

## Technology parks in Algeria: catalysts for harnessing tacit knowledge

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**Abstract.** Technology parks are an important tool for bringing together several economic entities including companies, clusters and universities. We believe that knowledge transfers through these latter plays an important role in improving competitiveness. Adopting the triple helix model of innovation, this paper explore the dynamics of technology park development in Algeria. In pursuit of this goal, a qualitative study was conducted internally at the Sidi Abdellah Park in Algiers, and externally with privatized public industrial SMEs. This SME have been experiencing a steady loss of tacit knowledge since the opening up of trade (1989), which opens interesting prospects for the research in technoparks, particularly in terms of public policy to create new internal structures. The aim of this policy will be firstly, to preserve this heritage of tacit knowledge; secondly, to enhance the value of professional experience accumulated over the years; thirdly, to host companies to ensure the continuity of the learning process.

**Keywords:** Algeria, Technology Park, tacit knowledge, structure creation, corporate accommodation.

## 1 Introduction

Despite an abundance of literature over the past two decades on the importance and challenges of technology parks regarding the diffusion of knowledge among the various entities they host (Hobbs et al, 2017), the issue of tacit knowledge sharing within these parks remains relatively unexplored (Díez-Vial et Montoro-Sánchez 2016). This gap is evident in the scarcity of empirical studies addressing the innovation process of companies, which heavily relies on tacit knowledge. Notably scholars such as Poliani (1966), Niloson and Winter (1982), and Nonka and Takeuchi (1995). In Algeria, despite the creation of several programs to support and accompany industrial SMEs, there is a total lack of integration of tacit knowledge, as shown by the work of Djeflat, (2004; 2008) and Datoussaid, (2015). However, so as not to upset the entire national strategy, this invaluable resource of "tacit knowledge" remains the only remaining internal strategic resource for Algerian industrial SMEs to promote their competitiveness. In fact, tacit knowledge became increasingly important after the sudden opening up of trade (1989), which led to the disappearance of several public industrial companies and the privatization of the remainder (Djeflat, 1999 ; Datoussaid, 2015), with high mortality rates recorded, particularly in the agri-food, wood, ISMME and textile sectors (CNAS, 2022). This situation has led to a halt in the learning process, resulting in a continuous loss of professional experience and tacit knowledge (Datoussaid, 2019). Research carried out in this context shows that a new growth regime is needed, based on innovation and adopting a model capable of exploiting the remaining tacit knowledge accumulated over the years to free itself from the weight of the oil rent in which it is embedded (Djeflat et Lundvall, 2016; Datoussaid, 2019). Tacit knowledge, as a new key factor for business competitiveness, is understood as personal and internalised (Smith, 2001). It is linked to our social and physical experiences, our cognitive abilities, somatic skills and mental and physical perceptions (Weixu, et al, 2020). Tacit knowledge is embodied to in learning individuals through accumulated experience, routines, ideas, procedures, etc. It is knowledge that cannot be fully explained, even by an expert, and can only be transferred from one person to another through a long learning process (Polanyi, 1962). This type of knowledge can play an important role in the innovation process of small and medium-sized enterprises. This is particularly the case when the focus is on the beginning of the process, i.e. invention and product development (Vanharanta and Koskinen, 2002). In this context, technology parks have spatial effects (proximity of major players) that favor knowledge sharing. They create an atmosphere conducive to the exchange of knowledge between companies located in the park, universities, and the market (Díez-Vial et Montoro-Sánchez, 2016). This situation has enabled park-managed companies to benefit from more advantages than non-managed companies, as shown by the work of Westhead and Batstone (1999). The creation of technology parks in Algeria is part of an ambitious national strategy aimed at building the information society and the knowledge economy. Algeria created the Agence Nationale de Promotion et de Développement des Parcs Technologiques (ANPT) to design and implement the national policy for promoting technology parks, to ensure the country's competitiveness on a territorial scale (Djeflat, 2007; Djeflat et al, 2017; Hamadi et al, 2018). This agency was created by executive decree no. 04-91 of March

24, 2004, under the supervision of the Ministry of Post and Information and Communication Technologies (M.P.T.I.C). it has launched four major Technopark projects across the country, notably in the wilayas of Algiers (central Algeria), Oran (western Algeria), Annaba (eastern Algeria) and Ouargla (southern Algeria). The park, which has been operational since February 2009, is in the town of Sidi Abdellah, in Algiers, the Algerian capital, and is known as the "Sidi Abdellah Cyber Park". The aim of this work is twofold: firstly, to explore the dynamics of technology park development in Algeria through a case study of privatized public industrial companies and their potential to set up in technology parks, to take advantage of the geographical proximity of the park's various players and capitalize on the professional experience lost over the years. The second objective, which is at the heart of this work, is to highlight the important role of public authorities in creating new internal structures to preserve, exploit and develop this heritage of tacit knowledge. In this context, our work attempts to answer the following main question:

To what extent can technology parks act as catalysts to exploit tacit knowledge for the competitiveness of privatised public industrial SMEs in Algeria? The article is structured as follows: the second section describes the literature review on the role of technology parks in knowledge sharing and innovation. The third section discusses the methodology adopted in this research. The fourth section summarizes the empirical results. The fifth section presents the discussion, while the final section concludes with interesting perspectives for the literature on technopole development dynamics.

### **1.1 Literature review on the role of technology parks for knowledge transfer and innovation**

Technology parks (TSPs) originated in the USA in the 1950s (Bakouros et al, 2002).

Since then many countries have set up this type of park to develop and revitalize regions by stimulating economic growth and revitalizing urban areas (Yang et al, 2009), promote innovation within co-located companies (Mian, 1996, Löfsten and Lindelöf, 2005, Ritala et al, 2015) and encourage the exchange and creation of technological knowledge between industry and academia (Mian, 1997, McAdam and McAdam, 2008). In many countries, and for several decades, the gap between academic science and industrial technology has arisen from the belief that academia and industry represent two different worlds, often incompatible with each other (Díez-Vial and Montoro-Sánchez 2016). It is precisely in this context that technology parks bridge the gap between academic science and industrial technology by providing an environment in which interaction between research institutes and companies is encouraged (Henriques et al, 2018). In this context, the results of an empirical study conducted by Link and Scott (2003b) in the USA reveal that formal relationships between parks and universities lead to an increase in academic publications and patenting activity. immediately, Díez-Vial and Fernandez-Olmos, (2014) shows that companies in Spain located in or near science and technology parks benefit most from their location if they already have cooperative research agreements with universities and their research institutes. In the same vein, another study in Sweden reveals that companies located in parks place greater emphasis on innovation and market metrics

(i.e. profitability) than companies located outside parks (Lindelo and Lofsten 2003, 2004). Furthermore, Squicciarini (2009) finds that the innovation performance of Finnish companies located inside a science park is higher due to knowledge spillovers. Furthermore, the analysis carried out in Spain by Vasquez-Urriago et al. (2016) shows that when companies locate in a technology park, the probability of innovation cooperation increases. Furthermore, the study by Siegel et al. (2003a) reveals that the research productivity of UK companies located in parks is higher than that of companies located outside parks. Similarly, for Malairaja and Zawdie (2008), Malaysian companies located in parks have more research links with universities than companies located outside parks. In terms of objectives, technology parks differ according to their location and specific features. In this context, Bigliardi et al (2006) distinguish the role of these parks in countries according to their degree of development. In developed countries, these parks are expected to contribute to the development of a region or the elimination of "grey areas". In emerging countries, on the other hand, technology parks are expected to act as a catalyst for development, helping new companies to survive and gain market share, and, in the case of established companies, guiding them towards product and process innovation. In this context and at academic level, most of the limited research on technology parks in Algeria has been devoted to the study of clusters (Belkacem et al., 2014; Djeflat, 2017; Hamadi et al, 2018; Kichou and Oueliken, 2021).

## **2 Methodology and Materials**

### **2.1. Methodology nature**

The methodology adopted in this research is qualitative in nature, based on exploratory analysis. Kaufmann (1996) points out that qualitative methods aim to understand and detect behaviours, processes or theoretical models that describe, measure, or compare. This methodological approach is based on a combination of bibliographical and documentary research, as well as fieldwork carried out by one of the authors and his research team:

- Bibliographic research focused on publications on the knowledge economy and innovation, as well as articles on technology parks.
- Documentary research focused mainly on general literature relating to industrial SMEs in Algeria, and mainly the statistical information bulletins published biannually by the Algerian Ministry of Industry (Direction Générale de la Veille Stratégique, des Etudes et des Systèmes d'Information) during the period (2002-2018).

### **2.2. Methodology design**

The methodology carried out for this study was twofold.

#### **First part – Inside the technological Park**

Field research was conducted in two phases between 2018 and 2022

The initial phase was conducted internally at the Sidi Abdallah Al-jours Park to assess the services provided by public incubators and the profile of tenant companies. The sample consisted of 55 companies situated within the incubator. Semi-structured interviews, lasting between one to two hours, were conducted with incubator

managers and officials from the ministry of higher education. Data analysis was performed using SPSS statistical software, and the findings are presented through descriptive statistics.

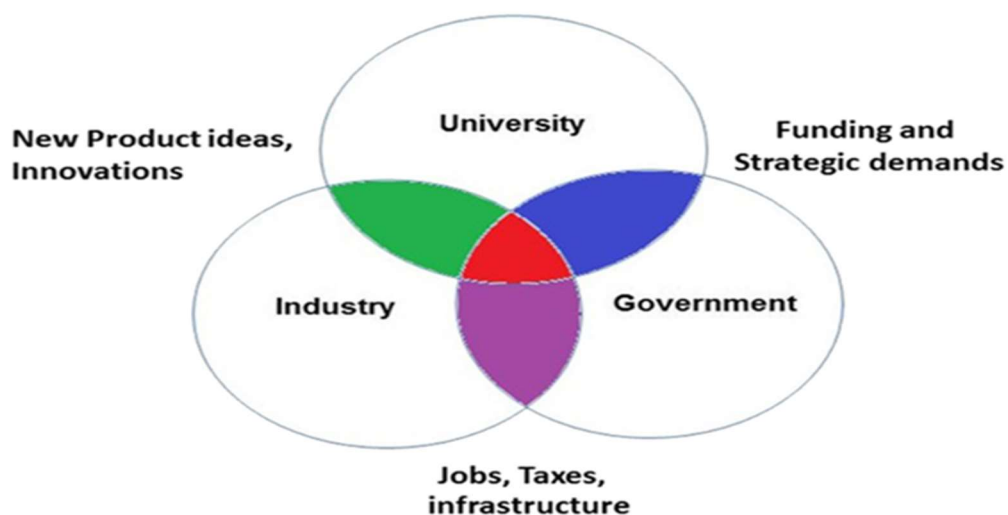
## Second part - outside the technological park

The second phase was carried out outside the park and focused on privatized public SMEs in the industrial sector; in which this type of company has a high mortality rate yet has been able to build the regional and national economy for Algeria, achieving satisfactory results from the country's independence to the opening up of trade in 1989. Empirical data were obtained through direct and semi-structured interviews. Eighty (80) people were interviewed. The sample was made up of managers, employees and workers who had taken full retirement, early retirement, downsizing in the form of voluntary redundancy with negotiation and, finally, managers who had joined privatized public companies following the privatization law decreed in 1988. It was launched in 1995 with Ordinance 95-22 of August 26, 1995, amended by Ordinance 97-12 of March 19, 1997.

### 2.3. Model adopted.

In this research, we adopt the triple helix model of innovation first theorised by Henry Etzkowitz and Loet Leydesdorff in the 1990s Etzkowitz (2008). This model refers to a set of interactions between academia (the university), industry and government, to foster economic and social development, as described in concepts such as the knowledge economy and the knowledge society. These three helixes are interconnected and interwoven to create a national innovation system.

Figure 1: Triple Helix innovation model



Source: Authors

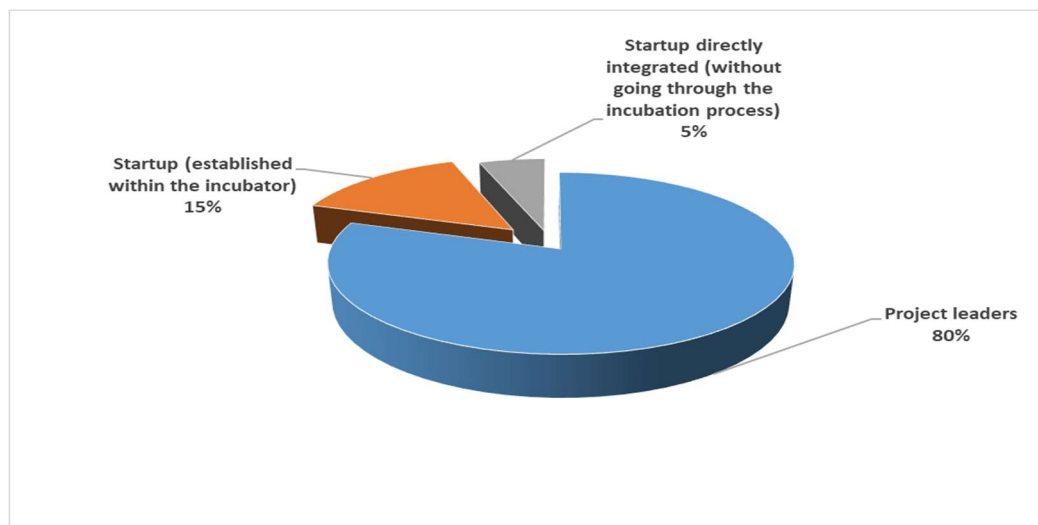
### 3 Results

#### 3.1. Inside the Sidi Abdellah Park

##### Sample composition by company status.

Figure 2 shows the diversity of incubated companies. The diversity of the incubator's activities means that project holders occupy first place with 80% of respondents. Start-ups created within the incubator represent 15% of our sample, while an external start-up contributes 5%.

**Figure 2:** composition of the sample by company status

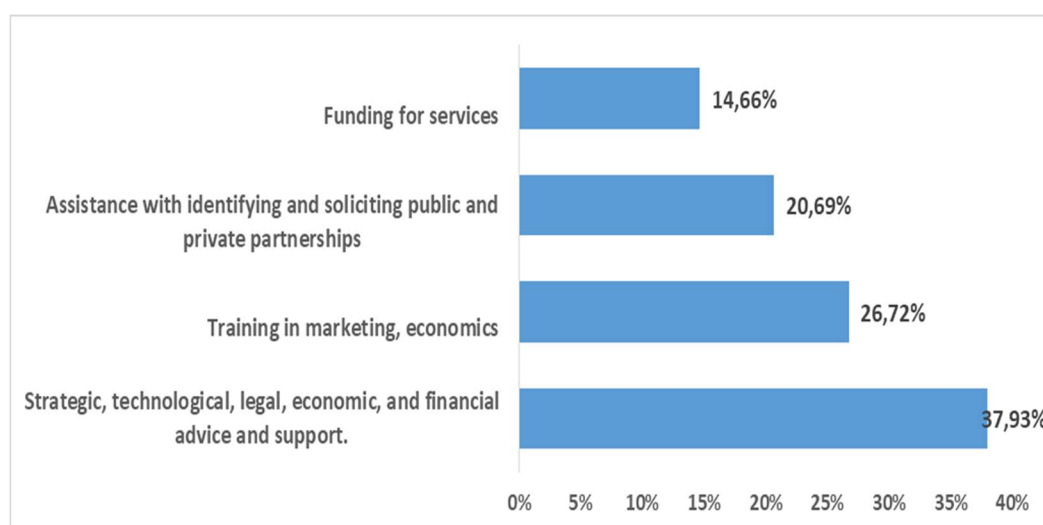


Source: Authors

##### Examination of incubator services / knowledge

Figure 3 shows that, among the services provided by the Sidi Abdellah incubator, advice and strategic support take first place in the technological, legal, economic, and financial fields, with over 37% of start-ups surveyed confirming that they benefit from these services. In second place are marketing and economic training courses provided by experts, sometimes even foreign consultants. In third place, assistance in identifying and finding public and private partnerships, followed by financing services, are the services offered by the incubator.

**Figure 3:** Incubator services



Source: Authors

### 3.2. Outside the Sidi Abdellah Park

#### Privatized public-sector industrial SMEs: a high mortality rate

Table 1 shows a high mortality rate among privatized public SMEs over the period (2002-2018): The number peaked in 2009 with 1,721 SMEs written off, despite the various strategies and measures taken by the Algerian public authorities to strengthen the development and competitiveness of industrial SMEs.

By way of comparison:

- The food industry leads the way, with 596 SMEs written off out of 1721 that disappeared in 2009. In 2012, out of 944 SMEs, 363 were written off.
- In the wood industry, out of 518 SMEs that disappeared in 2002, the number of SMEs written off fell from 112 in 2002 to 72 in 2018.

**Table 1:** Mortality of privatized public SMEs by business sector (2002-2018)

Industrial SME	2002	2008	2009	2010	2011	2012	2016	2017	2018
ISMME	68	59	217	153	173	123	65	33	43
Building materials	38	72	201	90	79	83	1068	24	62
Chemistry, Plastics	17	23	78	24	35	33	15	5	16
Agro food industry	206	180	596	407	402	363	119	81	168
Textile industry	42	34	179	53	64	63	72	26	41
Leather industry	15	15	78	20	23	15	06	5	7
Lumber Industry	112	112	296	256	276	218	70	37	72

Diverse industries	20	25	76	44	61	46	46	10	14
Total	518	520	1721	1047	1113	944	1433	221	423

**Source:** set by the author on the basis of industry ministry's data for the small and medium-size company and the promotion of the investment

### **Privatized public-sector SMEs: ongoing loss of tacit knowledge.**

The results in Table 2 show that the public-sector industrial SME is experiencing a significant loss of tacit knowledge. Out of 80 people surveyed with professional experience and apprenticeships, only 15 managers have joined the private sector, but unfortunately, they continue to work to the same routine. On the other hand, the other categories of staff (full retirement, early retirement, and voluntary departure with negotiation) have seen their learning process come to a halt, and their professional experience is not valued.

**Table 2:** Privatised public SMEs & Loss of tacit knowledge

<b>Staff categories</b>	<b>Full retirement</b>	<b>Early retirement</b>	<b>Voluntary departures with negotiation</b>	<b>Executives joining the private sector</b>	<b>Total</b>
<b>Number of people interviewed</b>	15	18	32	15	80
<b>Privatised public SMEs</b>	Stopping the learning process & Lost Experience	Stopping the learning process & Lost Experience	Stopping the learning process & Lost Experience	Continue with the same routine practices	Loss of tacit knowledge

**Source:** Authors

## **4 Discussion**

The results of this research reveal two advantages in terms of: the development of technopoles in Algeria through the creation of new structures to preserve this heritage of tacit knowledge, and in terms of the development of public SMEs through the hosting of this type of company. These two points are discussed in this section:

### **4.1. Hosting privatized public industrial SMEs to exploit remaining tacit assets.**

The loss of knowledge assets began in Algeria's public industrial SMEs with the policy of organic and financial restructuring of public enterprises in the early 1980s. This policy transformed large companies into medium-sized enterprises to make them self-financing and easy to manage, with the aim of repairing the mistakes accumulated in the past because of the "industrializing industries" model. While the adoption of this



model led to a degree of specialization in several branches of industrial activity, its new configuration dispersed human capacities (Datoussaid, 2019). Significant changes in staff activity (Benissad et al, 1997) and a lack of awareness of people's skills have been recorded (Djeflat, 2008). In most cases, the knowledge and know-how accumulated over the years has been lost (Datoussaid, 2019). Similarly, planning as a system for organizing industrial development, represented by the two five-year plans (1980-1984 and 1985-1989), based on a one-way hierarchy (top-down), pays no particular attention to the ideas of subordinates, since economic decision-making always remains centralized. According to Nonaka and Takeuchi, (1995), the knowledge acquired by workers should be exploited by top management in most branches of industry. Immediately, according to Datoussaid et al, (2018) the brutal opening of trade (1989) led to the disappearance of several state-owned industrial enterprises, resulting in a significant loss of experience, particularly in the agri-food, wood, ISMME and textile sectors (Table n°1). However, the privatization phenomenon prompted even the remaining SMEs to reduce their workforce through voluntary redundancies with negotiation; full retirement; early retirement; downsizing, sanctions etc (Datoussaid, 2015). Unfortunately, these privatized public SMEs, which have been stripped of a large part of their skills with no provision for succession, continue to live by the same routine practices, as the results in (Table 2) show. This also confirms the results of the work of Djeflat (2004; 2008) and Datoussaid's thesis (2015). Those routine practices are themselves the result of a series of apprenticeships. On-the-job learning, which is of vital importance, can produce technical progress, according to Arrow (Arrow 1962a). Ultimately, established routines (Dosi, et al, 1990; Lazaric, 2010), on-the-job learning (Foray, 2009) and the accumulated experience (Polanyi, 1966) of the remaining individuals constitute the building blocks of tacit knowledge, as shown by the work of Datoussaid, (2019). Given that several studies show that "on-park" companies do not directly invest more in R&D than "off-park" companies, nor do they have higher levels of technology diffusion Westhead (1997), this type of knowledge should be mobilized within the parks. It is in this new context that technology parks in Algeria could compensate for this loss of tacitness by welcoming this type of company to benefit from the geographical proximity of the park's various players, notably the university. With its new ideas, this actor could play a key role in the valorization of professional experience, the development of tacit knowledge and the sustainability of companies. According to Westhead (1995), Westhead and Cowling (1995), Westhead and Storey (1997), the survival rate of "on-park" companies is higher than that of "off-park" companies. In this respect, most studies consider that there is a high level of exchange of tacit knowledge between firms and institutions in graphically concentrated spaces, which is generally considered to be the main advantage of location (Almeida and Kogut, 1999). Consequently, proximity can encourage and facilitate the sharing of tacit knowledge at the local level between firms located in close proximity (Boschma and TerWal, 2007; Giuliani and Bell, 2005).

#### **4.2. State policy in this area: creating new structures to preserve this heritage of tacit knowledge.**

Given the importance of tacit knowledge as an invaluable resource of competitiveness and innovation for companies, compared to explicit knowledge, the creation of a new

structure within the park is necessary to preserve this type of knowledge. Tacit knowledge is knowledge "trapped in the head" of every individual in the organization (Nonaka and Takeuchi, 1995). It is made up, on the one hand of know-how, practice and acquired experience and, on the other, of the cognitive faculty that enables us to invent things (Djefflat, 2004). Explicit knowledge at company level is assessed through the various documents produced by all corporate functions: contracts, process manuals, customer satisfaction reports and questionnaires, project studies, supplier reports, internal and external e-mails. Whereas at the technology park level, it is assessed based on investment in the four pillars of the knowledge-based economy (education and training, research and development, ICT and infrastructure, institutions and incentives) (Datoussaid et al, 2018). In our research, the knowledge that circulates within the park is only explicit knowledge, which represents 10% to 20% of a company's knowledge according to Nonaka and Takeuchi, (1995). As shown in figure 2, it comes from academic project leaders and start-ups created within the incubator. In the same vein, Figure 3 shows that the Sidi Abedallah incubator itself does not cater for any of the knowledge-intensive categories, due to the total absence of knowledge-intensive companies (see Figure 2). The incubator offers explicit services such as marketing training, the provision of ICT infrastructure with legal, economic and financial support, and partnership advice. Furthermore, Fukugawa (2015) shows that, using data on Japanese science parks with incubators, research cooperation with universities is positively related to the fact that incubator managers have a wide range of professional experience. Ultimately, the call from public authorities to create new "on-park" structures is an opportunity to generate effective collaborative interactions with university productions in terms of sharing the explicit knowledge of university graduates and the tacit knowledge acquired by employees with untapped professional experience. This will help develop the tacit knowledge that Polanyi (1966, p.4) defined in his famous phrase: "we know more than we can say". Tacit knowledge accounts for 80-90% of a company's knowledge and is more real than explicit knowledge (Nonaka and Takeuchi, 1995); it can only be transferred from one worker to another through a long learning process (Polanyi, 1966). In fact, based on the results of an in-depth case study conducted by (Vasquez-Urriago et al, 2016) in Spain on 25 technology parks and 39,722 companies, we can affirm that working near actual or potential collaborators in a park improves companies' learning and absorption capacity and helps them develop their hard-to-wear and hard-to-acquire skills faster and more deeply. In this respect, the availability and development of human capital is a determining factor in park growth, as shown by the work of Yang and Lee (2000) in Taiwan and Motohashi (2013) in China.

## 5 Conclusion

The examination of privatized public industrial small and medium enterprises (SMEs) in Algeria has illuminated a persistent decline in tacit knowledge retention, underscoring the pivotal role of Sidi Abdallah Park. This insight not only sheds light on the evolving landscape of knowledge dynamics within the Algerian context but also presents compelling avenues for enriching the process surrounding the development of technopoles. In this context, our research holds originality by effectively bringing together these two actors (privatized public industrial SMEs and the Sidi Abdallah

technology park) in a knowledge-intensive context by achieving a common objective, namely the development of the park on the one hand and the development of tacit knowledge on the other. In this respect, it is essential to adopt the innovation model in which the role of its three helices produces a set of knowledge interactions between academia (the university), industry and tenant public bodies that evolves according to the degree of willingness of public authorities and the level of development of countries. And this field of research needs to be explored in greater depth to try and identify how tacit knowledge, which is the most valuable for companies and which is dispersed between co-located companies, is in fact an essential element of the economy in order to arrive at a universal definition of technology parks.

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