development, manufacture and distribution of veterinary products
21	Abdi Brahim	Manufacture of non-ATB dry forms, non-sterile oral fluids

Source: Directorate of Pharmaceuticals, Ministry of Health, Population and Hospital Reform

We obtained this list of firms constituting the future biotech cluster from the Ministry of Health. After our visit to the site, we found that there were only four operational firms, Abdi Brahim, El Kendi, Dar el Arabia, Ceva Laval: we sent these four firms a questionnaire. To analyse the collected qualitative data, we used the content analysis method. This step begins with selecting and extracting information that may answer our research questions. We first transcribed all the audio recordings and then, after several readings, we coded the texts, and put into units of analysis (themes, words, phrases) regarding the information sought by the topics covered in the interview guide.

The methodology of our research was organised into two phases. In the first phase (quantitative), a questionnaire was distributed to collect information on the localisation and cooperation activities carried out by the various companies and institutions located in the cluster during the period from May to June 2016. The second phase (qualitative) was carried out with three ministerial representatives between November 2017 and January 2018; this was through an interview guide complementing the first stage. A series of interviews with experts was conducted to deepen and validate the information obtained. The interview guide included questions regarding the factors of emergence.

Table 2: Data sources of the study

No.	Established Firms	Not established Firms	Public Authorities
Semi-structured interviews	-Three private firms: Elkindi Albarabia Firm Abdi	-A private firm Public Saidal	-Person in charge at Ministry of Health -Person in charge at Department of Industry -Responsible person at the National Agency of Technological Parks (ANPT) -Responsible person at the New Town of Sidi Abdallah (VNSA)
Other data	-Telephone exchanges with private firms: Ceva laval - Exploratory talks	Telephone exchanges Exploratory talks Sites	-Websites -Telephone exchanges -Internal documentation: studies, reports -Exploratory talks

Source: Authors

Salient Features of Sidi Abdallah's Biotechnology Cluster

At the academic level, little research has been devoted to the study of clusters in Algeria (Djeflat, 2013; Pommier, 2014; Belkacem et al., 2014), and still less in the field of biotechnology. An interesting analysis of the territorial distribution of industrial activities in Algeria (Belkacem et al., 2014) showed that in early 2010 there was no "industrial cluster", i.e., clusters of industrial enterprises with significant weight. This weakness of the industrial fabric is the consequence of the process of deindustrialisation that began in the 1980s. Since 2000, Algeria has adopted a public policy oriented to the creation of technology areas in the hope of involving all actors in the innovation process. In this context, the National Agency for the Promotion and Development of Technology Parks (ANPT) was created in 2007 under the supervision of the Ministry of Post, Information and Communications Technology (MPTIC). This agency represents a new instrument of the state in designing and implementing national policy for the promotion and development of technology parks. The launch of technology parks in Algeria was a turning point in public discourse: territorial scale should now be at the service of competitiveness, and the state must draw this effective geography (Djeflat, 2010, 2013). The Ministry in charge of regional planning has approved the National Scheme of Territory Development (SNAT) and introduced the concept of competitiveness and competence cluster. It brings together, on the same site or in a network of several Wilaya (the equivalent of city in Algeria; there are 48 wilayas), various skills: training and research centres, large porting companies, SMEs, start-ups (MATET, 2006).

This cluster aims to create a favourable environment for interaction between laboratories in order to establish necessary synergies for the construction of endogenous innovation capabilities. It is the result of a partnership of several American pharmaceutical firms with a set of Algerian ministries: Health, Industry, Higher Education, Labor and Planning. The establishment of technology parks in Algeria is part of an ambitious national strategy for the establishment of the information society, knowledge-based economy, giving absolute priority to the promotion of industry, research and information in the ICT sector. The objective behind promoting the cluster is, first, to develop the national production of medicines by making it available and cheaper, and second, to allow the Algerian Health Ministry to develop this sector as a priority and to bring out a centre of excellence in the field of biotechnology in the Maghreb countries and Africa. The desire to create a pole of competitiveness is part of the framework, to identify the most decisive areas where growth and excellence are best suited to stimulate the development of a country. The New City of Sidi Abdallah already hosts the first cluster of competitiveness and excellence. It consists of identifying and developing high-performing research teams and fields of activity, identifying SMEs and small and medium-sized industries (SMIs) active in these fields, crossing data and defining the first clusters of competitiveness and excellence (MATET, 2005, p.10).

Results

Based on the literature review and the results of the qualitative survey, the aim of this paper was to deepen our knowledge about important factors regarding the emergence of biotechnology clusters. Information was gathered about history, institutional framework and resource composition of the cluster, its networking activities and its general traits. First, regarding the legal nature of firms, the most dominant legal form among the companies studied remains stock companies and one-person limited liability company, with 50% and 33.3%, respectively. This informs us about the profile of companies that will set up on the biotech park by 2025. For the development strategy, these two types could adapt to the mode of governance required by the current and future competitive environment. Only 16.7% of the companies observed are limited liability companies (LLCs). This explains the growing number of local family businesses wishing to establish themselves in the cluster in order to benefit from the know-how of large multinational firms.

We outline the key factors of the cluster emergence process; we have adapted this process to the case of the Sidi Abdallah biotech cluster in Table 3.

Table 3: Triggering factors of emergence

Triggering factors of emergence	Results
Path-dependent and historical events	Absence of trigger elements
The Role of Intermediary Institutions	Minimal
The Importance of Local Demand	Weak demand
Anchor Firms	Absence
The Regulatory Framework	Lack of expertise
Cooperation Inside-outside cluster	Insufficient
Cluster Life Cycle:	Slow but long-sighted
Cluster Critical Mass	Insufficient

Source: Authors

The descriptive data were first analysed by SPSS to determine the general structure of the cluster. In a second step, we looked at how some of these characteristics influenced the emergence of this cluster. The concept of emergence of a peripheral cluster is analysed through the conceptual framework: form of emergence and main factors. Our results will be analysed through this conceptual framework.

Discussion of the Conceptual Framework of Peripheral Cluster Emergence

Much of the research regarding successful industry clusters is based on studies of fully functioning innovation systems, such as Silicon Valley. Biotechnology activities tend to concentrate strongly in specific areas of the globe, such as Cambridge, Massachusetts and San Francisco/San Jose California, both in the USA, and are globally dominant (Cooke, 2002). Previous studies have shown that the industrial dynamics of the biotechnology sector, especially in biopharmaceuticals, strongly favour only a few globally important clusters characterised by well-established relationships between small R&D companies, venture capitalists, big multinational corporations, or service providers. It would seem to be at least difficult, and perhaps entirely impossible, to develop an industry when some or most of these factors are missing. Because biotechnology techniques are so specific and specialised, there is typically not much knowledge transfer through social ties or networking between firms (Viljamaa, 2007).

The aim of this study is to contribute to the development of a body of knowledge of peripheral clusters by presenting an alternative approach to the analysis of key factors that are associated with successful clusters. We borrowed the concept of peripheral cluster from Kasabov (2011) (that he used to qualify the biotech clusters in the United Kingdom in a context of developed countries) to qualify the emergence form of biotech cluster of Sidi Abdallah. We have incorporated some factors in our study that appear in the works of Kasabov (2011), who states:

> *"The author suggested a body of knowledge about the drivers of cluster periphery, including the absence of anchor firms and incentives for attracting them, the loss of anchor small and medium-sized enterprises (SMEs), an inadequate or inappropriate inherited infrastructure, a lack of local capacity in basic science, and a difficulty in attracting star scientists and managers"* (p.839)

to which we have added more factors. This form of cluster emergence, called peripheral, is characterised by eight factors.

Development of Clusters is Path-Dependent and based on Previous Historical Events

The history of each cluster is unique, suggesting that cluster development is both path-dependent and heavily influenced by chance historical events (Kenney et al., 1999). The current economic strengths of a particular region are often based on developments and activities that took place over the course of several decades. The idea of the peripheral cluster implies that such non-core clusters did not benefit from a path-dependency or historical factors that could help them emerge. The periphery countries are those that are less developed than the semi-periphery (India, China, Brazil) and core countries. This thought pattern fits perfectly to the biotechnology sector. Development of peripheral locations may be assisted by generating local capabilities through "global connections" and local connections to institutions of knowledge dissemination and absorption, such as universities (Lagendijk, 1999, 2006; Lagendijk and Lorenzen, 2007; Kasabov, 2010). They remain trapped in position and cannot progress beyond it. They do not benefit from knowledge access and have a weak connection with research centres.
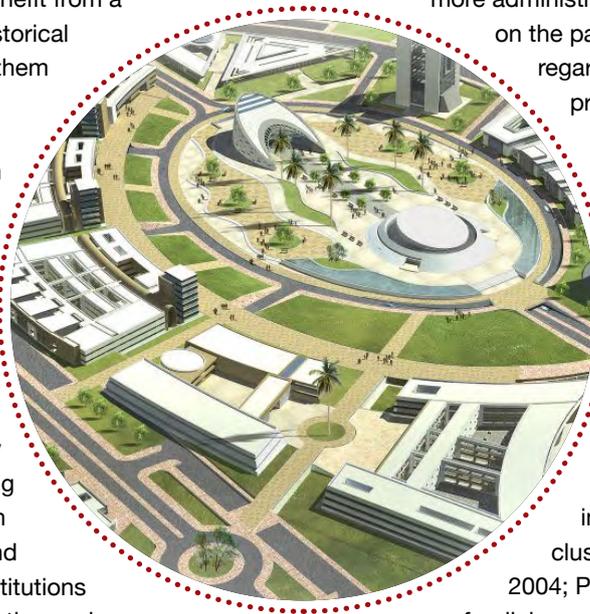
The interview findings have shown a low level of progress and a perception of shortage of institutional support for cluster development. Although the initiative cluster creation is of a top-down nature, carried out by the public authorities, substantial efforts have been needed to guarantee its success. The majority of the companies, questioned on the factors encouraging the emergence of the cluster, agree on the fact that more administrative flexibility is necessary on the part of the public authorities regarding supervision of the project. Since the launch of the project in 2012, the cluster has struggled to emerge. These companies need more support for installation on the site. Moreover, they require more tax benefits, mainly during the first years of the activity. Government policies may also be important for the birth of a cluster (Brenner and Mühlig, 2004; Porter, 1998). Two kinds of policies can be distinguished here. On the one hand, there are policies that were in place before the emergence of a local cluster and indirectly influenced its emergence. On the other hand, there are policies that explicitly try to trigger the emergence of a local cluster (Brenner and Muhlig, 2004).

Minimal Role of Intermediary Institutions

It is extremely difficult to build new clusters from scratch. However, it is also clear that strong, well-designed policy support is needed to overcome the various setbacks that these small clusters tend to face (Viljamaa, 2007). The role of public institutions in this phase could take the form of triggering the emergence factors, in this case inter-firm relationships, and favour the role of intermediary institutions such as technology transfer offices, supporting public investment through the provision of necessary funding, and innovation agencies (Asheim and Isaksen, 2002; Fiore et al., 2011). For our case, we found an absence of intermediary institutions such as technology transfer offices or private incubators.

Weak Local Demand

According to Elola et al. (2012), at the cluster emergence stage, the existence of local demand is usually strongly related to tradition and historical preconditions. According to Brenner (2004), local demand might be a trigger for the emergence of local industrial clusters. According to Djeflat (2015), and that we consider relevant and perfectly applicable to our case, the existence of effective demand for R&D and innovation services is crucial, while reality shows that this demand remains still very weak despite the opening of Algeria's economy through various mechanisms (globalisation, free trade zone, World Trade Organization (WTO) agreements, etc.), and the ensuing pressure of competition. The development of an innovation system at the firm or territorial level could not possibly evolve unless a substantial demand exists for new products and services, and subsequently for R&D activities (Nielsen, 2005).

Anchor Firms Absence

In the early phases of the creation of biotechnology clusters, localisation effects seem to be due to the so-called star scientists who are invaluable to R&D and tend to locate near their home universities, hospitals research centres, and sometimes supportive larger companies that interact with SMEs. The development of a cluster would be realised by the existence of anchor firms and research institutions. As a biotechnology research cluster develops from the "science stage" to commercial applications, the cluster may become dependent on a few anchor firms. In the case of the Sidi Abdallah cluster, the site is built far from all sources of access to knowledge such as universities or research centres. Such findings draw attention to problems that may contribute to early stage and *cluster periphery*. The majority of interviewees attributed the problems of early stage cluster to an inadequate local connectedness. The interviewees, especially SME managers, raised concerns regarding local initiative-taking and the generation of a critical mass of relationships among members of the cluster. Some SME managers pointed out that it was hard to develop contacts with international companies and multinational biotechnology players. This lack of success in networking with multinational companies outside the cluster is linked to the peripheral position of the cluster and its low visibility. Furthermore, cluster periphery may be associated with failed attempts to address visibility issues and reposition a cluster, both internally and internationally. The weakness of the Sidi Abdallah cluster is twofold: on the one hand, the absence of multinational pharmaceutical companies and, on the other hand, the research centres, hospitals and universities in the region. There is neither industrial root nor interaction with other institutions of knowledge. This weakness makes emergence difficult.

Lack of Expertise Regarding the Regulatory Framework

The regulatory framework counts enormously towards the emergence of clusters. The results of the empirical study highlight poorly coordinated regulatory agencies. We noticed a lack of expertise among state and ministerial officers in dealing with biotech products. Although Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreements have been ratified and incorporated into Algerian law, Algeria is not yet a member of the WTO. This feeds doubt among multinational firms who want to invest in Algeria. Furthermore, the emergence of the Sidi Abdallah cluster raises questions of Algeria's comparative advantage (Krugman, 1995) in the field of biotechnology in the areas of skilled labour and investment advantage. In a context of developing countries, the responsibility of public actors is all the more important in actions to create an image and a collective conscience. In a context of market failure, the emergence of clusters in developing countries can be fuelled only by political intervention (Mytelka, 2007). The goal is to create external recognition and develop an identity within the local community (O'Gorman and Kautonen, 2004). Collective consciousness, which is slow to emerge, would gradually lead to the logic of piloting and collective strategies (Pommier, 2006).

Insufficient Cooperation Inside-Outside Cluster

The traditional literature on clusters highlights the importance of collective understanding among stakeholders of the benefits of business-to-business cooperation, for example in resource management, and the opportunity to improve methods of integrating the value chain (Andersson, 2004). A firm will actively participate in cluster activities to identify issues of mutual interest and opportunities for mutual gain (Porter, 2001). While proximity is important for formal and informal flows of knowledge, global linkages are equally essential. In many cases, multinational enterprises have transferred skills and technologies that have played a decisive role in the development of local clusters (Dunning, 2000). Regarding this determinant, interviews with officials from different ministries and the installed firms revealed three important points in relation to the creation of the cluster: the established companies wish to develop partnerships with other firms, expand their activity, and search for other opportunities.

Most companies have maintained relationships and partnerships with other foreign or local firms, or both at the same time. The majority of companies surveyed on relationships with research and training institutions claim to have relationships with training centres (23%), followed by public research centres, international research centres and universities (18%). Partnership encouragement is more necessary than ever, either with foreign or local partners. We note that universities and specialised institutes that represent an essential engine for the development of clusters and their support are relatively far from the park.

Regarding the availability of contact with the Algerian diaspora, the results show that the majority of respondents say they do not have contact (83.33%). On the other hand, the results also show that all firms work with foreign experts and consultants. This result shows the need to collaborate with overseas firms on technology transfer and R&D. The common idea is the search for geographic and organisational proximity.

We also find that most firms use the Internet for inter-firm communication. More than 40% of companies have used this form of communication, followed by telephone, which allows actors to communicate with internal and external partners. Finally, the study found that the most used means of communication is face-to-face, up to 20%. This means of communication is considered important in order to consolidate and strengthen collaboration and coordination between all the companies and actors in the same territory.
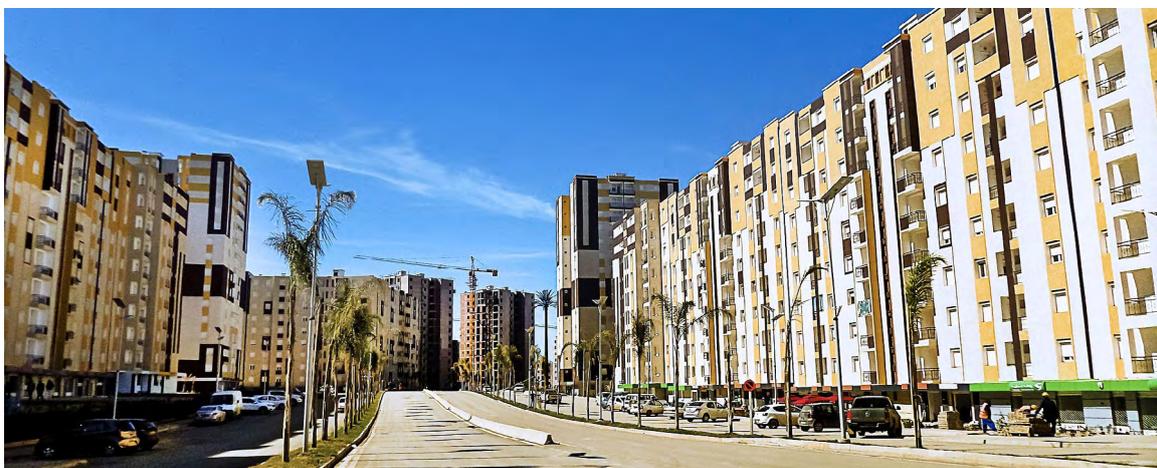
Cluster Life Cycle: Slow but Long-sighted

Since this is an organised cluster, using top-down logic, the process of emergence of the biotech cluster strongly depends on the process of realisation of *Schéma National d'Aménagement du Territoire* SNAT 2025. This raises the question of the life cycle of the cluster. The idea of a life cycle and stage of development within a cluster rejects the traditional approach of clusters deemed too static and unable to account for their dynamics of evolution and structuring (Swann et al., 1998; Pandit et al., 2002; Feser and Luger, 2003; Brenner, 2004). A set of works (Rosenfeld, 2003; Swann et al., 1998) distinguish four phases of development that are themselves a function of the processes of emergence, diffusion, commercialisation and decline of a technology. These are the development cycle of:

(1) embryonic clusters (initial stages of development);
(2) established clusters for which there are still growth prospects (emerging);
(3) mature clusters (difficulties to grow); and
(4) clusters in decline.

In the initial phase, material needs (e.g., financial, infrastructure, prospecting and market evaluation) seem to predominate (Favoreu et al., 2008, p.171).

In the initial stages (emergence and development phase of clusters) and due to the emerging nature of technologies and markets, intervention should focus on facilitating access to infrastructure and venture capital financing (Bianchi et al., 1996). We can conclude that, in the present state, it is in an embryonic phase. The emergence of the cluster is dependent on the evolution of works in the new city of Sidi Abdallah.

SNAT 2025 has been implemented in two phases. A first phase 2007-2015, during which the spatial planning policy will remain mainly marked by the voluntary action of the State. The existence of a life cycle of clusters and differentiated needs arise from the assumption that policies and interventions vary over time and have to adapt to changing needs and characteristics of the cluster (Dalum et al., 2005). According to an Algerian expert involved in the project to realise technological parks in Algeria, there is a heavy establishment of a pharmaceutical and biotechnological centre that constitutes an economic lever for the region or the whole country, offering to national and foreign investors the possibility of developing their projects on a site:

> "the failure is due to the slowness of the various Algerian players involved in the process, the project being multi-sectorial. According to him, the Algerians took a long time to set up an inter-ministerial committee. For their part, the Americans had to set up the roadmap to be proposed to the Algerian side" (Smail Chikhoune[1]).

Interviews with representatives of Ministries of Health, higher education and a representative of the ANPT reflect not only a slowness of these actors but also a lack of definitions of the missions of each one.

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[1] President of the Algerian American Business Council. He is involved in the realisation of the Algerian-American partnership in biotechnology.

Insufficient Cluster Critical Mass

In order to achieve internal dynamism, the cluster must mobilise many actors and reach a kind of critical mass. The presence of critical mass can perpetuate industrial restructuring in a cluster. On the other hand, critical mass can serve as a "buffer" and make a cluster resistant to exogenous shocks or other types of pressures including business "losses", even when they could be considered "key companies" (Andersson, 2004, p.28). In our case, the installation of domestic producers, such as Groupe Saidal[2], is planned soon. According to officials at the Ministry of Health and a representative of Groupe Saidal, this installation is subject to the state of advancement and development of the cluster, that is to say, the cluster must reach critical mass with a sufficient number of installed and operational enterprises. The Ministry of Higher Education and Scientific Research will intervene later when all the private companies are installed and have begun to produce.

The construction of research centres and research institutes specialised in biotechnology will be undertaken under the supervision of the Ministry of Health and the Ministry of Higher Education through the National Fund for Research (FNR). Support for entrepreneurial processes takes the form of financial aid (*Agence Nationale de Développment Investissement* (ANDI) investment funds), subsidies and specialised infrastructure, such as incubators. On the other hand, our empirical study highlights significant weaknesses in public policy in terms of support and assistance to companies, which are reflected in the absence of incubators in biotech. Regarding the availability of hosting by an incubator in the biotech clusters, the results show a total absence of incubators; this demonstrates all the more that this new cluster is currently under construction. In this way, the cluster will be brought closer to international standards in terms of innovation and research. The absence of critical mass can inversely make a territory vulnerable to the loss of specific resources and skills that are essential to the development of a cluster (Asheim et al., 2003). We can conclude that, to date, the critical mass in the Sidi Abdallah cluster has not yet been reached.

[2] The largest pharmaceutical company in Algeria.

Conclusions

Figure 1 shows that the lack of one or all of these key factors could lead to the emergence of peripheral clusters. Every determinant counts so much in the process of emergence. To move from a phase of peripheral emergence to a central emergence, these factors could be improved. It is evident from this figure that biotech's actors can increase the cluster emergence process through enhancing these factors that could be barrier factors if any effort is accomplished.
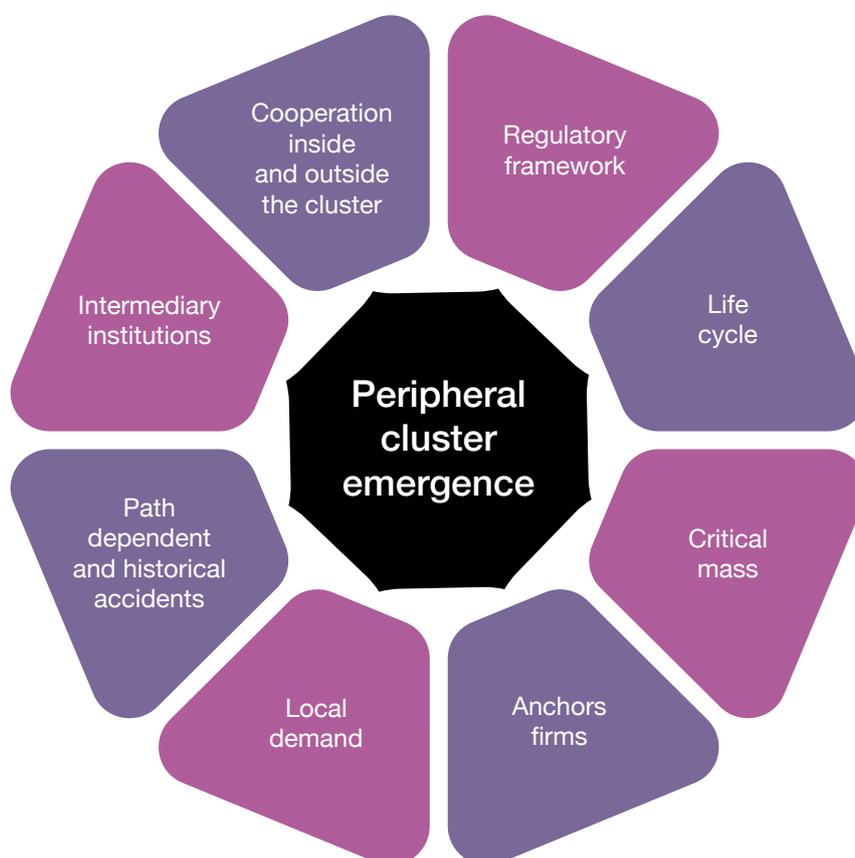

Figure 1:
Conceptual framework of peripheral cluster emergence

Source: Authors

The results of our research contribute to the territorial dynamics of emerging cluster literature in two ways. First, this study also represents one of the very few empirical studies conducted in the biotech cluster in Algeria and, as such, may offer some insights on the importance of the territorial dynamics in the field of biotechnology in developing countries. Algeria's transition to the market economy also implies a transition to the knowledge-based economy, where strategic territories become the engine. Second, our study contributes to the understanding of the emergence of the biotech park in Algeria that is in a phase that we call "peripheral cluster emergence". At this stage, cluster policy is often ineffective in peripheral regions with weak institutions, a lack of coordination between the different actors involved in the project, and significant barriers to knowledge production and exchange (Calignano et al., 2018).

The originality of this work stems from two aspects. The first is that, for the first time, we use the "emergence" paradigm to analyse biotech clusters. The second, this study represents one of the very few empirical studies conducted in biotech clusters in Algeria and, as such, may offer some insights on the importance of the territorial dynamics in the field of biotechnology.

Finally, the present research has some limits: results should be interpreted with caution due to the moderate size of our sample. Nevertheless, the findings of this study can be used to advise policy makers since they have become more and more interested in local industrial cluster emergence. This research has implications for public sector policy and theory of peripheral clusters, thus enriching academic research that frequently concentrates on established clusters that have grown organically.

References

Ahedo, M. (2004): Cluster Policy in the Basque Country (1991-2002): Constructing 'Industry-Government' Collaboration through Cluster-associations. *European Planning Studies*, Vol. 12, No. 8, pp.1097-1113.

Andersson, T., Schwaag Serger, S., Sorvik, J. and Wise Hansson, E. (2004): *The Cluster Policies Whitebook*, IKED, The Competitiveness Institute.

Arbuthnott, A. and von Friedrichs, Y. (2013): Entrepreneurial renewal in a peripheral region: the case of a winter automotive-testing cluster in Sweden. *Entrepreneurship & Regional Development: An International Journal*, Vol. 25, Nos 5-6, pp.371-403, DOI: 10.1080/08985626.2012.748095.

Asheim, B.T. and Isaksen, A. (2002): Regional innovation systems: The integration of local "sticky" and global "ubiquitous" knowledge, *Journal of Technology Transfer*, Vol. 27, No. 1, pp.77-86.

Asheim, B.T, Isaksen, A., Nauwelaers, C. and Tödtling, F. (2003): *Regional innovation policy for small-medium enterprises*, Edward Elgar, Celtenham.

Aydalot, P. (1986): *Milieux innovateurs en Europe*. Paris, GREMI.

Bathelt, H. and Taylor, M. (2002): Clusters, Power and Place: Inequality and Local Growth in Time-Space, *Geografiska Annaler*, Series B (Human Geography), Vol. 84, No. 2, pp.93-109.

Becattini, G. (1990): The Marshallian industrial districts as a socio-economic notion, in Pyke, F., Becattini, G. and Sengenberger, W. (Eds): *Industrial Districts and Inter-firm Co-operation in Italy*, International Institute for Labour Studies, Geneva, pp.37-51.

Belkacem, D., Herizi, R. and Moussi O. (2014): Etude des clusters industriels en Algérie, *Economics & Strategic Management of Business Process*, Vol. 2, pp.161-166.

Bianchi, P., Miller, L.M., Bertini, S., Crestanello, P., Durante, A. and Magnatti, P. (1997): *The Italian SME Experience and Possible Lessons for Emerging Countries*, UNIDO.

Brenner, T. (2000): *Industrial districts: a typology from an evolutionary perspective*. Paper presented at the DRUID Conference 2000, Rebild, July.

Brenner, T. (2004): *Local Industrial Clusters. Existence, Emergence and Evolution*, London and New York: Routledge.

Brenner, T. and Muhlig, A. (2004): *Factors and Mechanisms Causing the Emergence of Local Industrial Clusters – A Meta-Study of 159 Cases*. Mimeo, Max Planck Institute for Research into Economic Systems, Jena.

Brenner, T. and Mühlig, A. (2013): Factors and Mechanisms Causing the Emergence of Local Industrial Clusters: A Summary of 159 Cases, *Regional Studies*, Vol. 47, No. 4, pp.480-507, DOI: 10.1080/00343404.2012.701730.

Bresnahan, T., Gambardella, A. and Saxenian, A. (2004): 'Old Economy' Inputs for 'New Economy' Outcomes: Cluster Formation in the New Silicon Valleys, *Industrial and Corporate Change*, Vol. 10, No. 4, pp.835-860.

Calignano, G., Fitjar, R.D. and Kogler, D.F. (2018): The core in the periphery? The cluster organization as the central node in the Apulian aerospace district, *Regional Studies*, Vol. 52, No. 11, pp.1490-1501.

Camagni, R. and Capello, R. (1995): Milieux Innovateurs and Collective Learning: From Concepts to Measurement, in Acs, Z.J., de Groot, H.L.F. and Nijkamp, P. (Eds): *The Emergence of the Knowledge Economy: A Regional Perspective*, Springer, Berlin, Heidelberg, pp.15-45.

Casper, S. (2007): How Do Technology Clusters Emerge and Become Sustainable? Social Network Formation and Inter-firm Mobility within the San Diego Biotechnology Cluster, *Research Policy*, Vol. 36, No. 4, pp.438-455.

Chiaroni, D. and Chiesa, V. (2006): Forms of Creation of Industrial Clusters in Biotechnology, *Technovation*, Vol. 26, No. 9, pp.1064-1076.

Cooke, P. (1998): Introduction: origins of the concept. In Braczyk, H.J., Cooke, P.N. and Heidenreich, M. (Eds): *Regional Innovation Systems: The Role of Governances in a Globalized World*. London: UCL.

Cooke, P. (2002): *Knowledge Economies: Clusters, Learning and Cooperative Advantage*, London and New York: Routledge.

Cowan, R. and Cowan, W. (1998): On Clustering in the Location of R&D: Statics and Dynamics, *Economics of Innovation and New Technology*, Vol. 6, Nos 2-3, pp.201-229.

Cummings, A. and Djeflat, A. (2015): *Emergence*

of territorial Systems of Innovation in Developing Countries: building a conceptual framework based on Latin American and North African experiences, 13th Globelics International Conference, September, Cuba.

Da Rocha, A., Kury, B. and Monteiro, J. (2009): The diffusion of exporting in Brazilian industrial clusters. *Entrepreneurship & Regional Development: An International Journal*, Vol. 21, Nos 5-6, pp.529-552.

Dalum, B., Pedersen. C.Ø. and Villumsen. G. (2005): Technological life-cycles: lessons from a cluster facing disruption, *European Urban & Regional Studies*, Vol. 12, No. 3, pp.229-246.

Dicken, P., Kelly, P.F., Olds, K. and Yeung, H.W.-C. (2001): Chains and networks, territories and scales: towards a relational framework for analysing the global economy, *Global Networks*, Vol. 1, No. 2, pp.89-112.

Djeflat, A. (2006): Le système de support technologique (SST) au Maghreb: cas des PME en Algérie et en Tunisie, in Khelfaoui, H. (Ed.): *L'intégration de la science au développement*, *expériences maghrébines*, Ed ADEES, Publisud, Paris.

Djeflat, A. (2010): *Building Science*, *Technology and Innovation Systems in Africa: experiences from the Maghreb*, Adonis & Abbey, London, UK, 300pp.

Djeflat, A. (2013): *Stratégies d'acteurs dans le développement économiques des territoires et le secteur des TIC*, rapport scientifique, CREAD, 2013.

Djeflat, A. (2015): Emerging Innovation Systems (EIS): A New Conceptual Framework for Analysing GCC and Maghreb Countries Policies, *International Journal of. Innovation and Knowledge Management in the Middle East and North Africa*, Vol. 4, No. 2, pp.75-85.

Dunning, J.H. (2000): *Regions, Globalizations and the Knowledge-Based Economy*, Oxford University Press.

Edquist, C. and Johnson, B. (1997): Institutions and organisations in systems of innovation, in Edquist, C. (Ed.): *Systems of Innovation: Technologies*, *Institutions and Organizations*. London and Washington: Pinter/Cassell Academic.

Elola, A., Valdaliso, J.M., López, S.M. and Aranguren, M.J. (2012): Cluster life cycles, path dependency and regional economic development: insights from a meta-study on Basque clusters. *European Planning Studies*, Vol. 20, No. 2, pp.257-279.

Favoreu, C., Lechner, C. and Leyronas, C. (2008): Légitimité des politiques publiques en faveur des clusters, *Revue française de gestion*, Vol. 3, pp.157-178.

Feser, E.J. and Luger, M.I. (2003): Cluster analysis as a mode of inquiry: its use in science and technology policymaking in North Carolina, *European Planning Studies*, Vol. 11, No. 1, pp.11-24.

Fiore, A., Grisorio, M.J. and Prota, F. (2011): Regional innovation systems: which role for public policies and innovation agencies? Some insights from the experience of an Italian region, *European Planning Studies*, Vol. 19, No. 8, pp.1399-1422.

Florida, R. (1995): Toward the learning Region, *Futures*, Vol. 27, No. 5, pp.527-536.

Fornahl, D., Henn, S. and Menzel, M.P. (2010): *Emerging Clusters*, *Theoretical*, *Empirical and Political Perspectives on the Initial Stage of Cluster Evolution*, Edward Elgar, London.

Freeman, C. (1987): *Technology policy and economic performance: lessons from Japan*. London: Pinter.

Fromhold-Eisebith M. and Eisebith, G. (2005): How to institutionalize innovative clusters? Comparing explicit top-down and implicit bottom-up approaches, *Research Policy*, Vol. 34, No. 8, pp.1250-1268.

Fujita, M. and Thisse, J. (2002): *Economics of agglomeration*, Cambridge University Press, New York.

Giblin, M. and Ryan, P. (2012): Tight clusters or loose networks? The critical role of inward foreign direct investment in cluster creation. *Regional Studies*, Vol. 46, No. 2, pp.245-258, DOI: 10.1080/00343404.2010.497137.

Gupta, V. and Subramanian. R. (2008): Seven perspectives on regional clusters and the case of Grand Rapids office furniture city. *International Business Review*, Vol. 17, No. 4, pp.371-84.

Hamdouch, A. (2011): Investigating cluster emergence and evolution dynamics, *Région et Développement*, Vol. 13, pp 269-278.

Hendry, C., Brown, J. and Defillipi, R. (2000): Regional clustering of high technology-based firms: opto-electronics in three countries, *Regional Studies*, Vol. 34, No. 2, pp.129-144.

Johannisson, B., Caffarena, L.C., Cruz, A.F.D., Epure, M., Pérez, E.H., Kapelko, M., Murdock, K., Nanka-Bruce, D., Olejárová, M., Lopez, A.S., Sekki, A., Stoian, M.-C., Tötterman, H. and Bisignano, A. (2007): Interstanding the industrial district: contrasting conceptual images as a road to insight. *Entrepreneurship & Regional Development: An International Journal*, Vol. 19, No.

6, pp.527-554.

Kaufmann, J.-C. (1996): *L'entretien compréhensif*. Paris: Nathan.

Kasabov, E. (2011): Towards a theory of peripheral, early-stage clusters, *Regional Studies*, Vol. 45, No. 6, pp.827-842.

Kenney, M. and Von Burg, U. (1999): Technology entrepreneurship and path dependence: industrial clustering in Silicon Valley and Route 128. *Industrial and Corporate Change*, Vol. 8, No. 1, pp.67-103.

Kowalski, A.M. and Marcinkowski, A. (2014): Clusters versus cluster initiatives, with focus on the ICT sector in Poland. *European Planning Studies*, Vol. 22, No. 1, pp.20-45.

Krugman, P. (1991): History and industry location: the case of the manufacturing belt, *The American Economic Review*, Vol. 81, No. 2, pp.80-83.

Krugman, P. (1995): *Development Geography and Economic Theory*, Cambridge Press.

Lagendijk, A. (1999): Regional anchoring and modernization strategies in non-core regions: Evidence from the UK and Germany, *European Planning Studies*, Vol. 7, No. 6, pp.775-93.

Lagendijk, A. (2006): Learning from conceptual flow in regional studies: Framing present debates, unbracketing past debates, *Regional Studies*, Vol. 40, No. 4, pp.385-399.

Lagendijk, A. and Lorentzen, A. (2007): Proximity, knowledge and innovation in peripheral regions. On the intersection between geographical and organizational proximity, *European Planning Studies*, Vol. 15, No. 1, pp.457-466.

Lundvall, B-Å. (1992): *National Systems of Innovation: Towards a Theory of Innovation and Interactive learning*, London: Pinter.

Maggioni, M.A. (2002): *Clustering dynamics and the location of high-tech-firms*. Springer Science & Business Media.

Markusen, A. (1996): Sticky places in slippery space: A typology of industrial districts. *Economic Geography*, Vol. 72, No. 3, pp.293-313.

Marshall, A. (1890): *Principles of economics: an introductory volume*, London, Macmillan.

Marshall, A. (1930): *Principles of economics*, 8th edn. Macmillan, London.

Ministère de l'Aménagement du territoire, de l'Environnement et du Tourisme (2005): *La Mise en œuvre du method national d'Aménagement du territoire* (SNAT) 2025.

Ministère de l'Aménagement du territoire, de l'Environnement et du Tourisme (2006): *Les Pôles d'excellence et de compétitivité*, Alger.

Morgan, K. and Nauwelaers, C. (1998): *Region innovation strategies: the challenge for less favoured regions*. Jessica Kingsley, London.

Moulaert, F. and Sekia, F. (2003): Territorial innovation models: a critical survey, *Regional Studies*, Vol. 37, No. 3, pp.289-302.

Mytelka, L.K. (2007): *From clusters to innovation systems in traditional industries, in industrial clusters and Innovation systems in Africa: Institutions, market and policy*, United Nations University, New York.

Nelson, R.R. (1993): *National Innovation Systems: A Comparative Study*, Oxford: Oxford University Press.

Nielsen, R.N. (2005): *Does university education contribute to human resources development in the Danish system of innovation and competence building?*, DRUID Academy Winter 2005 PhD Conference on Industrial Evolution and Dynamics, DRUID, Copenhagen Business School, Denmark.

O'Gorman, C. and Kautonen, M. (2004): Policies to promote new knowledge-intensive industrial agglomerations, *Entrepreneurship and Regional Development*, Vol. 16, No. 6, pp.459-479.

Orsenigo, L. (2006): Clusters and clustering in biotechnology: stylised facts, issues and theories. In Braunerhjelm, P. and Feldman, M.P. (Eds): *Cluster Genesis*. Oxford, UK: Oxford University Press, pp.195-218.

Pandit, N.R., Cook, G.A.S. and Swann, G.P. (2002): A comparison of clustering dynamics in the British broadcasting and financial services industries, *International Journal of the Economics of Business*, Vol. 9, No. 2, pp.195-224.

Pickernell, D., Rowe, P.A., Christie, M.J. and Brooksbank, D. (2007): Developing a framework for network and cluster identification for use in economic development policy-making. *Entrepreneurship & Regional Development: An International Journal*, Vol. 19, No. 4, pp.339-358.

Pietrobelli, C. and Barrera, T.O. (2002): Enterprise clusters and industrial districts in Colombia's fashion sector. *European Planning Studies*, Vol. 10, No. 5, pp.541-562.

Pommier, P. (2006): *Pilotage des clusters*, *outils et méthodes*, Les cahiers du CDIF, n° 12, 2006.

Pommier, P. (2014): *Clusters au Maghreb: Vers un modèle de cluster maghrébin spécifique*, IPEMED, Paris.

Porter, M.E. (1990): *The Competitive Advantage of Nations*, New York, Free Press.

Porter, M.E. (1998): *The Competitive Advantage of Nations (with a new foreword),* New York, Free Press.

Porter, M.E. (2001): *Clusters of Innovation: Regional Foundations of U.S. Competitiveness*, Council on Competitiveness, Washington, DC.

Pratt, A.C. (2004): Creative Clusters: Towards the governance of the creative industries production system?, *Media International Australia*, Vol. 112, No. 1, pp.50-66.

Ritvala, T. and Kleymann, B. (2012): Scientists as Midwives to Cluster Emergence: An Institutional Work Framework. *Industry and Innovation*, Vol. 19, No. 6, pp.477-497.

Rosenfeld, S.A. (2003): Expanding opportunities: cluster strategies that reach more people and more places, *European Planning Studies*, Vol. 11, No. 4, pp.359-377.

Saurwein, F. (2011): Regulatory Choice for Alternative Modes of Regulation: How Context Matters. *Law & Policy*, Vol. 33, No. 3, pp.334-366.

Schmitz, H. (1995): Collective efficiency: Growth path for small-scale industry, *The Journal of Development Studies*, Vol. 31, No. 4, pp.529-566, DOI: 10.1080/00220389508422377.

Scott, A. (2006): Origins and Growth of Hollywood Motion-Picture Industry: The first three Decades, in Braunerhjelm, P. and Feldman, M.P. (Eds): *Cluster Genesis: Technology-Based Industrial Development*, Oxford, UK: Oxford University Press, pp.17-37.

Scott, A.J. (1992): The role of large producers in industrial districts: a case study of high technology systems houses in southern California. *Regional studies*, Vol. 26, No. 3, pp.265-275.

Shin, D.-H. and Hassink, R. (2011): Cluster life cycles: the case of the shipbuilding industry cluster in South Korea. *Regional Studies*, Vol. 45, No. 10, pp.1387-1402, DOI: 10.1080/00343404.2011.579594.

Swann, G.M.P., Prevezer, M. and Stout, D. (1998): *The Dynamics of Industrial Clustering – International Comparisons in Computing and Biotechnology*. Oxford University Press, New York.

Viljamaa, K. (2007): What does it take to build a local biotechnology cluster in a small country? The case of Turku, Finland, Chapter 3 in Krattiger, A., Mahoney, R.T., Nelsen, L., Thomson, J.A., Bennett, A.B., Satyanarayana, K., Graff, G.D., Fernandez, C. and Kowalski, S., *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*, MIHR: Oxford, UK and PIPRA: Davis, USA, pp.281-294.

Biography

Abdelkader Hamadi is currently an associate researcher at the Center for Research in Applied Economics for Development (CREAD), Algeria. For the past year, he has turned to computational statistics applied to health at the University of Lille 2 (ILIS). He has a PhD in Health Economics from the University of Lille 1, where he used to teach statistics. His research work mainly focusses on innovation economics and health economics issues in the MENA and African region. He is also a reviewer in many international journals on development. He has published many articles in various international journals.

Younes Ferdj is currently a permanent researcher at the Center for Research in Applied Economics for Development (CREAD), in charge of the Economic Integration research team. He has a PhD in Economics and Applied Statistics from the National School of Statistics (ENSSEA). State engineer in statistics: applied statistics option. His research focusses mainly on development economics, spatial economics, territorial development, regional integration, panel econometrics, and spatial econometrics. He is the author of three publications in national journals.

Aimad Datoussaid is currently an associate professor at the Faculty of Economic Sciences, Management and Commercial Sciences of the University of Djilali Lyabes, Sidi Bel Abbes (Algeria). He is both a member of the Management of Innovation and Marketing research laboratory council and of the doctoral training committee in management sciences at the same university. He is currently directing three doctoral theses and a research project entitled *Knowledge management and wealth creation in industrial SMEs excluding Hydrocarbons in the West-Algeria region*. He is also an associate member of the Maghreb network (Maghtech.org) for the integration of science and technology in Maghreb development (University of Lille, France). He is the author of several national and international publications.