

Progress towards the Implementation of the National Innovation System in Tunisia

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Abstract

In the beginning of the nineties, Tunisia, along with many other developing countries, recognized the need to develop specific policies for science and technology. New institutional and governmental structures were created with a mission to encourage and support scientific and technological research and development. About 20 years after the starting of these policies, a comprehensive framework to support innovation has now been established, sub-systems have been strengthened, bridging structures are evolving, specific programs to harness science with economic purposes have been launched and a new culture of entrepreneurship and innovation is gradually emerging in the society.

Notwithstanding the accomplishments so far, the science system and the system of enterprise development are evolving more or less independently. In fact, there is yet no general awareness of a "system" as such and thinking about the link between research and innovation is implicitly dominated by the "linear" model of technology transfer. In this paper we will discuss the key issues that should be addressed in order to achieve a better integration of the elements that constitute the innovation system.

1. Introduction

Important developments have been observed over the last three decades in the nature of innovation systems and processes. For a long time, the innovation process has been seen as a linear process. Upstream of this linear process there was basic research, and downstream was the market. Innovation was thus seen as a result of sequentially transforming scientific knowledge into new goods and services. The link between research and innovation is now understood to be much more complex [1]. Nowadays innovation is increasingly perceived as a complex phenomenon based on cumulative processes of interaction and learning [2]. The production and dissemination of innovation is analyzed as a system in which multiple elements of different economical and socio-institutional natures intervene. In 1995, Metcalfe [3] defined the 'National Innovation System' or NIS as 'a set of distinct institutions which jointly and individually contribute to the development of new technologies and which provide the framework within which governments form and implement policies to influence the innovation process. As such, it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts which

defines new technologies.' The starting point of the innovation system approach is that organizations are not innovating in isolation but in the context of an innovation system. Their performance is therefore dependent on the quality of the system, and particularly on the quality of the subsystems (R&D, education and training, industrial firms, intermediary and supportive infrastructure ...), and even more on the mutual tuning of these subsystems. A further characteristic of the system approach is the concept of 'path dependency'. An NIS does have a memory that should be taken into account when studying the dynamics of its development [4].

2. The evolution of the Tunisian National Innovation System

Three main phases could be identified in the evolution of the Tunisian NIS, each one occurring in a specific political and socio-economical context. A very brief description of their main features is given below.

Phase 1. The post independence period: building the first capacities (1956- 1970)

Science and Technology were recognized by the newly independent state as being the way to achieve the political objective of the modernization of the society and the economy. Two main priorities were set up at that time. The first one was the development of human resources and the second one was building a national industry. This first phase could be characterized by two main features:

- Education became an important value in the society and the main tool to achieve social promotion,
- A great number of educated people and skilled professionals were available for the public administration and the industrial sector.

Phase 2. The start and development of the private industrial sector and the growth of higher education and research activities (1970-1991)

This phase built upon the achievements of the first one and was characterized by two main features:

- The development of the private industrial sector and the industrial employment,
- The emergence of R&D activities and the first attempts to set up a national policy for science and technology.

Phase 3. The launch and implementation of a specific R&D policy and the liberalization and restructuring of the economy (1991- to date)

From an institutional point of view the first concrete step to formally organize research activities in Tunisia and provide structures with which to implement a national policy was the creation of a the Secretariat of State for Scientific Research and Technology (SERST) in February 1991. The main mission of SERST was the use of research as a tool to address problems of development in areas such as agriculture, health, industry, energy and the environment. It was set up under the authority of the Prime Minister and was intended to play an inter-ministerial role formulating proposals for a research policy at the national level in coherence with the needs of the country in terms of socio-economical development and monitoring the implementation of this policy via the activities of the different ministries that are involved. To facilitate the job of inter-ministerial coordination the Higher Council for Scientific Research and Technology was created in 1992. It is chaired by the Prime Minister and brings together representatives of the ministries, the labor unions, the heads of industry and indeed any other organization or person whose input is considered helpful to their work.

The first major achievement of SERST was passing the country's first legislation that is dedicated to the organization of research and technological development in early 1996. Significant efforts were made to increase funding for research and the SERST established a target of 1% of GDP by the end of 2004. All ministries played a role in trying to achieve this goal. In addition to its role in policy formulation, the SERST also financed and lead a number of research programs, among which are the 'Programmes Nationaux Mobilisateurs', (PNM), the Program for the Valorisation of Research Results, (VRR), and the Grant for Investments in R&D (PIRD). Inspired by the example of industrialized countries such as France, the PNM were launched in 1992. They focused on:

- Agriculture and Fisheries,
- Environment and Natural Resources,
- Industry and Energy,
- Computing and Telecommunications,
- Healthcare and Pharmaceuticals
- Socio-economical Research.

The PNM programs were discontinued in 1998. All in all, they provided support for a total of 600 projects costing about 20 millions \$. Agriculture as well as healthcare and pharmaceuticals accounted for 67% of this expenditure.

The VRR program was launched in 1992 and this was the first attempt at systematically promoting the commercialization and the application of

research results to the social or economical environment. To 2006 it supported 80 projects with a total value of about 7 millions \$, where agriculture represented 25 % of this investment, IT 21%, Energy 15% and Biotechnologies 11%.

The PIRD was created in 1995 in the wake of legislation intended to support investment in activities such as R&D conducted by enterprises, and launched in 1996. It was the first research program dedicated to the needs of the enterprise. It provided a 50% grant of up to 20000 \$ towards a feasibility study as well as 750000 \$ towards the testing or adaptation of new technologies or the development and evaluation of prototypes. The PIRD financed a total of 54 projects involving companies for a total value of about 3 millions \$.

In 2003, a new generation of industry oriented programs were launched. Two of them deserve a particular attention: the 'National Program for Technology Parks' and the 'National Research and Innovation Program'. The first one aims at creating 10 specialized technology parks by 2014, and the second supports industry-oriented research in the fields of textiles, mechanical and electrical engineering, and packaging and construction materials. The first Tunisian technology park was created in 2001 and is specialized in ICT ventures and already hosts a number of very innovative companies.

Considering the industrial sector, a dialog with the European Union and the successful conclusion of an Association Agreement in February 1995 gave further substance to the worry that certain sectors of Tunisian industry could vanish if exposed the rigors of the open market. As a consequence, in 1996 a major initiative was launched in order to upgrade the small and medium sized industry sector – the PMN or 'Programme de Mise à Niveau'. At first, it focused on manufacturing, and then in 2002, the PMN started to address the needs of the service sector. The PMN is managed by a structure called COPIL – the 'Comité de Pilotage' made up of representatives from government administration, the banks, the industrial federations and the labor unions. Participation in the PMN was on a voluntary basis. Each company had to submit a strategy for approval by the COPIL. If approved, the company gains access to a range of services specifically designed to help companies move up the capability ladder and achieve new levels of business development. During the period of 1996 until 2006, a total of 2276 companies have benefited from the program which mobilized 3.5 billions \$ worth of investments on the basis of 450 millions \$ worth of subsidies. Among the many benefits of the program was the introduction of disciplines in relation to marketing, human resource management, quality management, information systems, and the emergence of a new sector essential to technology adoption and business development - a consulting industry sector. In

parallel with the PMN, the Tunisian Ministry for Industry also launched a tri-annual program to introduce total quality management. This program set up in 1996, aimed to introduce quality management to 1500 companies and train 600 experts and specialists in the domain.

Currently, the most ambitious industry initiative is the PMI or 'Programme de Modernisation Industrielle' with a partial funding of 75 millions \$ from the European Community. This program started in 2004 and will run until the end of 2008. It comprises several sub-programs including a sub-program called 'Development through Innovation' that also aims at developing research industry links. A total of 20 millions \$ has been set aside for this sub-program and 2 millions \$ for a sub-program to promote the management of intellectual property.

Dedicated instruments for financing innovation were set up at the same period with the establishment of venture capital companies which reached the number of 40 in 2008. In 2005 "business angels" type funds were also launched in order to stimulate the development of start-up companies.

It appears clearly from the foregoing that a framework for supporting innovation has been established, sub-systems have been strengthened, bridging structures are evolving, specific programs to harness science with economical purposes have been launched and a new culture of entrepreneurship and innovation is gradually emerging in the society.

Notwithstanding the accomplishments so far, the science system and the system of enterprise development are evolving more or less independently, there is yet no general awareness of a "system" as such and thinking about the link between research and innovation is implicitly dominated by the "linear" model of technology transfer.

3. A new set of challenges

In analyzing the development of Tunisian innovation policy over the last 20 years it can be seen that a strong emphasis has been made in the supply side (production of knowledge) and that this policy was dominated by financial instruments. Although this policy was successful in reinforcing and rewarding the knowledge infrastructure, there is an urgent need to go further steps beyond in the long term process of building of a coherent NIS. At least three challenges must be faced:

- **The adoption of the NIS paradigm for the formulation of RTD & Innovation Policy**

While a growing number of individuals are familiar with the concept of a National Innovation System, it has not yet become part of mainstream thinking among policy makers about the role of knowledge

in the economy. There is an urgent need to boost the adoption of the NIS paradigm as a conceptual framework for the formulation of innovation policies in Tunisia.

- **The adoption of new instruments to ensure knowledge flows and systemic efficiency such as Industrial Clusters and Foresight activities**

Several new instruments that link up the individual components of the NIS have been launched in the last decade by several developed and emerging economies. They emphasize the importance of bridging institutions such as transfer centers, industry liaison offices, incubators and innovation centers. These instruments also stimulate demand for the RTD and Innovation services provided by the bridging institutions. They provide support for the development of financing structures and mechanisms such as funds for seed or venture capital. They address strategic needs of the innovation system by generating and disseminating information of a strategic nature. Examples of such instruments include Foresight and Technology Road-mapping initiatives and the development of clusters [5].

- **The set up of organizational norms that provide the environment for creativity and innovation in the economy, and in the society as a whole.**

Each country has its own institutional history and regulatory characteristics. But it is clear that the efficiency of an innovation system is largely based on the capacity of institutions to adapt to new challenges in the economy, new patterns of competition, and specific changes in the innovation process itself. The existence of flexible and participative modes of management, and the ability to continuously adapt the regulatory framework for innovation, is crucial for the success of public policy in RTD and Innovation. The organizations and services that make up the NIS are only effective when they are linked together as a system. In other words they are only effective when there is a high level of communication and interaction between the different actors. This requires not only an awareness of the system in terms of its players and the roles they fulfill, but the adoption of certain organizational and social norms by the actors in the system. These do not evolve spontaneously. Organizations need time to understand how they can best contribute within the system. Then they need to develop and maintain the links and functions that this requires. This can be achieved only by making a conscious effort. Otherwise, investments in science, education and innovation related institution building will have a limited long-term impact on the economy. For these reasons it is important not only to boost the adoption of systemic thinking by policy makers but to boost

the adoption of systemic behavior by all actors within the system.

4. Conclusion

Modern economies are extremely complex, comprising thousands of autonomous entities from both the public and private sector that communicate, collaborate and negotiate to achieve their goals. These systems include companies, agencies, administrations, foundations and individuals and they cannot be managed through systems of centralized control. In addition to their complexity, the capabilities and roles of the many actors change too rapidly in response to market pressures, in response to new business opportunities and new technologies. One of the tasks of government is to create conditions under which science and technology will contribute to growth and prosperity for the nation. Building universities and ensuring the proper funding for RTD and Innovation is only a part of the work that allows this to happen. The systemic approach helps policy makers to see more clearly that they must also address needs of the system and needs of the actors that go beyond the provision of finance. They must support the development of strategic alignment among the stakeholders of the system, their ability to visualize change and lead change processes that are essential for growth and development.

5. References

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