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Bouhari, Mohamed and Khabbouchi, Rafika and Mathlouthi, Yamina

Faculty of economics and management, El Manar university, Tunis, Tunisia, ESPRIT Private School of Engineering and Technology, El Ghazzala, Tunisia, SUPCOM, Higher School of Communications, El Ghazala, Tunisia

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# What Cluster Model for the Competitiveness of Tunisian Companies?

Mohamed Bouhari, Rafika Khabbouchi, Yamina MATHLOUTHI

Mohamed Bouhari, Faculty of economics and management, El Manar university, Tunis, Tunisia; mohabouh@yahoo.com

Rafika Khabbouchi, ESPRIT Private School of Engineering and Technology, El Ghazzala, Tunisia; khabbouchi\_rk@yahoo.fr

Yamina Mathlouthi, SUPCOM, Higher School of Communications, El Ghazala, Tunisia, yamina.mathlouthi@yahoo.fr

**Abstract—** This paper gives purpose to identify the factors of the constitution of "the Tunisian cluster" in an environment open to competition. It is a contribution to the debate on the importance of clusters for competitiveness of small and medium enterprises (SMEs) to make more innovative and competitive regions and to promote strategically important sectors in technology.

Approaches based on the knowledge economy grew by better integrating forms of proximity, organizational, institutional and geographical, (Torre and Rallet 2005) and relational (Boshma, 2005).

An empirical study was conducted on a sample of Information and Communication Technologies ICTs'companies. The results show that the lack of attractiveness of ICT Tunisian companies to form clusters is not due to a lack of suitable infrastructure but to the absence of relations involved in a partnership approach or localized nature between higher education, research centers, industry training and organization, enabling to carry out scientific and technical projects.

**Keys words:** Clusters, technology centers, geographical proximity, organized proximity.

## I. INTRODUCTION

For years, economic policies in developed countries are oriented towards strengthening the capacity to innovate based on geographical grouping of organizations (companies, laboratories ...) called "clusters". This interest in clusters is related to the discovery of the importance of geographical proximity, institutional and organizational structures, the dissemination of knowledge, skilled human capital to promote innovation and competitiveness of firms and regions.

Clusters are defined as a process of concentration of firms in a domain and in a given territory. They rely on collaborations between firms, research centers and public authorities. As Antonelli stressed, (2000); Massard and Torre (2004); Duranton et al. (2008), competitiveness clusters and technology parks are the will of the networking of innovation stakeholders - industry, research and training - on a geographical space in order to encourage the emergence of local synergies in innovation.

In Tunisia, the process of the formation of clusters appointed clusters originated in the mid 2000. It focused on three sectors, namely textiles and clothing, food and technologies information and communication (ICT). The objective was to develop synergies and cooperation between

businesses, research laboratories and training institutions, to allow Tunisian companies to take a position in their fields in Tunisia and abroad. Despite the multiplication of groupings and constitutes an encouraging sign, the number of clusters is still limited today.

Tunisian companies are - they ready to engage in the Cluster Launcher? What conditions encourage them to participate? And what are the key factors for a successful cluster?

This will be the purpose of this article, tracing the main stages of the formation of a cluster" the Tunisian", formed mostly by SMEs. This will allow us to better understand the debate as to the tension in the cluster policy between territorial logic anchor companies and logic insertion in science-industry research networks.

The elements of the innovative cluster as research organizations, custodians of knowledge and intensive service companies have questioned the geographical proximity as the sole determinant of cluster-wide (Preissl and Solimene, 2003).

An econometric literature, listed later in the "geography of innovation" has provided since the early 1990s, a systematic approach to localized phenomena. This literature has confirmed the localized nature of knowledge spillovers (Rosenthal and Strange, 2004), but indicated that the geographic dimension is intricately linked to other mechanisms such as technological proximity, interpersonal and labor mobility. Other forms of cognitive proximity, institutional, organizational or social (Loilier and Tellier, 2004) can support within the cluster innovation process (Boschma, 2005; Torre and Rallet, 2005).

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This article includes three sections. After this introduction, the first section is the question of the

identification of clusters. The second section will return to some theoretical foundations of dynamic clusters of factors and present their emergence and the main empirical identification methods implemented. The third section presents the model used to identify the conditions for success of a cluster. This last section will give way to a brief conclusion.

II. OVERVIEW of CLUSTER DEVELOPMENT TRAJECTORIES

A. Elements of definition

The cluster is a network that develops in a given territory. It is often considered as a system that is strengthened from within, and which produces wealth endogenously in a given territory. According Rallet & Torre (2005), the cluster is characterized by the existence of a geographical and relational proximity. It highlights collective inter-institutional cooperation and performance related to spatial proximity and density of social and professional relationships. It is this framework to understand the drivers of economic competitiveness of regions and nations.

The available literature on clusters highlighted many successes in several countries. The government has played a facilitating role in promoting cooperation and innovation within clusters. The concept of cluster refers first to the United States to an industry geographic concentration of actors connected by often spontaneous business networks. In some countries - Mexico, Brazil, India, Peru, Taiwan, the term cluster refers to spatial concentrations of small and medium enterprises competing or complementary activities on more or less specialized segments, and achieving results also significant in terms contribution to national sectoral output and exports.

In Europe, a relatively recent development is pushed by the government. In France, the clustering process started in 2005. At the end of reconciliations and labeling of new clusters, 71 competitiveness clusters existed in 2007.

In Africa, the clusters have the characteristics of being less numerous, being smaller and less developed. The few industrial platforms do not constitute genuine clusters and are close to the points of single reduction activities

B. The different forms of Cluster

The reality of the clusters in the field began with the creation of embryos for synergy between pre-existing businesses. Clusters can be divided into three categories: traditional clusters, cluster - planning and the neo-clusters.

| Categories           | Characteristics  |
|----------------------|--|
| <b>Tradi-Cluster</b> | This form reflects the initial conditions of the industrialization process: exploitation of human and natural resources, small and medium enterprises founded by local entrepreneurs (family capital) and based on simple technology and traditional know-how (Schmitz and Nadvi, 1999). |
| <b>Plani-Cluster</b> | This form reflects a new reality in the context of a deliberate economic development operation. It is based on an agglomeration project (public project)   |

|                    |   |
|--------------------|---|
|                    | which is funded by the government and run by a local institution (Curlier, Samson, 2006). Manufacturing sectors are the first concerned. This is to build private-private or public-private partnerships by initiating a sharing collective resources or infrastructure.  |
| <b>Neo-Cluster</b> | This form relates to the grouping of companies specialized in high-end products and / or competitive internationally. The concern of the training of skilled labor and technological improvement motivates the competitors to regroup. Sharing of infrastructure and common service organization performing subcontractor network are also present. So this is the most advanced form of emerging clusters. |

C. Determinants of clusters: Theoretical study

In most work on clusters, the emergence and dynamics of cluster structuring falls relatively antagonistic dichotomous logic (Bresnahan et al 2004. Fromhold-Eisebith and Eisebith, 2005; Chiaroni and Chiesa, 2006; Casper, 2007). For years, we are witnessing the emergence of a new form of industrial organization in which clustering strategies are structuring. For this reason, we will discuss a logic beyond the traditional boundaries of clusters, highlighting the key role of the combination of different forms of proximity (cognitive, organizational, social, institutional) in the form of an organized nearby. This logical approach than purely "spatial" of the problem of clusters, which gives more importance to social networks, trust, reputation, culture and rules.

Analyzes in terms of proximity to the proposed approach proximiste (Bouba Olga O. J. and Zimmermann, 2004). In an economy characterized by high mobility of businesses and individuals, proximity plays an important role especially for business innovation and cooperation. A distinction is made between two main forms of proximity: geographic and organized (Rallet A. and A. Torre, 2004; Caron A. and A. Torre, 2004). The physical proximity " deals with the separation in space and links in terms of distance " while organized proximity " deals with the separation in space and links in terms of organization " ( J. Gilly and Torre A. , 2000).

Geographical proximity is a discriminating component since a dense conglomeration of companies attracts buyers, suppliers and labor.

The significance of this distinction lies in the cross-analysis of these two forms of proximity in order to understand the interactions between actors (businesses, institutions etc.) and territories.

To deepen the concept of organized proximity, Gilly and Lung Y. J. (2004) mobilized an explicitly institutional approach to distinguish two dimensions: organizational and institutional organized in the vicinity. Organisational proximity

takes " to additional resources held by potentially capable actors to participate in the same activity finalized meso-economic nature , within the same organization (large group) or a group of organizations ( cooperation network sector business , local productive system ... ) "( J. Gilly and Lung Y., 2004). Institutional proximity is based in turn on " the adherence of actors to common action rules, explicit or implicit (habits) and in some situations, a common system of representations or values ' (Gilly and Lung J. Y., 2004).

Organized proximity becomes a necessity as neighboring firms may be in conflict, while others can collaborate remotely located.

A cluster usually has a specific image and a reputation (branding, naming, etc.), support or state supervision (public

### III. DETERMINANTS of CLUSTERS: EMPIRICAL ANALYSIS

In this section we discuss, First of all, the existence of clusters of regions in Tunisia. Next, we describe the characteristics of the three areas that allow us to study the determinants of clusters. In the end, we present the methodology, recalling the econometric method used in the models of the determinants of clusters.

#### A. Clusters Tunisia: Towards a functional typology draft

The industrial fabric of Tunisia has approximately 5700 companies with higher substantive or equal to 10 jobs. More than 2,600 of them are totally exporting. One in five is totally exporting in the branches of aircraft components, electrical and electronic cars. In recent years, leaders have adopted an approach to change the model of the consortium in the cluster model. The objective was to facilitate the creation and development of innovative activities based on trade and cooperation between businesses, research centers and training institutions.

To animate the clusters , there was the establishment of 241 laboratories and 174 scientific research units , 8 technical centers and 10 competitiveness clusters and technology parks specializing in food processing, mechanical, electrical and electronic industries, technologies information and communication , biotechnology and healthcare industries , environment and renewable energy finally textiles and clothing

The ten clusters or operational technology parks are spread over the regions (Ariana, Borj Cedria, Sidi Thabet, Sousse, Sfax, Monastir, Bizerte, Gafsa, Gabes and Medenine)

The animation team of competitiveness clusters have favored the appearance of some clusters (CMT: Cluster Mechatronics Tunisia CTTT: Cluster of technical textiles in Tunisia, Renewable and dairy products) while others are being set up (Clothing Biotechnologies, Eco and ICT industries) (Source: IPAMED). Indeed the management of each pole is provided by a company that provides the single desk and priority to offering quality services to businesses.

Despite these initiatives, the emergence of clusters was limited and several factors make it difficult to establish a

and para-public bodies, local authorities....).Based on socio-political institutions and specific networks (Angeon 2006, De Bernardy 2000).

To varying degrees, we accept four of basic cluster components: specialization, cooperation, closeness and agglomeration effects. Similarly, human and cultural community and the socio- professional environment are seen as supporting confidence among agents, as part of the dissemination of knowledge and exchange of skills.

In order to make rapid progress towards the goal of our analysis, we assume that these favorable factors are perfectly transferable to the reality of the emerging countries that have not reached the stage of developed economy like Tunisia.

stable cluster mapping. To study the determinants of the formation of a cluster were selected ICT companies located in Greater Tunis. This study is based on a survey by the IRMC.

#### B. Description and specific technology clusters in the greater Tunis area

The empirical analysis of the main determinants of enterprises clusters in the Greater Tunis is based on field research through interviews conducted (in 2007 and updated in 2013) in 94 companies located in three main areas: Elghazala Berg Lake and Chargaia.

The selection of companies was based on geographical representation - these three areas represent important poles - and the disposal of the company belong to a group (34 companies prefer not to get to a group). All companies contacted are the technology sector.

To facilitate economic analysis of certain interdependencies may exist between the variables of the questionnaire we undertook a series of non-parametric statistical tests known as chi test name two.

The two chi test (chi square test) can prove or disprove the existence of a statistically significant relationship of cause and effect between two variables whether quantitative, qualitative or mixed nature. A first digital test result leads us to accept dependency. The two variables, area and group are significantly dependent.

Table I: Relationship and Area Group

| Group        | Area Choice |            |              |       |
|--------------|-------------|------------|--------------|-------|
|              | Chargaia    | El Ghazala | Berge du Lac | Total |
| 0            | 4           | 16         | 14           | 34    |
| 1            | 30          | 11         | 19           | 60    |
| <b>Total</b> | 34          | 27         | 33           | 94    |

Pearson  $\chi^2(2)=15,565$  et Prob=0,00

A second result of the study concerns the characteristics of businesses made the event, especially the main activities. The business is a classical variable that determines the behavior of companies. Dies, Industry Telecom, Computer Manufacturer, SSII, Label Software, Computer and Internet companies are owned by 78 companies. Note that these industries consume highly intensive inputs into knowledge and produce goods or services with high added value in knowledge. The relatively intangible nature of inputs /

outputs determines a growing responsiveness to knowledge externalities.

The sector is analyzed in terms of technological intensity, so the companies belonging to the high-tech sector and intensive services knowledge (the tech variable) are more innovative than those belonging to the low- tech or low service knowledge intensity. However, in sectors with high technological intensity and services to knowledge intensive, companies can choose to integrate in order to share the costs and risks.

TABLE II  
MAIN ACTIVITIES by AREA

| Activité Principale                   | Zone     |            |             | Total |
|---------------------------------------|----------|------------|-------------|-------|
|                                       | Charguia | El Ghazala | Berg du Lac |       |
| 1. Telecom Industry                   | 4        | 8          | 4           | 16    |
| 2. Computer manufacturer              | 2        | 1          | 1           | 4     |
| 3. SSII                               | 6        | 11         | 7           | 24    |
| 4. Software Publisher                 | 3        | 2          | 9           | 14    |
| 5. Other computer companies, Internet | 8        | 3          | 9           | 20    |
| 6. Audiovisual                        | 0        | 1          | 1           | 2     |
| 7. Electronics industry               | 0        | 0          | 1           | 1     |
| 8. Call centers                       | 7        | 1          | 1           | 9     |
| 9. Research center                    | 1        | 0          | 0           | 1     |
| 10. Others                            | 3        | 0          | 0           | 3     |
| <b>Total</b>                          | 34       | 27         | 33          | 94    |

Pearson chi2(18)=31,432 et Prob=0,026

In fact, we note that the choice of the area is strongly linked to the main business of the company. The area is considered as a determining factor for the choice of the company's business. Based on the calculated probability, we find that we must reject the null hypothesis with an error risk of 5%. We can conclude with a confidence level of 95% that the choice of the main activity was significantly related to the area.

A third result concerns the agglomeration of a large part of the activities of ICT which is mainly built on the basis of an access to a local knowledge network policy rather than a contamination of behavior. Indeed, the choice of local partner is mainly motivated by the geographical requirement (11 companies) by the financial / business requirement (21 companies) and membership in a network (19 companies).

The presence of these factors makes it possible for companies to join networks of innovators through low transaction costs. It also provides financial benefits by sharing costs and risks, and by larger collective investments.

The image effect is associated with a winning region. Companies may be sensitive to different reasons for localization. Some seek above all to reduce their production cost, including choosing a developed area (27 companies), and where the rent cost is low (51 companies). Others come to the territory to benefit from the accessibility and availability of

infrastructure (24 companies) and services (31 companies). In this case, the economies of cities are powered by informational externalities.

From this point of view, if the geographical requirement is a strong factor anchor for a cluster based on the externalities of knowledge, motivation residing in the membership of a network is powered by informational externalities that different from knowledge externalities.

TABLE III  
ChOOSING LOCAL PARTNER

| Group        | Choice of local partner |                        |                                  |                        | Total |
|--------------|-------------------------|------------------------|----------------------------------|------------------------|-------|
|              | No answer               | geographic requirement | Financial / business requirement | Belonging to a network |       |
| 0            | 17                      | 4                      | 9                                | 4                      | 34    |
| 1            | 22                      | 11                     | 12                               | 15                     | 60    |
| <b>Total</b> | 39                      | 15                     | 21                               | 19                     | 94    |

Pearson chi2(3)=3,8042 et Prob=0,283

The two variables choice of local partner and group are significantly independent. In other words, the survey shows that companies significantly have the same attitude to the choice of local partner whatever their group or not.

A fourth result shows the cluster development brake is - to - say the factors preventing companies to belong to a group. Companies that reported having encountered difficulties in integrating into a group identified the following factors:

- The absence of complementary activities such as the surface treatment and industrial services outsourcing nearby available to businesses.

The measures designed to improve the spontaneous dissemination of information between companies may prove effective in the presence of complementary activities. The effects of spillovers that follow will ensure the dissemination of this new knowledge and skills in the cluster through demonstration effects, by an accumulation of know-how in the industry, by labor movements between companies, or by the flow of information and knowledge.

The concept of complementarity, developed in particular by Milgrom and Roberts (1990), is based on the idea that two activities are complementary if increasing a increases the efficiency of the use of the other. In particular, they showed that the successful adoption of new technology depends on its association with the implementation of new organizational and policy practices related to the production process, marketing and engineering.

For relations with universities or public research organizations, the empirical literature is also shared on the positive effect of cooperation on innovation performance (Loof and Brostrom, 2008 Cassia et al 2009).

- The absence of Complementary skills. Diseconomies related to proximity and competition result in labor shortages and a real difficulty in recruiting qualified staff.

The complementarity in terms of technological components is based on an assembly of expertise required for

example in the framework of a project. It promotes technology transfer that operates in three ways: the labor movement among qualified firms; fairs and forums for exchanges between enterprises; and the interactions between users and producers. Knowledge spillovers from the effects of technology transfers interact with economies of scale, coverage and transaction.

-The Strong competitive relationship. Excessive competition between small not able to differentiate their products businesses can lead to lower margins, leaving few resources available for technological improvements.

- The made size of the local market. A large local market can provide a minimum demand induced innovation and technological efforts to develop these innovations. The specialized local companies are attracted by the strong local demand, which lowers the price of specialized inputs.

Table IV  
CLUSTER DEVELOPMENT BRAKES

| Group  | 0  | 1  | Total |
|--|----|----|-------|
| <b>Constraints</b>                           |    |    |       |
| <b>Lack of complementarity of activities</b> | 8  | 15 | 23    |
| <b>Lack of complementary skills</b>          | 6  | 17 | 23    |
| <b>Too strong competition Relations</b>      | 10 | 13 | 23    |
| <b>Size limited local market</b>             | 10 | 15 | 25    |
| <b>Total</b>                                 | 34 | 60 | 94    |

Pearson chi2(3)=1,7229 et Prob=0,632

In this case, the assumption of independence is retained. Both variables and brake development group are significantly independent. The assessment on the group membership is independent of constraints. In other words, companies have significantly the same attitude when faced with constraints whatever their membership in a group or not.

#### IV. CONCLUSION

The objective of this study is to highlight the cluster determinants Tunisia. Theoretical analysis clarified the one hand , the cluster concept considered a geographical concentration of firms belonging to the same economic sector, on the other hand, the main determinants of clusters namely proximity geography, the existence of shared business services , the sectoral dimension and collaboration of stakeholders on innovation issues. The combination of different forms of proximity (cognitive, organizational, social, institutional),

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called organized proximity helps to promote knowledge creation and innovation.

The presence of institutions such as technical or research centers, universities, funding agencies are the factors of the consistency of the cluster (J. Prager, 2008). The grouping of companies on territory and in a given field of technology should be studied as a social phenomenon while consolidating the triptych university / research / industry; in this case, economic relations should be embedded in social networks. Today, companies that choose to belong to a group, must create and develop their business by seeking resources present in the context in which they operate.

Empirically, we used data from a survey conducted by the basic IRMC in 2007, covering a sample of 94 Tic companies in Greater Tunis. This survey provided a wealth of information relating to principal activities of enterprises (Telecoms Industry, Computer Manufacturer, SSII, Software Publisher, Other computer companies and Internet Audiovisual Industry Electronics Call Centers, Research Center) and many informations about structural characteristics of these companies, the reasons of location, the choice of partnership, the incentive- institutions and the factors slowing the cluster creation. These companies located in three zones may form technology clusters that are part of the dynamics of development of these areas.

The study of Tic sector seems a good methodological choice because many companies in this sector are located in areas hoping withdraw gains related to the availability of a skilled workforce, quality infrastructure and support local institutions. Through the survey results and models of clusters adopted in developed countries, it is possible to provide some answers on current public programs aimed at developing clusters.

The lack of attractiveness of ICT Tunisian companies to form clusters, is not due to a lack of infrastructure adapted to Tunisia is one of the best endowed countries in telecommunication infrastructures in Africa ( both rise mobile telephony, broadband internet ( poorly developed), intranets and extranets and media) - but the lack of relationships involved in a partnership approach or localized nature between higher education, research centers, training and industry body, to allow to carry out scientific and technical projects. The absence of complementary activities, complementary skills and size of local market are limited among the cluster development brakes.

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