

CARTUJA 93, A TECHNOLOGICAL PARK LOCATED AT THE SITE OF SEVILLA'S WORLD'S FAIR¹

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1 . Introduction

Since the late seventies, scientific parks, business and innovation centres and technological institutes have become important tools for the development of cities, regions and countries. Their success is mainly due to two factors. On one hand, their role in the diffusion of innovation and knowledge throughout the productive system is a decisive mechanism in increasing productivity and stimulating economic growth. On the other hand, these bottom-up initiatives are more efficient and less expensive than the incentives usually offered by central administrations.

After more than twenty years of local development initiatives, it is time to ask if these instruments of technological policy are still efficient for the development of cities and regions increasingly integrated at the international level. It is with this goal in mind that the Cartuja'93 Technological Park's emergence and functioning is analysed. The Park's formation, between 1993 and 1999, was a slow and difficult process and during this period it was very common among social scientists to refer to it as a failure, as the deserted Cartuja. At present, however, it seems that Cartuja'93 is consolidated and has become a urban Technological Park. Therefore, how can this change be explained? Which are the factors that explain Cartuja 93 apparent success?

The paper begins with a theoretical introduction describing the authors approach to the innovation process within the dynamics of cities and regions. Cartuja'93 Technological Park is then analysed with specific reference to Seville and Andalusia's development and to the mechanisms of technological diffusion. Special attention is given, at this point, to the reasons for the transformation from a stage of slow growth and poor results in terms of job and firm creation, to the present situation where Cartuja'93 seems to consolidate as an urban technological park. The paper concludes with some comments on the key factors for the development of Technological Parks in developing regions.

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2. Innovation and development of local economies

It is generally recognised that economic development of cities, regions and countries comes about as a result of technological progress. Economic growth is the consequence of capital accumulation that, in turn, incorporates technological progress. In the final analysis, it can be stated that economic growth is the accumulation of capital and knowledge.

Firms introduce innovation into the productive system through investment decisions. Therefore, the content and the effect of innovation depends on the way production is organised, on the strategies used by firms to maintain or increase their output and their market share, and on the existence of needed services to introduce technical progress into the productive organisations. When firms need external support for adopting and adapting innovation, they must resort to private and/or public external services. Therefore, technological policy plays a strategic role in the processes of economic development.

In recent decades there have been important changes in the way production and regulation of capital are organised (Vázquez-Barquero, 2002). The crisis of Fordism has favoured the development of flexible organisational structures, some times through the formation or consolidation of local entrepreneurial systems and at others through more organisational flexibility within large firms. However, these structures have always been strongly rooted and integrated within the territory. Changes in organisational models of production have been accompanied by changes in institutions and regulations so that the focus of spatial and industrial policies has gradually moved from centralised policies (top down) to local policy initiatives (bottom up), from linear innovation systems to interactive models (Asheim and Isaksen, 1998).

The evolutionary model, as Freeman (1988) points out, considers that innovation occurs when ideas about products, production methods, marketing or organisational strategies go beyond the point of mere discovery to be implemented within the productive reality. Through investment, firms apply new technological knowledge to the production process and the marketing of their products, which allow them to become more efficient. Thus innovation is, primarily, an economic and entrepreneurial activity since it requires the use of financial resources to obtain better yields and profits.

Innovation is a learning process that takes place as a consequence of productive and entrepreneurial capacities and of those that arise through the use of goods and

services produced. Innovation's social and territorial dimensions mean that the increase in knowledge will transcend the individuality of the firms and agents to become a collective learning process. From this perspective one can speak of interactive learning among the actors within the environment in which firms make decisions to invest and locate.

Thus, innovation is an interactive process led by firms that make investment decisions, but is organised with the entire group of research institutions (university, national research council and other technological centres and institutes). These scientific and technological actors form a network where learning processes are generated. Therefore, the efficient flow of exchange of knowledge taking place as firms, universities and public and private institutions cooperate, conditions the evolution of innovation.

This view of the innovative processes has brought about a significant change in industrial and regional policy, whose objective is to improve technological content and method in the productive weave. Interest in linear innovation models² has subsided as growing attention is paid to interactive models, which strive to provide technological services to firms, strengthen the relational system among the actors and foster co-operation among entrepreneurs, researchers and teachers (Vázquez Barquero, 1993).

Technological policies based on the linear view of innovation are supply policies which try to remedy some of the market failures by supporting those investments in knowledge that firms would not spontaneously make on their own because of the expectation of limited returns or the economic risks involved. They adopt a functional and hierarchical top-down view of knowledge (science, invention and innovation) and of its diffusion throughout the networks of scientific and technological institutions operating in each country. On the other hand, interactive innovation policy aims to meet the demand for services by innovative firms by providing research and development services. These policies adopt a territorial approach in the sense that services are rendered through the network of local actors to satisfy the demands of local firms. It is therefore a bottom-up policy since it aims to meet local needs and demands locally.

The objectives of linear innovation policies are to promote research and development in firms and facilitate access to knowledge embedded in capital goods.

² Linear innovation models maintain that scientific advancements occur and are transmitted sequentially, they emerge in scientific institutions and are progressively transferred to the economic sector. On the

Target firms are usually large, high-tech firms who produce technology intensive goods and have R&D laboratories. On the contrary, interactive policies promote learning and the diffusion of coded and non-coded knowledge throughout the local network of mainly small firms and provide these firms with the technological services which will bring products closer to the market.

Linear policies are instrumented through direct technological support to each firm by providing public funding in the form of incentives and subsidies to R&D programs or to infrastructure. Interactive policies, on the other hand, are implemented through intermediary organisations, which, for a price, offer an on-going supply of services to clients. Besides the technological services related to generic or specific technologies of a sector or activity services offered include the formation of human resources, information and counselling on capital goods, raw materials and marketing, all of which complement each other and are essential in order to obtain satisfactory results.

Finally, one must add to these differences in principles, instrumentation and objectives, other organisational and management dissimilarities between the two policies. Linear policies are managed centrally through central (or regional) administration offices that apply the legislation on incentives to innovation. Conversely, interactive policies are decentralised in that intermediate organisations are in charge of rendering the services. Firms, their potential clients, and other local actors interested in the initiative, participate in their management. One of the objectives of these organisations is to become financially self-sufficient through sales of the services they provide, although public administrations often collaborate with budget assignments.

The concept and operation of policy has significantly evolved since the beginning of the eighties. But one paradigm or technological policy is not simply substituted by another. Both models actually coexist and are implemented depending on the characteristics of target firms. Policies based on linear innovation models aim to promote radical innovations and their initial development. Beneficiaries of this policy are usually large firms, or high-tech firms. Policies based on interactive innovation models, on the other hand, target the development of incremental innovations and the provision of technological services. They attempt to meet the needs and demands of small and medium-sized firms and, particularly, of local productive systems.

contrary, interactive models consider that innovations arise as a result of firm relations with the market through contacts within the network of local and/or regional actors.

3. Andalusia in the eighties and the origins of Cartuja'93.

Spain approved its new Constitution in 1978 and began one of the most intense decentralisation processes of the political and economic power that has taken place in Europe (Carrillo Benito, 1997). Andalusia³ voted for its self-government in 1980 and two years later approved its Statute of Autonomy. In words of Marin Rodriguez (1995), it seemed to have all it wished for and needed to change the course of its economic growth path. However, the economic position was not very encouraging in the eighties.

Andalusia in those years was, and still is, with its 7.2 million inhabitants, the most populated region of Spain. After more than 100 years of continuous decline, at the beginning of the eighties it was an example of a regional economy with serious structural problems: one of Europe's poorest regions, peripheral geographically, underdeveloped technologically, with a weak industrial basis, scarce scientific potential, low training manpower, isolated from the rest of the continent because of its bad transport and communications system, with serious infrastructure deficiencies and deep social problems, essentially determined by its high unemployment rate. All these characteristics made this region an unattractive area for investment and job creation.

In those years, analysts insisted on the precarious situation of the regional economy. Some (Delgado Cabeza, 1995) emphasised its excessive specialisation in the development of its natural resources, the disarticulation of its economic structure, in the sense of links missing in the economic chain, but also in the sense of a strong economic and social dualism, "the traditional" and "the modern", its scarce capacity to generate employment – with very high unemployment rates, above 30% of the working population, due to the destruction of jobs in traditional sectors and its scarce capacity for the creation and development of new firms, and the unequal distribution of wealth, as a consequence of an unequal growth model, based on external support, which means a subsidised economy. Others (Román del Rio, 1995) placed more emphasis on its low levels of productivity (the Andalusian GDP represented 12% of Spain's GDP, while territory and population represented a 17% of Spain as a whole), on its serious unemployment situation, on its low income level (it did not succeed reaching 75% of the national income) or on its low standard of living, (with averages on subjects like

³ Andalusia is an 87.268 km² region. It represents the 17.3% of the Spanish territory and around 2% of the European Union - EU15 – territory. The region is located at the Europe's southern border, at scarce kilometers from the north of Africa, between the Atlantic Ocean and the Mediterranean Sea.

schooling, telephones per inhabitant, hospital beds, etc., clearly under the national average), due to low growth rates, the disarticulation of the economic system, the scarce business culture, the low qualified manpower and the progressive deterioration of the regional environment.

In view of this panorama, and still without powers and resources, the provisional regional government started in 1980 an emergency Economic Plan (PUA, 1980-1982). Two years later in 1982 the explanatory preamble for the Law 4/1982 that approved the Special Investment Plan (PEI) for 1983 of the first autonomous government picked up the following phrase, specially descriptive of Andalusia's situation in those years: "The economic situation of Andalusia at the end of 1982 is commonly characterised, without exaggeration, as extremely serious" (Ferraro García, 1995). When in 1984 the Andalusia Council assumes the powers to promote its own research and development policies this area was also desolate. After a study of the human resources and the existing R&D infrastructures, they concluded that Andalusia counted on a reduced number of researchers that worked almost exclusively in the public sector, and for whom it was difficult to apply any qualifier criteria. This led the Andalusian Government to start a Scientific Policy Programme that meant progressive increase in the R&D budget and, at the same time, the realisation of the necessary support planning activities. In 1987 the first Andalusian Research Plan began, whose diagnosis confirmed, among others, the bad upkeep of the Andalusian R&D system, the lack of clear aims and thematic coherence, and the lack of relations with the regional productive system.

In this complicated context the first regional government drew up a development policy that emphasized the modernisation of the regional productive system as the only possible option in order to place Andalusia in a more and more liberalised international environment. In July 1988 the President of the Andalusia Government, Mr. Manuel Chaves, asked a team from the university headed by Professors Manuel Castells and Peter Hall (Project PINTA)⁴, for "a report about Andalusia's development possibilities, in the prospect of its modernisation and comparison with the most advanced societies of our time". This team worked for two years analysing the role of the technological modernisation in Andalusia's economic development with a double perspective: on one hand, studying the situation and prospects of new technologies in Andalusia, carefully concentrating on those which, from the international experience, they considered

strategic: biotechnology, information technologies, robotics, laser, new materials and renewable energies. On the other hand, analysing the economic and technological variables of the growth model in Andalusia and the relations between them. The project PINTA (Manuel Castells and Peter Hall, 1992) recommended the introduction of new technologies to base Andalusia's development, and in order to do that it established the following considerations:

1) That the technological innovation capacity implied the creation of instruments that promote, adopt and adapt new technologies and their diffusion by the region's productive system. That is to say, the creation of research and production complexes that had all the phases of the high technology industries productive process. So they considered as a premise that there had to be innovation capacity in the productive structure of the region so that a new industrial space could be a factor of the economic development.

2) That innovation instruments produced technological development effects only as far as they are intensely articulated with the productive system. The report's authors considered that the constant interaction between research, innovation and production formed a basic element of the more advanced and innovative regions.

3) Furthermore, they indicated three necessary additional factors to develop the new industries: an innovation source (scientific complexes and university or large businesses); a close articulation with the economic world (in terms of transport and communications); and an employment market for engineers and scientists in number and quality corresponding to the needs of the new productive complex.

From that point of view, the final report put forward the dilemma of choosing between two socio-economic models with opposite characteristics for Andalusia: a subsidised economy, based on the public sector, or a competitive and diversified open economy. The authors recommended the need to choose the second model, on the basis that in the very near future the important thing for the region did not have to be to produce new technologies of the most advanced level, but to use and adapt those technologies in function of the strategic needs of Andalusian development. To do that they propose to create in Andalusia two Technological Parks: one in Malaga, to articulate strongly technological innovation and industrial production on the basis of multinational corporations interested in establishing themselves in the European market,

⁴The principal results of this study were published in two volumes: Andalusia: Technological Innovation

and attracted by the area's standard of living; and another in Seville, the Cartuja'93 Project, that proposed use the highly qualified infrastructure and space produced by the World's Fair EXPO'92⁵, with the purpose of generating applied research in strategic technologies for Andalusia's development (essentially information and communications technologies, new materials, applied biotechnology to agriculture, food technology and environmental technologies), and articulate that applied research with the regional productive system, as much in industry as in agriculture and services, and also on an international level (especially difficult in North-South technology transfer).

The team also designed a land use proposal, that considered scientific-technological uses, as well as office staff, performing arts, college students, general services, cultural and recreational equipment, lodgings and extensive green areas, and advanced the constituent elements of Cartuja'93: sources of technological knowledge (national and regional public research organisations, Seville's University R&D centres and technologically advanced companies), scientific and technical manpower (from the University of Seville, but also from others Andalusian universities and of large business companies that would be established within the complex), and capital liable to accept a low profitability in the short term (essentially public capital). Furthermore, EXPO'92 would eliminate Seville's traditional isolation (new airport, connection with Madrid through high speed train and expressways...) and it would permit establish a co-operation network among different countries and companies, called to be the basis for launching the new project. So the authors of the Project PINTA, conformed EXPO'92 and Cartuja'93 as two large indissolubly bound programmes of co-operation mutually.

In this way, Cartuja'93 was theoretically presented as a "win-win" project for all the actors at stake: for large businesses, it would mean the opportunity to find a quality space in a European Economic Area with fast and full integration, with production costs comparatively much lower than in the rest of Europe. With respect to the national governments and international institutions, they would have an instrument fully prepared and strategically located to contribute to the transfer of North-South technology. For Andalusia, the benefits of Cartuja'93 were seen as basic, especially to raise the regional technological level and to adjust new technologies to the specific

and Economic Development. Manuel Castells and Peter Hall (directors). Espasa Calpe. Madrid. 1992.

⁵It is necessary to list in this regard that in December 1988 state Society Exp692 already put forward the countries and companies taking part the possibility of constructing permanent pavilions provided that its later use was integrated in the joint Technological Scientist and that has to be afterwards the enclosure of the World Fair.

needs of the regional productive fabric. For Spain the project would stimulate the North-South territorial balance and would imply deepening in its technological development policy and, finally, for EXPO'92, it would mean the posterity of its legacy.

4. - Creation and evolution of Cartuja'93 Technology Park⁶.

The recommendations of project PINTA were adopted as their own by the Andalusian government and also by the Spanish government and by the Seville City Council, and the Scientific and Technology Park Cartuja'93 started its activities, officially, in October 1993, just one year after the closing of the World's Fair EXPO'92, once the demolition work had been completed, once the non re-usable pavilions had been eliminated, and once the activities required were adjusted and in place.

However, things didn't work out as planned in 1990. The United States entered a recession in 1991, with a negative GDP growth of -1.2%, and also the United Kingdom, who registered that same year a GDP growth of -2,2%. Japan registered in 1991 an enviable 4.4% growth, but in 1993 fell to 1.4% and in 1993 to -0,5%. Germany and France held up two more years, until 1993, a year that finished with negative growth in both economies (Germany, -1.5%; France, -0.9%) (OCDE). Unemployment began to be extended in a Europe that showed a dramatic difficulty to create employment at that time. Between 1980 and 1993, 550.000 public jobs were created in Spain, as a consequence of the process of decentralisation and of the growth of the Welfare State, which made public expense grow from 25% GDP in 1978 to 50% ten years later, while 520.000 private jobs were destroyed. The peseta was devalued in 1992 and in 1993 and the fluctuation band of the European Monetary System was then widened to 15%. The OCDE economies spoke the language of the crisis, and the winds of those years of depression turned down Project Cartuja'93.

In fact, already in 1990 some voices (Carrillo Benito, 1990) alerted of the persistence, in spite of the strong investment effort that EXPO'92 meant, of basic problems in Seville's economy (deficiencies within the secondary infrastructure transport network, lack of definition in the tourist sector, a low business culture, insufficient skill on behalf of the local firms management), and also on the effects of the

⁶We continue at this point the analysis and the data about the creation and evolution in Cartuja'93 Technology Park that Benjumea Pino, the former Technical Director, provides in his Report on the change in the Technology Park between 1993 – 2003, published in the magazine Cartuja Innovates in the special 10th anniversary issue.

change of the economic cycle on the Project Cartuja'93⁷. The recession of the national and international economy, affected the local and regional business performance. The amounts of Public investment in the province of Seville was strongly cut, the programmes and projects that had mobilised resources for 1992 were ended, and the impact on the regional economy of the European Community Single Market was very negative for Andalusia and Seville. Against the strategy proposed by Project PINTA, that granted special importance to establish international R&D centres, companies and organisations (centre of technological forecast of the European Union, centre of transfer of technology of the Development Plan of United Nations, high R&D centre of the International Olympic Committee, laboratory of the European Spatial Agency...), some authors then proposed a different option for Cartuja'93: *"The establishment between the public sector and the private -local -of a common action framework, whose formalisation was consistent with a set of strategic planning initiatives(...) duly coordinated and addressed to (...) the promotion of the new Seville economy for the year 2000"* (Carrillo Benito, 1990).

Those responsible for Cartuja'93 during its first years maintain the strategy previously established and focus the park's action on the attraction of international investment, on the basis of the previous commitments with a select group of multinational companies. However, the change of economic cycle ensured that these commitments might not have been respected, and the attraction of international investments to Cartuja'93 was seen as a non-viable strategy. On the other hand, the surprising change of municipal government that Seville underwent after the World's Fair led the domestic political quarrels over Cartuja'93 Council of Directors, the public society that had been created to lead the launching of the Technology Park.

Despite all this, fourteen of the old pavilions of EXPO'92 were in use in December 1994, at the end of the first year of the new Scientific and Technology Park, and another four were in the process of re-use once the Council of Directors of Cartuja'93 authorised the location of other organisations. Thus, at the end of 1994 of the total Park building surface (356.544 m²) there were 61.328 m² in use, a 17.20% of

⁷In 1990 Carrillo Benito (1990) indicated the following: "... Finally, the fourth temptation is the self-satisfaction, that is to believe that the only thing to do is to wait and to collect the fruits of what is carried out. Unfortunately there are more than one reasons to consider that this is not so. That everything made is not, in itself, an absolute guarantee for the future. The new challenge is therefore to find out and to adopt in time and form a series of measures that serve as a complement to what has been obtained, and to clarify some of the questions that still hang on the next future of our province".

the total, and another 58.944 m² were in the process of being used again (equivalent to 16.55% of the total), which guaranteed its immediate future growth. However, in spite of this strong initial impetus, 1995 and 1996 were years of slow growth and activity for the Technology Park. As Jose María Benjumea (2003) indicates, *"it is at the end of 1996 when in the media and some sectors of local public opinion began to appear complaints on the slow process of growth and development of the Scientific and Technology Park, that even advocated, questioning the validity of the model, a liberalisation of uses towards business and administrative activities. However, the experience in all the European Technology Parks confirms slowness at the initial stages of its development. So the symbolic and paradigmatic Sophia Antipolis, in the French Blue Coast, needed a period of ten years to reach 2.000 jobs, figure that in Cartuja 93 had already been amply met in 1996"*.

After the complete stop felt by Cartuja'93 in the three years immediately after its inauguration, the economic recovery during the second half of the 90s and the consideration of the "quality of the territory" as a factor that privileges the location of the companies, led to those responsible for the Technology Park to focus on the local capacities, developing a new strategy that combined the promotion of endogenous resources of the territory with the co-operation between the public and private actors. This meant, in very specific terms, to put the assets of the Park at the disposal of the small and medium-sized local firms, and to place the attraction of international investments on a second level. It meant, therefore, a strategy that might fit within those termed "third generation" (Halkier, Danson and Damborg, 1998), that considered a more complete consideration of the inter-relationship among the local and regional interests, and national and international, within the globalisation framework. During this time, certain companies in Seville showed an interest in establishing their R&D activities in Cartuja, as a result of the birth and consolidation of a group of new technological companies of Andalusian capital⁸, and the increased demand of technological services by the traditional local and regional sectors (agro-industry, tourism).

All this ensured that 1997, 1998 and 1999 were years of special importance for Cartuja'93. During this period, several research centres linked to the *Consejo Superior*

⁸On many occasions closely linked to teachers of the Superior School of Engineers.

*de Investigaciones Científicas (CSIC)*⁹ (the main public research organisation in Spain), and the Seville School of Engineering¹⁰ moved to Cartuja and started their scientific activities. The introduction in the Park of new organisations and technological companies also accelerated. Furthermore, at the end of this period two facts of great importance for the final consolidation of the Technology Park took place: In October 1999 the *Empresa Pública de Suelos de Andalucía (EPSA)*, the public company who owned the land of Cartuja'93, began its privatisation, which has a positive effect on the development of the Park. Also in 1999 both multinational corporations (Siemens and Rank Xerox) that had constructed permanent pavilions (in which they had developed its activities since 1993) informed Cartuja'93 S.A. of their decision to abandon its location in Cartuja'93. This fact, so negative a priori, became the greater exponent of the change in strategy that we have indicated and in the confirmation that Cartuja entered at that moment the phase of its final consolidation: both pavilions were acquired in 1999 by two local firms¹¹. With all this, the size of the Park in performance goes from 75.908 m² (in December 1996) to 127.033 m² (December 1999).

During the period 2000-2003 this rate of growth in Cartuja's activity was kept up and even accelerated: in these three years the location of new firms and organisations raised in another 21.035 m² plus the surface in use¹², and authorisations for the establishment of new companies and technological organisations granted the last 56.093 m² of building available surface. This means that since December 2003 the total amount of 356.544 m² of the Park building surface has been completed, and today, the debate in Seville is how to proceed to its enlargement.

⁹It means the Chemical Research Institute, the Institute of Vegetable Biochemistry and Photosynthesis, the Institute of Sciences of the Materials and the National Centre of Accelerators of Particles.

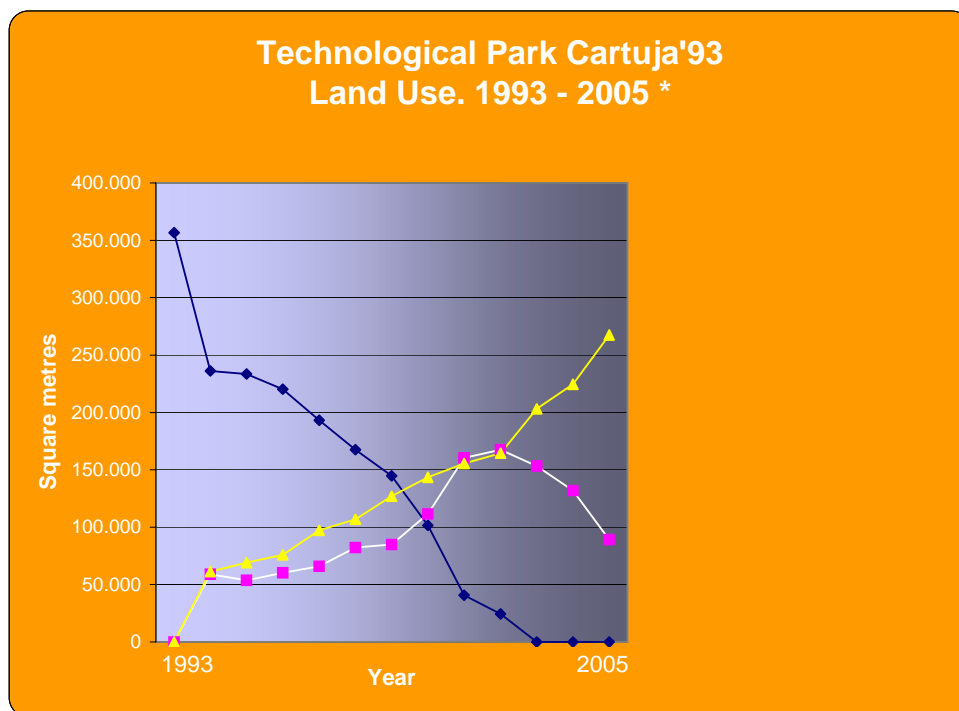
¹⁰With qualifications of industrial engineering, telecommunication, chemistry, aeronautics, industrial organization, automatic and electronic, the Seville School of Engineers in its more than 30 years of existence has trained more than 2000 engineers. They have exercised a role of first order in the substantial change that is testing this region. Currently this School has about 5000 pupils and more than 300 teachers, figures that will noticeably be increased in the years to come.

¹¹Inerco, a company of environmental engineering founded by teachers of the nearby Superior School of Engineers, and Mac Puarsa, industrial company that concentrated on the Park its laboratory and quality control teams.

¹²In June 2000 the Business Centre "Pavilion of Italy" is inaugurated under the management and development of Cartuja 93 S.A.. With its more than 10.000 m² of useful surface became a "central" reference point in the Park.

Table 1: Technological Park Cartuja'93
Land Use. 1993 – 2005

	Available	Awarded building site	In use
1.993	356.544 m ²	0 m ² -	0 m ² -
1.994	236.222 m ²	58.994 m ²	61.328 m ²
1.995	233.568 m ²	53.677 m ²	69.299 m ²
1.996	220.285 m ²	60.351 m ²	75.908 m ²
1.997	193.246 m ²	65.996 m ²	97.302 m ²
1.998	167.432 m ²	82.257 m ²	106.855 m ²
1.999	144.699 m ²	84.812 m ²	127.033 m ²
2.000	101.513 m ²	111.528 m ²	143.503 m ²
2.001	40.680 m ²	160.355 m ²	155.509 m ²
2.002	24.385 m ²	167.621 m ²	164.538 m ²
2.003 (*)	0 m ²	153.300 m ²	203.244 m ²
2.004 (*)	0 m ²	131.920 m ²	224.624 m ²
2.005 (*)	0 m ²	89.120 m ²	267.424 m ²



Source: Cartuja'93 Technical Manager

5. Cartuja'93 today: an irreplaceable reality in Andalusia's second modernisation.

The major aim of any Technological Park is to become an innovation tool, strongly articulated with the local productive system. Cartuja'93 is today a technological-scientific complex that is completely full. It is an urban technological park, that is a 10 minute walk from the centre of a metropolis with more than 1.1 million inhabitants.

With an invoicing in 2002 of more than 1.200 million EUR (30% more than in 2001), and 8.600 employees (13% more than in 2001)¹³ Cartuja'93 is, ten years after its inauguration, one of Andalusia's scientific and technological development references. Nowadays Andalusia is a very different region from what it was in the eighties¹⁴, and is ready to give a second leap towards the modernisation of its productive system and its economy on the basis of the creation of new technological complexes designed with the experience accumulated in Cartuja'93.

ACTIVITIES	Nº COMPANIES/ CENTRES	ECONOMIC ACTIVITY (million of Euros)	EMPLOYMENT
Advanced Technologies	142	996,88	6.679
Advanced Services	53	155,69	1.341
General Services	37	56,58	588
Total	232	1.209,16	8.608

Source: Inventory and Technological Evaluation of the companies and organisations installed in the Scientific and Technological Park Cartuja'93. Year 2002. (www.cartuja93.com).

The advanced technologies activity is the most important segment in the Park. It includes 142 companies, research and development centres in the telecommunications and computer science field, environmental technologies, energy, health technologies, biotechnology, agrobusiness and applied engineering. In December 2002 it represented

¹³*Instituto Andaluz de Tecnología* (2003): Inventory and Technological Evaluation of the companies and organisations installed in the Scientific and Technology Park Cartuja'93 corresponding to 2002.

¹⁴In year 2000 the Andalusian Gross Domestic Product was EUR 84.171 million, the third of Spain and above of GDP countries like Ireland, Hungary or New Zealand (Ferraro García, 2000). During the period 1995 – 2000 the Andalusian GDP has grown 26.34%, improving its convergence with Spain, whose GDP has grown for that period 20.71% (*Instituto de Estadística de Andalucía*, 2004). The gap, however, between Andalusia and the European Union continues to be important in terms of GDP.

82% of the complex invoicing¹⁵. The importance of advanced technologies is also clear in the labour force of Cartuja'93: these activities employ 6.679 people, more than 3.500 (53%) highly skilled¹⁶. A 76% of these companies are immersed in research, development and innovation projects, activities to which they declare dedicate an annual average budget of approximately 23% of its total. The design and development of products, components and equipment and the improvement of processes were, at that time (2002), the activities that concentrated greater number of projects.

Table 3: Cartujá93 – Advanced Technologies (December 2002)			
	Nº COMPANIES /CENTRES	ECONOMIC ACTIVITY (thousands of Euros)	EMPLOYMENT
Telecommunications and Computer science	43	344.266	2.430
Applied engineering	28	294.176	1.065
Environment	8	175.392	917
R&D Centres	31	68.985	1.327
Energy	4	48.378	132
University	3	25.791	540
Health Technologies	8	21.517	114
Biotechnology and Agribusiness	5	10.286	26
Training	12	8.085	128
Total	142	996.881	6.679

Source: Inventory and Technological Evaluation of the companies and organisations installed in the Scientific and Technology Park Cartuja'93. Year 2002. (www.cartuja93.com).

Forty three companies on *telecommunications, electronics and computer science* represent in Cartuja'93 an invoicing in 2002 of EUR 344 million and 2.430 jobs in the fields of computer engineering, telephone, television and broadband Internet services, software, storage, protection, integration and data management, solutions for telemedicine, etc. Furthermore, in Cartuja'93 is located the headquarters of the regional information technologies association (*ETICOM*), which provides its members with promotion, innovation, trade and international services, and the *Instituto de Automática y Robótica* of Seville's Engineering School, which is doing R&D in the fields of perception, control and robotics.

¹⁵From the year 2000 the advanced technologies segment has practically doubled its activity, which has permitted the general turnover of the Park to have increased in two years more than 70 percent

¹⁶ A recent survey (Instituto Andaluz de Tecnología, 2003) revealed that 94% of the cases are computerized jobs; 100% have a local network area, 100% have electronic mail and access to Internet, and 28% has videoconference. 77% of these companies made high use of Internet in 2002, and 94% a very high use of e- mail.

Engineering applied companies are the second in importance in Cartuja'93, with an invoicing in 2002 of EUR 294 million and more than 1.000 jobs in such diverse areas as electromechanical, aeronautical and aerospace, construction and civil engineering, industrial safety, energy, environment and agriculture, including the development of information, location and control systems. An examples of this type of companies (in aeronautical and aerospace engineering) are the cases of *Boeing International Corporation*, who manages from Cartuja'93 the activities that it has contracted in Andalusia for the manufacture of the B-717 model components; *Tecnológica S.A.*, who supplies electronic components and quality control services to the European Spatial Agency; *Emerge Ingeniería S.A.*, a regional public company created to anticipate the needs in Andalusia of EADS-CASA aeronautical A-380 and A-400M programmes; or *Aerópolis*, the company that is currently developing the birth of the Aerospace Technology Park of Andalusia close to Seville's Airport. Cartuja'93 also lodges Seville's Engineering School¹⁷, the *Industrial Organization School* (*EOI*, the first school of management in Spain), *AENOR*, the Spanish Association of Standardization and Certification, and the *Andalusian Centre of Metrology*¹⁸.

An interesting group of companies and research bodies has been also generated around *energy*¹⁹, as the *Centro de Nuevas Tecnologías Energéticas*, who developed from 1994 R&D projects with the aim of searching for a more rational energy system; the company *Iberdrola*, that currently manages a budget of 1.500 million Euros and

¹⁷With qualifications of industrial engineering, telecommunication, chemistry, aeronautics, industrial organisation, automatic and electronic.

¹⁸Created in 1990 by the Andalusia Government within the I Andalusian Research Plan, it works jointly with more than 600 companies of all Andalusia in R&D activities and industrial projects and services in the areas of the calibration and metrology. In the area of engineering Cartuja'93 receives also *VEIASA* a public undertaking dependent on the Andalusia Government dedicated to the inspection and industrial facility control; *AICIA*, an association for the research and industrial cooperation, protected by the Seville's Engineering School, without any doubt pioneering and fostering the development of the industrial sector in Spain; and the *IAT* (Andalusian Institute of Technology), a private foundation created by the Industrial Engineers of Andalusia that acts as a centre of innovation and technology that collaborates with companies and the Administrations in the design and implementation of their innovation plans and policies.

¹⁹Energy has been a decisive factor in the increase of Andalusia economic activity. Since 1995 the regional energy demand have registered a total growth of 38.3%, and an intense development of transformation, transport and distribution infrastructures has been done. Four pillars support the Andalusian government energy policy: the promotion of renewable energies, the effective promotion of saving and energy efficiency measures; the extension and improvement of the infrastructures, and, finally, the creation of research, development and innovation lines in the field of new energy technologies. All this priorities having the common aim of the fulfill the commitments acquired by the European Union in the Kyoto Protocol, based on the reduction of the emissions of gases responsible for the greenhouse effect during period 2008-2012 on all the Union in 8%, regarding 1990 (Plan Energético de Andalucía 2003-2006. Decreto 86/2003, de 1 de abril).

which they plan to invest in Andalusia in the next 3 years, in the construction and implementation of a cycle combined plant, together with other renewable energy facilities (essentially wind energy and biomass); *Enditel Endesa*, pertaining to a company of the energy sector *Endesa Diversificacion*, created to valorize the parent company's know-how in the areas of telecommunications, infrastructures, information and energy system; the South Regional Delegation of Spanish Electrical Network, responsible for the transport of electrical energy and the operation of the Spanish electrical system; the Andalusian institute of renewable energies, and the society for the energy development of Andalusia - *Sodean*, a dependent of the Andalusia Government, specialized in the start-up of energy policies, programmes and projects that also provides electrical engineering services.

Around *Environmental technologies and services* Cartuja'93 has also generated an important complex of companies and research centres whose influence is extended beyond the limits of the Andalusian geography²⁰. It is necessary to emphasize here the *Instituto de Bioquímica Vegetal y Fotosíntesis*, a research centre specialised in the biology of photosynthesis organisms and its biotechnological applications; the *Instituto de Investigaciones Químicas*, specialised in bio-organic chemistry (carbohydrates, biological chemistry, organic synthesis and molecular recognition) and in organometallic chemistry and homogeneous catalysis; the *Instituto de Ciencias de los Materiales*, that covers the entire investigation of materials cycle, including its synthesis and their properties; the *Centro Nacional de Aceleradores*, that offers research teams throughout the world the possibility of analyzing and amending materials through technologies based on ions beams (Ion Beam Analysis); and the *Institute for Prospective Technological Studies (IPTS)*, one of the seven scientific institutes of the European Commission's Joint Research Centre (JRC), and the single operative service that the European Commission has in Spain.

The cluster of life sciences (biotechnology, agribusiness and health technologies) is represented in Cartuja'93 by biotechnological companies as *Newbiotechnic*, (created by Andalusian capital), with businesses in the areas of biocontrol agents against plagues and plant diseases, molecular services directed to

²⁰The environment is one of the strategic factors of Andalusia development in the medium and long term. 39% of the 770 Andalusian town councils are linked wholly or partially to a Protected Natural Space. There are 128 natural spaces protected in Andalusia that represent 40% of the territory protected in Spain and 19% of the total of the Andalusian territory (1.6 million hectares). 62% of the Andalusian surface is catalogued as Priority Interest Areas in the EU Directive of Habitats.

genetic diagnosis, and gene technology; or by the *Centro de Innovación y Tecnología Alimentaria*, a research centre on agro-alimentary technologies. And in the area of health, among others, the *Centre PET* of tomography by emission of positrons, that takes part in the development of new molecules that permit the early diagnosis of illnesses like cancer or Alzheimers; and the *Medical Centre of Diagnosis*, specialised in the field of radiological diagnostics.

Advanced services have also acquired special attention in the development of Cartuja'93. In December 2002 it included 53 companies and organisations with activity in the areas of: communications and information, business consultants, management and marketing and business associations, with a general economic activity of EUR 155.69 million and 1.341 employees.

	Nº COMPANIES/ CENTRES	ECONOMIC ACTIVITY (thousands of Euros)	EMPLOYMENT
Communication and information means	4	50.526	336
Commercial management and marketing	7	26.414	443
Management and centres of companies	8	24.477	108
Representation, distribution and marketing of products	11	19.878	56
Business consultation	14	19.671	218
Employers' associations	7	10.224	123
Image sound, communication and production	2	4.502	57
Total	53	155.696	1.341

Source: List and Technological Evaluation of the companies and organisations installed in the Scientific and Technology Park Cartujá93. Year 2002. (www.cartuja93.com).

In the area of the *communication and audiovisual production* it should be pointed out that Cartuja'93 is the headquarters of the Faculty of Communication of the University of Seville, that teaches journalism, audiovisual communication and publicity and public relations, as well as a full range of masters and postgraduate studies on communication; and also of the publishing corporations of several newspapers and of the regional public TV company, as well as other services companies dealing with publicity, communication and audiovisual production. And, as previously mentioned, it receives other *faculties, colleges and superior training centres*, as is the case of the

Andalusian centre of business studies (*CEADE*), the school of management and marketing (*ESIC*), and the *Andalusian International University* (the last impart a range of doctorate and masters courses through which it tries to create an international space for education and the exchange of information, knowledge and technology). Cartuja'93 also has some important *professional services* firms, as for example *Deloitte & Touche*, *Solucionara*, – one of the greater Spanish multinationals in the field of professional services, and *Garrigues Lawyers and Tax Advisers* - one of the more important European law offices, and also two financial organisations: *El Monte* and *La Caixa*.

Today, Cartuja'93 is also the headquarters of several *economic development agencies*. Besides Society Cartuja'93, the society responsible for the management of the Technology Park, and *AGESA*, the state society entrusted to optimise and promote the full heritage that the State has in Cartuja, fruit of EXPO'92, within the Scientific and Technology Park some other agencies are located: the *Seville World Trade Center*, that offers in the new building a full range of infrastructures and high-quality business services; the *Instituto de Fomento de Andalucía*, a regional development agency responsible for the innovation support policies, research and technological development: el *Centro de Innovación y Transferencia de Tecnología*, created by the Andalusian government to stimulate the development of an Andalusian regional innovation system: *Sevilla Siglo XXI*, a local society instrumental in stimulating local development in Seville's province; *Sevilla Global*, the economic development agency of Seville's City Council²¹.

And in the area of the business associations Cartuja'93 is headquarters, besides the previously mentioned *ETICOM*, the *Confederación de Empresarios de Andalucía* (*CEA*), the most representative Andalusian employers organisation with more than seven hundred fifty associations, federations and employers organisations associations, which provide services in areas like quality control, trade and business internationalisation and technology transfer, and also the *Círculo de Empresarios Cartuja'93*, an association of firms promoted and set up by the companies and organisations that develop their activity in Cartuja'93 to promote relations among partners.

²¹ Within Cartuja'93 the *Foundation of Three Cultures of the Mediterranean* is located. This is a joint initiative of the King of Morocco, the Andalusia Council which have soon joined the *Centro Simón Peres por la Paz*, the Palestinian National Authority, and other people and institutions committed to dialogue and peace, whose activities are directed towards promoting dialogue, peace and tolerance between Mediterranean towns and their cultures.

6. Final comments about Cartuja'93.

Cartuja'93 is a space planned by the public authorities, and very specially by Andalusia's Regional Government, stemmed from the action of a regional bottom-up development policy. After the World's Fair, Cartuja'93 helped transform the need to use most of the assets that EXPO'92 left in Seville into a tool for developing the Andalusian economy and try to incorporate it into the most prosperous of Europe's regions. The enormous investment that Expo'92 represented, and the political support that it enjoyed conferred to Cartuja 93 an impetus far above that which any other European technology park had received.

During 1993-1996, the activity of the Scientific and Technology Park Cartuja'93 was very determined by the approach, excessively ambitious, of its initial design, very focused towards the attraction of multinational corporations and excellent international research and technological development centres, that was soon proved unviable in a context of international economic recession and increasing competition coming from China and other Asian countries. In short, the proposal to transform Cartuja'93 into an international North-Sourth technology transfer centre created confusion between the institutions and the companies, which made the project not viable. The project was not linked to Seville and Andalusia's economic system, and it did not take into account the new territorial strategies of the multinational corporations, and did not take into consideration the economic and technological dynamics of the emerging countries more committed to their industrial and technological policies and more attractive for the location of foreign companies. This explains Siemens behaviour of leaving the park, once having satisfied the investment commitments of the previous decade.

Furthermore, the project PINTA was completely dissociated from the local productive system and from the interests of the economic and social actors of Andalusia (even for Spanish actors). It was due to an outstanding proposal made by two prestigious professionals that had not taken into account sufficiently the role of the economic, social and institutional actors. Its lack of a territorial foothold makes obvious the lack of local companies representation within Cartuja'93 Board of Directors that is ultimately responsible for the management of the Park. It was managed centrally,

without considering that the participation of the clients in management makes the performance of the Park more efficient.

The failure of the initial proposal led those responsible for Cartuja'93 to develop, from 1997, a new strategy for the development of the Park that combined the promotion of the territory's endogenous resources with the establishment of co-operation relations between the public and private actors, placing the attraction of international investments on a second level, and making a broader consideration of the inter-relationship among the local, national and international interests, within the globalisation framework. The practical implementation of this new strategy had as basic goal to favour long-term local private investment in the Technology Park. For achieving this, decisions were made for the regulation of the conditions for the purchase of the land, restructuring of EXPO'92 old Pavilions and of the construction and equipment of new plant buildings by local technological companies and local, regional and national public organisations. This change of strategy has permitted the creation of new companies in the last few years, and more importantly the spreading of technological innovations through the local and regional productive system, with the consequent stimulus of increased productivity, and the development of the productive fabric of Seville and Andalusia.

The experience of Cartuja'93 also shows that the existence of a local leadership that grants credibility and trust is crucial to the rise and development of innovation tools in developing regions. Indeed, the role of the public authorities in the creation and consolidation of Cartuja Park and reaching a certain critical mass of projects and scientific, technological and business initiatives, has been, certainly, determinant. To achieve this, clear goals and ideas as well as understanding by all economic and institutional actors is necessary; as well as the identification at each moment of the project, of challenges and opportunities, flexibility and adjustment capacity of the initial designs to the evolution of the economic cycle and to the changes in demands of the local productive system; and, finally, to make, with these analyses in mind, the right decisions in the right place at the right time.

Another lesson learned from Cartuja'93 is that the development of tools for the creation and diffusion of innovation is a slow process, in this case over ten years, a process that accompanies not only the economic cycle, but also the change in the perception of the local productive system of the strategic importance of incorporating technological innovation in its growth strategies in the medium and long term, of its

financial capacity to confront investment decisions that stem from this change of perception (an access to suitable financing sources is, at the moment, a determining element), and of the existence of local technological companies with capacity to take the opportunities that implies being established in a space of excellence.

All this strengthens the new conceptions of local development that opt for a new strategic vision. This approach permits design a coherent group of guidelines, decisions and projects, both public and private, in order to reach the defined aims agreed upon by the civil society. In the current globalisation context, local economic development requires the combination of local and external investments as well as the circulation of innovations and the knowledge through the local productive system.

In December 2003, the Scientific and Technology Park Cartuja'93 was completed and, at this time its challenge is to emphasise in the aims for which it was created: to encourage, both inside and outside of Andalusia, the innovation, training and growth of companies and organisations based on knowledge. For this it will be necessary to continue stimulating the development of new and better support services for R&D and innovation, and to promote the consolidation of co-operation networks among the companies and organisations established to have access to external resources in the matter of information, markets and technologies.

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