URBANIZING INNOVATION: SCIENCE PARKS AND THE INTERACTION WITH THEIR CONTEXT

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ABSTRACT

The present study is an attempt to analyze the special social or economical factors that make an environment appropriate for knowledge transfer and to discuss the role of innovation in what concerns future urbanization of places and economical evolution of cities. Furthermore it is a discussion on the issue of factors positively affecting technological innovation as well as on the importance of science parks linked with a university, all in an urbanized context. It includes a brief historical overview as well as the up-to-present existing ways of “urbanizing innovation”.

Key-words: Urbanism, Science Parks.
The cultural evolution of human societies is the result of the effect of man’s achievements on himself, which in their turn motivate further achievements and new effects. It is well known that at different times and in different places man produces objects or inventions that bear witness to his social, economic or technical development and to the gradual changes in his way of thinking, generally accepted by the social group to which he belongs. All these achievements are strongly related to his natural and social environment. In fact, it is strongly possible that the different natural and social environments affect the various cognitive procedures which are subsequently reflected to relative activities (Orphanidis, 2008). Furthermore, it is well known that, through continuous trials and failures, man has learned to quickly analyze and understand the situations he experiences or is about to. So, in order to better satisfy his needs, he acts subconsciously by avoiding -as much as possible- rough environments or difficult situations.

The evolution of a society depends on demographic, economic and social situations or changes. However, innovation in applied knowledge presumes ‘applied imagination’ concerning the working environment. The achievement of a human subconscious positive social respond will result eventually to the flourishing of new ideas in science and production. Collective acceptance of a working and social pole can be the crucial to the development of science as well as to the future of cities. As Urbanism mainly discuss the subjects concerning the evolution of cities, it is very important to point out the factors that trigger evolution and urban growth, not only the economical but also the social ones. This study is mainly concerned on the way economical and urban growth is linked with the innovation sector. During the millennia of human life on Earth, survival or evolution has been almost always related to the invention and production of new technology. The latter contributed to the preponderance of certain groups of people over others. The

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processes of technological research during and after the Second World War were intensified for obvious reasons, thus marking a turning point in what concerns the relations between new technological achievements and economic development. Indeed, in the post war period, technological research was more than ever considered as the core of any economic evolution. Henceforth there has been much effort put and money invested in this field and the implementation of the latter in everyday life. To state it otherwise, the importance of innovation being recognized and accepted as a major component for economical growth, new knowledge-based economies have begun to flourish.

During the 70’s an experimental wave in the development of science parks began to appear. These first attempts were mostly made by universities searching to find ways to commercialize the knowledge they produced on academic level, together with small firms wanting to invest in this knowledge and looking for a link between universities and industries. Some of the first examples of innovation in such spaces like that were the cases of Cambridge and Harriot - Watt in Britain, Haasrode in Belgium and Sophia-Antipolis in France. As observed by Nicos Komninos “By the end of the 1970’s a new environment of innovation was beginning to appear. It was no longer the large company, but rather a complex of smaller firms that in the framework of the industrial district developed and applied technological innovations and new product development through specialization and flexible collaboration” (Komninos 2002, p.22).

This first wave of innovation environments led to a second- and biggest- wave of science park developments in the 80’s. At that time more than 100 science parks were created in the E.U., largely supported by the general political and economical framework of the European Economical Community. The areas that those developments were set constituted “islands of innovation within wider regions of more traditional activities. These islands also expressed a new spatial division of production and labour, in the sense that the new technology based activities needed special socio-economic conditions to emerge and take root” (Komninos 2002, p.23).

Although the term “science park” has been widely used up to present, there are actually several categories of innovation environments which are globally
developing but are substantially different from one another. According to the classification of the Official Journal of the European Communities (C 186/52) innovation environments that promote research, technology and technology transfer can be:

“A research park. Most of the times located in close proximity to a university or a similar academic and research institution. It focuses mostly on research rather than development and the key is academic/ research liaison at the leading edge of science and technology. Normally production plants are precluded.

A technology park. This is a development to accommodate companies engaged in the commercial application of high technology with activities including R&D, production, sales and servicing. It is distinguished from science and research parks because of a greater emphasis on production. Academic involvement is also essential. Technology parks meet the specialized location requirements of high-technology companies, but they offer a higher proportion of non-production to production space. The emphasis is on the proximity of high-technology companies engaged in similar operations. There may be restrictions on tenants, and a requirement that they exhibit some high-tech activity.

An innovation centre. This is a facility catering for the needs of predominantly new businesses engaged in the development and marketing of new technological products and services. The purpose of an innovation centre is to promote the setting-up of high-tech businesses with high market risk. The services provided include technical services and advise of finance, marketing and technology.

A business incubator. This is a place where newly created firms are located in a rather limited space. Its aim is to increase the chance of growth and rate of survival of these firms by providing them with modular building facilities, common technical facilities, and also managerial support and back-up services. The main emphasis of incubators is job creation and local development, but the technology orientation is often marginal” (Komninos 2002, p.55).

By the mid 1980’s it began to be pretty clear that science parks could play an important role to the amelioration of a state’s economy as well as to the
regeneration and restructuring of declining cities and the promotion of their growth (Carter 1989). For those reasons, many states started to be more and more interested in the creation and funding of such innovation spaces, not only in already developed areas but also in the periphery. The case of the U.K. is a good example of achievement of economical benefits through innovation: There indeed, the construction of many small parks all over the country was promoted and their funding was mainly provided by the public sector. As David Rowe stated “government development agencies provided 21% of all science park finance, universities 28% and local authorities 11%. The private sector contributed 8% of total investment and tenant companies 32%” (Rowe 1988, Komninos 2002, p.5).

An interesting observation is that the parks that were located in the rapidly growing areas as well as those that were related to computer science and technology started to grow much faster than the rest of them. Although the cases differed in size and outputs, there was a general admission, in almost all European countries, of the fact that the economical boosting by promoted innovation and technology transfer was definitely leading to the regeneration of areas.

Consequently, in France, Germany, Belgium, Greece, Italy and Spain the state’s attitude towards this new situation was more or less similar and this was the reason that, in almost all cases, government and universities were resolute in providing a large part of the funding.

Soon this strategy of supporting innovation and promoting collaborations of institutions, multinationals and R&D research institutes started to bring tangible results: “in Sophia-Antipolis in France 11.000 direct and much more indirect employment was created in twenty years” (Fache 1993, Muller 1985, p.150-156).

“There was evidence that: science parks provided business and financial support services of significant value to tenants; the presence of the parks provided a major stimulus to academics starting their own business; the parks increased informal relationships between the universities an firms; and that they might have considerable long-term effects on changing the attitudes of young scientists towards business” (Monck 1988, Komninos 2002, p.59).
With more or less successful results in every case more and more innovation-based clusters began to appear globally, creating new networks of innovation, which were supported by strong economical collaborations. Elaboration on the above inevitably leads to the formulation of three important questions: what are the factors that promote the formation of such clusters, what are the factors that make them successful and, most importantly, what policies could support a steady growth of existing clusters and at the same time boost the creation of new ones?

Although there is no standard pattern for the growth of such clusters, we could distinguish some factors that are important to a large number of cases. In most of these cases the presence of the university in the formation of a science park plays a major part. As mentioned above, in their great majority, science parks have been created by an “innovation core” constituted by a university and some private firms. As shown by a comparative study “science parks play an important role in stimulating economic growth but an essential prerequisite is the intellectual catchment area provided by the academic institution” (Sunman 1986, Carter 1989, p.7). But although the formations of such places need the university, the actual reason for a success in depth of time is the functional relationship between the university, the firms, the spin-offs and all the adjacent offices and labs. The lack of such successful relation “considerably restrains the supply of technologies and innovation services that the parks are supposed to provide” (Van Dierdonck, Debackere, Rappa, 1991, p.109-123, Komninos 2002, p.90)

Another key factor is the large number of benefits that come from the so-called “economies of agglomeration”. Companies that are located in such clusters often benefit from lower costs and better market performance. As accurately pointed out by the report of the two years project by the Cambridge Urban Design Studio: “advantages come from a big concentration of especially skilled labour, from technical advances in the specialist trade and from networks which supply the firms outputs and market their inputs. Commercial rivalry between firms remains a key driver for innovation and change” (Echenique, Pearce, Fawcett, Palmer, 2003, p.9)

But is there a specific spatial factor that encourages also the formation of innovative clusters and, to a more general extent, innovative environments?
Although there has been a very big debate on that issue, it is not yet clear which comes first, innovations or innovative milieu. It is interesting to mention James Simmie statement: “once in existence it does seem that the dynamic interactions between actors in an innovative milieu can encourage the continuation of further innovation” \(^{11}\) (Simmie 2001, p.29). However one can observe that in most cases the spatial aspects of the innovative clusters have played a major role in their further successful growth. Moreover, the spatiality of such places affects multiple sides of the “innovation growth issue”. The physical attractiveness of a place might be a very basic but at the same time extremely important factor for the creation of an environment which can start to behave as a magnet for big firms and their high-level staff. Usually innovation clusters start to emerge in places where physical beauty of the space is combined with good infrastructure and facilities for research.

A good example of such places can be the case of Sophia-Antipolis in France, created in 1970, in a physical space that was selected for being one of the best parts of South France, in the Cote d’Azur, northwest of Antibes. In this very attractive Mediterranean environment, the science park, supported by great infrastructures and only 30 minutes away from Nice and the airport, has gathered around 1260 corporate names in a period of nearly 40 years. The concept of its creation consisted of three stages:

- “Firstly setting up and attracting sufficient intellectual and industrial resources to create an industrial, technological and scientific network (1969-84)
- Secondly a vigorous self-generation involving training programmes, the creation of new companies, technological transfer, international links etc.
- Thirdly extending the impact of this technological and cultural centre to the wider environments largely with the aid of advanced computer communication systems.” \(^{11}\) (Laffite 1985, Gibb 1985, p.87-88)

This park has boosted not only innovation and research but also the general growth of the area, with 25 911 jobs created in total. In addition to that, it is worth observing that the park has the ability to expand and accommodate growth
pressures as 1326 jobs have been created while around 30 new companies implanted between July 2001 to January 2003 (Sophia-Antipolis Organization).

The obvious attractive spatial factors should not be ignored when examining the factors for successful places of innovation. As those science parks employ high-class scientists, researchers and professors that usually are highly paid due to their expertise, the places where they will decide to stay for some years would preferably be attractive ones, providing good quality of life together with high quality work space. Along with that, big firms prefer to settle in areas that will promote their international image and status and use it as a possible marketing aid. Many times the actual management office of a park uses the attractive area together with a high class university to make the park more prestigious and inviting for firms. As the innovative pole grows, the land value of the park rises and the profits from the development increase. However, there are cases of parks where the exploitation of the area and the use of this marketing trick have brought in large amounts of profits from the increased land value and they have ended up being more of development areas rather than spaces for research and innovation. Agreeing with the conclusion of the Joint Urban Studio: “attractive places are a vulnerable resource. Decision-makers should recognize attractive places as a resource for business, innovation and competitiveness and they should pay attention to the costs and benefits of exploiting such attractiveness and to the design and managements of consequent growth pressures”\textsuperscript{xiv} (Echenique, Pearce, Fawcett, Palmer, 2003, p.5)

According to a comparative survey of science parks in Belgium, Germany, France, Italy, the Netherlands, Spain and the U.K., which the Urban and Regional Innovation Research Unit (URENIO) realized, two critical factors were identified for the development of science parks: the regional context and their technology specialization. In this study, a very important point was pointed out: “the performance of the parks located in fast-growing areas is better than those located in old industrial areas”\textsuperscript{ xv} (URENIO 1999, Komninos 2002, p.61). This implies that urbanization processes and urban environments promote innovation and tend to make those emerging innovation environments more functional and effective. But what are the links that connect urbanization and innovation? Can an urban
environment definitely be an effective catalyst for the promotion of research and innovation?

As we are moving towards an era that most of the world’s population will be urban, the new metropolises will be the actual space where people from different social, economic, cultural and educational background will have to live, work and cooperate, making the city itself further evolve. Most of the countries at a global level are or are gradually trying to be highly urbanised and in most of the cases cities are the basic elements of a country’s economy. So generally and according to the Institute for Public Policy Research (IPPR), most knowledge workers live in cities, most patent applications originate from cities and most knowledge-intensive businesses are located in cities. Although is not clear what exactly are the specific factors that make a specific city attractive we could say that the dynamic environment of an urban context promotes innovation and the generation of new ideas as well as the creation of multiple interfaces between many different environments. A city offers three basic advantages: proximity, density and variety. Those three factors create a very dynamic space that if they are combined with attractiveness and quality of life can possibly give birth to a very successful place for innovation and knowledge. Cities are par excellence places where multiple interactions take place everyday, multiple cultures meet and different fields of knowledge can be more easily found and combined. Innovation in general and by definition comes from new ideas and new ideas are promoted by interaction. Urban environments could be the ideal context for innovation as long as innovation is more “open” to that context. At the same time, innovation could act as a very good catalyst for urbanization and offer its outcomes to the city. The assets of combining urban environments and innovation reach both ends.

Further, what are the main benefits when innovation environments are located in an urbanized context? Firstly, the location and the good infrastructure usually provided by cities makes innovation systems settle easily and start working more effectively. As stated above, innovation needs interaction and a place without links to promote this interaction has more possibilities to fail. Those links first of all are physical. Airports, roads and all sort of transport means are of great importance, not only for the constant come-and-go of scientists and researchers
but also for the quick delivery of products produced in such places and the quick feedback from the market that is also crucial.

Secondly, the plethora of institutions located in cities, such as business and industry associations, the Higher Education Institutions and the professional associations, government institutions as well as firms which are the main users of new ideas (IPPR). This concentration of institutions creates strong bonds between knowledge and business and very soon large collaboration networks are born between those institutions and the private sector. Thereafter and because of those networks we can witness a very productive outcome: firms sponsoring research and research findings produced and tested among the public through the firms. This circle of innovation not only promotes economy but also helps research be more effective.

Thirdly, cities provide great market opportunities. Due to the variety that an urban context has, a lot of different demands for products are created. In addition to that cities can provide to research among a variety of consumers groups that help the marketing testing of products. Although it seems to be that in our global era, global markets are more important than local markets for innovation, “still big urban markets create big opportunities for demand niches and innovation. Urban firms can use the “pick-and-mix” economy of big cities- and links to bigger external markets- to reach innovative solutions” (IPPR). 

Finally, the stimulating environment that is created in an urban space plays a very important role to innovation. It has been observed that the isolation often encountered in not very well designed science parks usually leads to the creation of discontented employees gradually degrading their productivity. In spite of this observation though, the factor of isolation is often not considered as substantial and therefore neglected. However, it should be pointed out and be given a serious thought in the procedure of examining the reasons for a successful innovative environment. Therefore, the dynamic and at the same time mind-stimulating space that a city can generate not only provides scientists and researchers with a high quality of life without the isolation often created by science parks, but also gives birth to new ideas due to the interaction between different kinds of social and economical groups.
As very well stated by D. Harvey and supported also by Komninos (Harvey 1998, Komninos 2002, p.139): “urban areas can compete for those key control and command functions in high finance and government that tend, by their very nature, to be highly centralized while embodying immense power over all manner of activities and spaces”. In other words, given that many cities have theoretically the possibility to become centers of finance capital, of information gathering and control and of government decision-making, they can compete for this goal by developing a certain “strategy of infrastructural provision”. Most important to this end is the “efficiency and centrality within worldwide network of transport and communications” and, consequently, heavy public investment in airports, rapid transit, communication systems, and the like. On the other hand, the “provision of adequate office space and linkages” is equally important. In view of the materialization of all the above, a good cooperation of the private and the public sector is therefore essential. Their collaboration will permit them to anticipate the needs and respond accordingly. Private property developers and financiers must not act only according to their own interests, but with serious consideration to public ones as well. Other kinds of investments must also take place in order to permit assembling of a wide range of “supporting services, particularly of those that gather and process information rapidly, a fact which, in its turn, increases the need for specific skills requirements”. Therefore, such activities “put a premium on urban centers” with certain kinds of educational provision (business and law schools, computer training facilities, and so forth).

As we can see, urban areas can be exceptionally dynamic environments with the ability to gather capital and thus governmental power and create the appropriate physical and economic conditions to promote the creation of networks of collaborating educational institutions, research spaces, private firms and markets. At the same time, those collaborating networks can provide with the urban space the outcomes of their interaction and help the city to further evolving with the help of innovation in many different levels -creation of jobs, use of innovative technology and systems to make urban life more effective etc.

During the last years, the idea of combining science and urban space is starting to be more and more seriously considered when observing worldwide trends in the
field of innovation. Science parks are beginning to be designed and used as a
catalyst for the urbanization of an area while at the same time they constitute the
foundation stone for the economy of the newly created urban centers. A very good
example for this beneficiary contribution is the case of the district of Kista in
Stockholm. This area is in proximity of the city center (12 kilometers away) but not
in the center, a fact that is also pointed out by the IPPR as important in the
making of innovation spaces: “formal and informal networks don’t need to be very
close to urban centers necessarily but need to be within decent traveling distance
of each other and the center” (IPPR).

Kista is more than an urban area - it is also the capital of the Kista Science City,
intended to be developed into a living and growing urban place with companies,
university and other international-class institutions of higher education, while at
the same time into an attractive and extensive supply of housing, culture service
and recreation to attract competent people. The region embraces four
municipalities around Järvaflätet on Stockholm’s north-western outskirts, which,
together with the business community and the academia have joined their efforts
in order to achieve greater growth in both business and higher education. The
complex was visualized in 2000 for the coming 10-15 years with an infrastructure
which will include housing, the transport network, local traffic and other
improvements. As mentioned above, Kista Science City has been planned to and is
actually located in close proximity to the city centre, 15 minutes from Central
Station on the underground railway and 15 minutes from the main Stockholm
airport at Arlanda. It also has the advantage of being close to Sweden’s financial
centre in central Stockholm, as well as the area in which there has been a strong
development of biomedicine, stretching from Uppsala to the north, via the
Karolinska Institute and Huddinge in Stockholm, to Södertälje just to the south.

Kista companies are about 750, employing nearly 28,000 individuals. Two-thirds of
these employees work in the ICT sector, as everything here, from the major
international enterprise to the small, is entrepreneur owned ICT business. A good
example is the case of Ericsson, which has its head office in Kista and is the largest
single employer with a staff of more than 9,000. No fewer than 25 companies have
more than 200 employees. On the other hand, the good corporate and research
climate has also been a serious attraction pole for top-class national and
international researchers. All these companies and researchers work and are connected with each other through wireless systems, since the entire value chain is supported by mobile services and broadband systems. Despite difficult times in recent years, the number of companies has steadily grown and the number of employees has reached a record in 2005. Though very recently conceived and created, Kista has already made a noticeable mark concerning highly visible changes, such as the rebuilt of Kista Galleria, northern Europe’s largest indoor shopping centre, and the erection of Kista Science City’s landmark, Kista Science Tower, 160 meters high and Sweden’s tallest office building. Some 1,000 new student homes have also contributed to the liveliness of the place. The changes can be seen too, in better transport: a new motorway exit to Kista, new bus routes in the whole of Kista Science City, more frequent underground trains etc. Among the housing projects, mention can be made of Silverdal, which is growing up close to Edsviken in the southern part of the municipality of Sollentuna, and of Kista Gård, but next to central Kista as well (Kista Science Park).

Part of the Sweden’s Royal Institute of Technology had set up an ad-hoc university for information and communication technology designed from the beginning to collaborate with the companies in the area. This action in turn was aiming to accelerate the urbanization of Kista, by changing its character of a traditional working area without many services into a contemporary milieu required by modern society for work or education. Or, to put otherwise, progressive modernization of Kista has been materialized, since the beginning, by “connecting the adjacent housing areas to the growing centre for new technology and getting new land uses, restaurants, libraries, theaters, cinemas, and pubs, into the area” (PACE-TELECITIES 2000, Komninos 2002, p.197).

Conclusively, we could assume that technological achievements through planned research are a major component of economic evolution of a state as well as to the regeneration and restructuring of declining cities and the promotion of their growth. The results of this research though could be easier achieved in an innovative environment, while more tangible and effective if promoted by technology transfer. The strategy of supporting innovation and promoting collaborations of multinational institutions proved to be very helpful in all relevant fields. Consequently, the creation of science parks with an “innovation core”
Constituted by a university and some private firms would ameliorate the informal relationships between universities and firms and have considerable long-term effects on changing the attitudes of young scientists towards business. The potential of universities is great, considering the fact that they can give prestige to a park and make it more attractive to firms. Furthermore, this kind of university-linked science parks could constitute the foundation stone for the amelioration of the economy of already existing cities or of urban centers in the making.

Actually, the above is beneficial to both ends, since discussion on the environment has led to the conclusion that an urbanized context would be a much more positive factor for the promotion of innovation, given that a city offers the advantages of proximity, density and variety, all leading to interaction. Therefore, strategic planning focusing on openness and innovative ways for technology and knowledge transfer should start to be implemented in many parts of the world in order to achieve a more efficient way of using the knowledge produced in (until now) cut-off labs. The interaction created could lead to “smarter” cities with citizens more open to knowledge and to the advantages offered by education. If, in addition, this is combined with attractiveness and quality of life, it can possibly be a very successful milieu giving birth to innovation and knowledge.

We already notice that efforts to urbanize innovation are beginning to be more and more global as the benefits from this “marriage” are reaching many sectors and levels. As mentioned above, interactive innovative clusters have proved to be a good way for the making of smarter and more efficient cities. Nicos Komninos accurately underlined the goal set to urban planners by the following: “what is asked of urban planners today is not to represent a given order of ideas or values, but to invent urbanities for flexible economies and information-based technologies. [...] They are asked to invent city models to regulate flexible agglomerations and innovative environments for knowledge-based development” (Komninos 2002. p.188).


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