National Forums of Industrial Competitiveness of Productive Chains

Software and IT Services Forum

Software
and IT Services

BLUE AND WHITE BOOK

SITS Strategic Plan 2004 - 2014

Action Plan 2004 - 2007

Ministry of Economy and Production

Secretariat of Industry, Trade and of the Small and Medium Sized Enterprises

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- Ministry of Education
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- Secretariat of Science, Technology and Productive Innovation
- Secretariat of Foreign Trade
- Secretariat of Communications
- Secretariat of Economic Policy
- Undersecretariat of Public Management
- INTI (National Institute of Industrial Technology)
- ONTI (National IT Office)
- ONIG (National Office of Management Innovation)
- CONICET (National Council of Technical and Scientific Research)
- Provincial Governments
- Government of the City of Buenos Aires
- Municipalities

THE PRIVATE SECTOR:

- CESSI *(Software and IT Services Business Chamber)*.
- CICOMRA *(Argentine IT and Communications Chamber)*
- CABASE *(Argentine Chamber of Databases and Online Services)*
- EDUTIC *(Association of Institutions devoted to distance learning and educational technologies in Argentina)*
- CADIEEL *(Argentine Chamber of Electronic, Electro mechanical and Light- technical Industries)*
- CATYA *(Argentine Chamber of Telecommunications and related industries)*
- AADS *(Argentine Association of Systems Leaders)*
- ADVA *(Association of Argentine Videogame Developers)*
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PREFACE

In November 2003, the Ministry of Economy and Production of the Nation, launched, through the Undersecretariat of Industry, the "Forums on Competitiveness", as a result of which nine productive sectors were selected with the aim of calling upon the different players involved in the improvement of competitiveness in each of these sectors. The program recognizes, among other issues, the need of the country to have "strategic options" available and to reframe its productive specialization pattern based on prioritizing those sectors that add value and are important generators of skilled jobs.

On the basis of these perspectives, the **"Forum on Software Competitiveness and IT Services"** was launched last December. This illustrates the overt acknowledgement of the potentiality of the sector and the need to design and agree on public policies aimed at the development of this sector. The executive and legislative branches of government as well as the business sector had been working for two years on specific initiatives such as export promotion, financing, laws acknowledging the sector as another industry, and promotion laws, among others.

The previous work done along these lines allowed us to assert at the beginning of the forum that *"the starting points should be some of the issues on which there is already consensus, on which we can build for the purpose of increasing competitiveness of the SITS industry, expanding the local market and boosting exports"*. Probably, the main consensus reached is that of sharing the vision of **TRANSFORMING ARGENTINA, A NON-CENTRAL COUNTRY, INTO A RELEVANT PLAYER OF THE WORLD MARKET OF SOFTWARE AND INFORMATION SERVICES.** This means that based on the countless comparative advantages of the country, it seems reasonable that Argentina be included as one of the successful non-central countries of the sector, provided we are able to correctly identify the actions to be implemented and that these actions are supported and approved by state policies so that they can be implemented on an on-going basis.

In line with this shared general vision, we set out to draft a **Strategic Plan for Software and IT Services for the years 2004-2014.** Thus, it was not difficult to identify the problems and opportunities that would become actions or measures to be developed. Nine Thematic Groups were formed: Human Resources, Research and Development, Supply and Demand Observatory, Exports, Quality, Finance and Investment, Intellectual Property and Free Software, the State and Software Development, Embedded Software and the Electronics Industry.

Contrary to what is written in planning manuals, the starting points **were not the problems but rather the vision**. We believe that if we start by the problems and generate the corresponding answers we will be trapped by the same line of thought that contributed to generating these problems, in the first place. Thus, the conceptual analysis and the description of actions in each thematic group were based on the shared vision, based on where we imagined that the sector

would be in ten years' time. This reinforces rather than opposes the need of trying to solve the concrete problems of the sector on a daily basis.

The general criterion was to call upon all the participants involved on behalf of the **National State, and the Private and Education Sectors**. Since these thematic groups were related to different national organizations in charge of the execution of policies, the meetings were held at the central offices of each of the sectors involved. This enabled us to closely relate and link the analysis and development of the general objectives with their execution on a daily basis. This is an essential factor for the coordination of the actions to be implemented by the six national organizations involved, so that they all have the same objectives and priorities.

At the same time, **Regional Forums** were organized in the cities of Rosario, Cordoba, Neuquen, Bahia Blanca, Tandil and Jujuy (northwest). The Forum venues were the poles or clusters of the sector's companies, as well as universities specialized in IT-related careers. The criterion of calling upon the private and education sectors and, in this case, the respective provincial governments and municipalities was applied in each one of the locations mentioned above. The forums organized in the cities of Mendoza, Salta, Patagonia (Santa Cruz) and Santa Fe have already been pre-constituted and have a fixed starting date.

We are not alien to the enormous **challenges of implementation and continuity** posed by our objectives; however, we believe there is no other way in which our country can acquire relevance in a high technology sector. One of the challenges will mainly consist of using the Strategic Plan and Promotion Law to make the software and IT services sector become a matter of State policy in Argentina, turning it into a strategic option for society as a whole. **The recent enactment of the law aimed at promoting the software industry as well as the national authorities' submission of the 2004-2007 action plan are considered the essential tools that will help us in the pursuit of these objectives.**

Dr. Silvia Bidart; SITS Forum Consultant.
Dr. Gabriel Baum; SITS Forum Consultant
Lic. Alberto Briozzo General Coordinator of the SITS Forum.

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Approximately 280 representatives from different Levels of Government, the Private and Education Sectors and NGOs participated during nine months in the Thematic Groups and Regional Forums. Some people coordinated the final reports while others made written contributions or attended different meetings. We thank all the people mentioned below for their participation and encourage them to continue with this endeavor going forward.

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INTRODUCTION *

A WINDOW OF OPPORTUNITY

In the last few years, we have observed a myriad of economic and social transformations linked to the emergence of "The Knowledge Society". Information and Communication Technologies (ICTs) occupy a central position among these transformations.

The expansion of ICTs is generating deep changes in the traditional forms of social and productive organizations, in both developed and developing countries; and the feedback between ICTs and globalization processes is decisively transforming the essence of the economy throughout the world.

There are no doubts about the increasing penetration of these new technologies in the social fabric or about the fact that the ICT sector has been one of the fastest growing sectors in the last few years.
Likewise, different studies carried out recently have shown that both the use and production of ICTs may strongly contribute to the increase of productivity in countries, companies and productive sectors alike.

The software and IT services sector (SITS) is a key segment within ICTs. In fact, at a global level, the SITS market has been growing faster than the hardware sector, and it is estimated that this upward trend will continue in the future.

Although developed countries are the main SITS consumers, many developing countries have been able to penetrate the sector successfully, such as India, which has become famous worldwide. On the one hand, the need to reduce costs leads companies in developed countries - especially from the U.S.A.- to increasingly outsource the rendering of IT services, stimulating the expansion of the *international outsourcing market*. On the other hand, companies in developing countries are presented with a whole range of opportunities that may help them progress in the development of innovative products and services, since the SITS sector is still far from having reached a stage of technological "ripeness". At the same time, markets are still in a permanent process of redefinition, which opens new business opportunities.

* This introduction was written by Dr. Andrés López based on the conclusions of the SITS forum

At present, the Argentine economy faces the challenges of entering the "knowledge-based economy" in the best possible conditions. Part of this challenge consists of finding strategies that will enable it to penetrate at least some of the sectors integrating the core of this "new economy". One of these sectors is precisely the software and IT service industry.

The following are some of the factors that contribute to the attractive expansion of the SITS industry for a country as ours:

i) The use of SITS may strongly contribute to the improvement of economic indicators and make a positive impact at a social or institutional level. Local SITS production may strengthen these advantages through the development of new and cheaper solutions which adapt better to local needs.

ii) The exports of the sector have been rapidly growing and the world market shows important opportunities to sustain this trend.

iii) The SITS industry tends to pay high wages and to generate more employment requiring higher levels of qualifications than the average economy.

iv) Likewise, it generates positive "spill-over effects" that will benefit the rest of the industries since its development is based on its capacity to innovate and create human capital.

Argentina has had a SITS sector for many decades. This sector has been expanding in the local market and more recently in foreign markets, practically without any type of official support and essentially based on the capacity and creativity of its human resources, the country's main competitive advantage in this area.

If the aim is to enhance the development of this activity, the public and private sectors will need to join efforts to define a model or strategy allowing them to leverage the advantages of Argentina and aiming at positioning the SITS sector in a prominent place in ten years` time, catering for the predictably increasing demand of the local market and taking advantage of the opportunities provided by the global market. The purpose of this document is to lay the foundations to define this strategy.

THE INTERNATIONAL CONTEXT

The SITS World market and late entry countries

In 2001, the world market of IT technologies amounted to approximately USD 1.4 trillion; while the software market amounted to USD 196.2 billion, IT services amounted to USD 425.7 billion (table 1). This sector has recently recorded a very rapid expansion, with annual growth rates of about 6.9% between 1993 and 2001 for IT technologies, 13.4% per year for software and 10.2% per year for IT services (table 2).

TABLE 1

IT TECHNOLOGIES WORLD MARKET. 1992-2001 (billion USD)

	Hardware		Software		Services		Internal costs*		Total	
Country	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001
U.S.A	70.741	136.051	29.720	96.556	73.257	199.203	104.994	107.428	**278.712**	**546.681**
Japan	38.938	49.686	6.652	13.729	32.709	52.320	64.328	67.786	**142.627**	**188.012**
Germany	14.772	24.488	5.584	14.697	14.598	27.018	24.338	29.075	**59.292**	**98.260**
Great Britain	11.532	21.287	4.882	13.798	9.200	27.354	21.624	26.723	**47.238**	**91.356**
France	10.722	14.716	3.664	10.524	11.847	24.870	22.081	28.543	**48.314**	**81.221**
Canada	5.845	9.558	1.869	5.958	6.371	12.385	10.404	10.865	**24.489**	**39.630**
Italy	7.309	9.182	3.326	4.650	6.670	11.083	4.826	6.303	**22.131**	**32.450**
The Netherlands	3.415	5.720	1.340	4.436	2.902	6.202	5.612	6.578	**13.269**	**23.988**
Australia	2.749	5.617	891	2.726	1.933	5.485	5.127	4.953	**10.700**	**19.289**
Switzerland	2.774	4.281	1.082	2.561	1.809	4.527	4.972	5.182	**10.637**	**17.025**
Brazil	2.192	8.816	743	1.863	1.630	5.368	2.391	3.583	**6.956**	**18.328**
Sweeden	3.490	4.241	842	2.307	2.918	5.488	3.954	5.137	**11.204**	**17.487**
Spain	3.776	4.939	1.283	2.243	2.644	4.256	2.055	2.786	**9.758**	**15.180**
China	2.848	16.738	117	1.491	85	1.524	314	1.324	**3.364**	**22.591**
Belgium	1.791	2.889	1.100	1.617	1.620	3.222	3.141	3.795	**7.652**	**11.956**
Korea	3.791	8.816	202	1.027	1.216	2.803	1.809	2.731	**7.018**	**16.174**
Denmark	1.544	2.469	484	1.407	1.231	2.918	2.542	3.186	**5.801**	**10.258**
Austria	1.316	2.301	472	1.332	1.214	2.439	2.195	2.563	**5.197**	**8.892**
Mexico	1.675	3.316	302	597	818	1.865	1.467	2.326	**4.262**	**8.405**
Southafrica	1.227	1.986	287	997	876	1.852	1.212	1.961	**3.602**	**6.975**
Norway	1.326	2.037	420	1.145	1.041	2.565	1.307	1.713	**4.094**	**7.626**
Finland	1.012	1.956	274	1.086	773	1.774	1.117	1.649	**3.176**	**6.630**
Taiwan	1.260	3.022	156	662	431	1.019	788	1.658	**2.635**	**6.634**
Israel	681	1.212	228	587	370	1.481	628	803	**1.907**	**4.192**
India	666	3.100	61	494	364	1.769	429	1.488	**1.520**	**7.131**
Argentina	**445**	**1.729**	**67**	**410**	**460**	**1.083**	**569**	**634**	**1.541**	**4.012**
Hong Kong	687	2.107	79	357	170	693	650	888	**1.586**	**4.235**
Poland	524	1.661	80	511	135	877	267	867	**1.006**	**4.031**
Turkey	953	981	72	241	107	312	196	333	**1.328**	**1.955**
Colombia	212	694	24	177	138	459	613	797	**987**	**2.189**
Rest of the world	10.722	20.523	1.798	6.051	4.182	11.446	6.951	11.842	**23.653**	**54.428**
Total	**210.935**	**376.119**	**68.101**	**196.237**	**183.719**	**425.660**	**302.901**	**345.500**	**765.656**	**1.377.221**

*: IT costs absorbed internally by companies and user institutions.
Source: own edition based on WITSA (2000 and 2002).

The bulk of IT markets is in developed countries, especially in the United States (40% of the IT world market, 49% of the software market and 47% of the IT services market in 2001). For developing countries (that hold 5-6% of the global SITS market), the main markets are some countries in Latin America (Brazil, Mexico) and Asia (China, Korea, Taiwan, India, Hong Kong). In 2001, Argentina ranked 26th on this list, with an almost 0.3% share of the international IT and IT services market and about 0.2% of the software market (table 2).

TABLE 2
IT MARKET SHARE AND GROWTH RATES PER COUNTRY. 1993-2001 (%)

	IT			Software			IT Services		
	Market share		Growth rate	Market share		Growth rate	Market share		Growth rate
	1993	2001	1993-2001	1993	2001	1993-2001	1993	2001	1993-2001
U.S.A	37.5	39.7	7.6	46.2	49.2	14.4	42.0	46.8	11.7
Japan	18.6	13.7	2.8	10.6	7.0	7.7	17.6	12.3	5.3
Germany	7.7	7.1	5.9	7.9	7.5	12.6	7.5	6.3	7.9
Great Britain	5.9	6.6	8.4	6.2	7.0	15.3	4.6	6.4	5.3
France	6.1	5.9	6.4	5.0	5.4	14.4	6.0	5.8	9.7
Canada	3.1	2.9	5.9	2.9	3.0	14.2	3.5	2.9	7.7
Italy	2.5	2.4	6.2	3.8	2.4	7.1	3.1	2.6	7.9
The Netherlands	1.7	1.7	1.7	2.1	2.3	14.6	1.4	1.5	10.4
Australia	1.5	1.4	1.4	1.6	1.4	11.7	1.2	1.3	11.0
Switzerland	1.3	1.2	1.2	1.5	1.3	11.1	1.0	1.1	11.1
Brazil	0.9	1.3	1.3	0.7	0.9	18.9	1.0	1.3	13.2
Sweeden	1.3	1.3	1.3	0.9	1.2	16.9	1.4	1.3	9.1
Spain	1.1	1.1	1.1	1.4	1.1	11.0	1.2	1.0	7.8
China	0.4	1.6	1.6	0.1	0.8	48.5	0.1	0.4	39.3
Belgium	1.0	0.9	0.9	1.5	0.8	5.4	0.8	0.8	8.8
Korea	1.0	1.2	1.2	0.3	0.5	19.4	0.7	0.7	9.6
Denmark	0.7	0.7	0.7	0.6	0.7	15.2	0.7	0.7	10.8
Austria	0.7	0.6	0.6	0.7	0.7	13.1	0.6	0.6	8.6
Mexico	0.6	0.6	0.6	0.5	0.3	6.2	0.5	0.4	7.9
South Africa	0.5	0.5	0.5	0.5	0.5	14.8	0.5	0.4	8.9
Norway	0.5	0.6	0.6	0.6	0.6	14.3	0.6	0.6	11.4
Finland	0.4	0.5	0.5	0.3	0.6	21.4	0.4	0.4	12.2
Taiwan	0.3	0.5	0.5	0.2	0.3	19.4	0.2	0.2	10.9
Israel	0.3	0.3	0.3	0.3	0.3	11.4	0.2	0.3	17.1
India	0.2	0.5	0.5	0.1	0.3	30.7	0.2	0.4	19.0
Argentina	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**16.1**	**0.3**	**0.3**	**8.6**
Hong Kong	0.3	0.3	0.3	0.2	0.2	10.9	0.2	0.2	8.1
Poland	0.1	0.3	0.3	0.1	0.3	24.9	0.1	0.2	24.5
Turkey	0.1	0.1	0.1	0.1	0.1	13.0	0.1	0.1	28.0
Colombia	0.1	0.2	0.2	0.1	0.1	19.5	0.1	0.1	11.5
Rest of the world	3.3	4.5	11.1	2.8	3.0	14.4	2.2	2.6	12.5
Total	**100**	**100**	**6.9**	**100**	**100**	**13.4**	**100**	**100**	**10.2**

Source: own edition based on WITSA (2002).

One of the most dynamic markets within the IT sector at an international level is *outsourcing,* a phenomenon essentially resulting from the need to reduce costs. The forecasts of the main specialized consulting companies indicate that this trend shall continue in the next years even though the issue is raising controversy, especially in the United States due to an alleged loss of job opportunities.

The bulk of production and software exports is concentrated in the United States, Japan and in the most developed countries of mainland Europe. However, there are many cases of developing countries or of European peripheral countries with a consolidated international presence in the SITS sector (Israel, India, Ireland) or countries that intend to position themselves in that market (Russia, China, The Philippines). Each of them presents a well-defined export insertion strategy (explicit or not). At the same time, there are countries such as Brazil or Korea that have developed large SITS industries based on their local market size and level of sophistication (table 3).

TABLE 3

Development of software and IT services in "late" entry countries. Latest available year (USD billions)

	Sales	SITS Exports	Exports/Sales Ratio	Jobs	N# of companies
India	12.500	9.500	76%	400,000	6.000
Ireland	14.000	13.000	93%	28,000	≅900
Israel	4.100	3.000	73%	15,000	≅400
Brazil	7.700	100	1%	170,000	3.500
Uruguay	240	80	33%	2,500-3,000	250
Argentina	**1100**	**180**	**16,4%**	**25,000**	**600**
Costa Rica	n.d.	50	s.d.	3,000-4,000	150
Chile	200	15	8%	2,000	200
Singapore	1.660	476	29%	n.d.	n.d.
China	13.300	700	5%	190,000	5.000
Korea	7.700	240	<3%	63,000	4.900

Source: updated based on Lopez (2003).

India's strategy is mainly based on service exports though they have started to mobilize professionals (body shopping) in order to be able to move into offshore programming and services in the future. Ireland's exporting profile clearly differs from that of India as far as exports destination and composition are concerned. The European Union, rather than the United States, is the main destination of Irish exports. Regarding exports composition, it differs from the Indian model in that packaged software is the predominant service provided. Unlike Ireland, Israel has concentrated mainly on the software niche of security and anti virus technologies.

Other than these three cases, which are the ones that have been most studied and widespread at an international level, there have been other late entry experiences in the SITS sector. For example, some countries in East and Southeast Asia have made important progress in the industry, including Taiwan, Singapore, Thailand, Korea, Malaysia, The Philippines and China, a group that other countries of a relatively lower development level like Vietnam want to join. As has been previously the case in other countries with other productive sectors, governments have openly supported the development of this industry considered strategic due to its intensive technology, qualified human resources and its high dynamics.

Last, it is worth mentioning that many former socialist European countries have tried by all means to access the SITS sector, taking advantage of skilled, inexpensive labor (available in Romania, Hungary, Poland, Russia) among other factors. In the case of Russia for example, the emphasis is laid on the advantages that this country would offer in terms of highly qualified personnel costs for *outsourcing* activities and specifically for *offshore* software development.

Given the different experiences of "late entry" countries in the SITS sector, it may be concluded that there are alternative insertion strategies which may also differ, for example, in terms of the degree of orientation towards export markets, the emphasis on sales of products and services and the role of local companies *vis-à-vis* multinational companies, among other factors.

Regarding "exporting" strategies, in practice, SITS exports from developing countries have always been much more service-oriented than product-oriented (this is evident in countries such as India, The Philippines or Russia). Among the cases of "late entry" in the sector, only Ireland or Israel – which cannot be considered as developing countries – have made significant progress in the exportation of products. Singapore is starting now to develop this strategy.

Regarding the profile of the companies, while multinational companies prevail in Ireland (even though in the last few years there have been many dynamic and innovative Irish start-ups), in India there is a strong presence of both foreign and local companies. In Israel, the growth of the sector was initially spurred by national companies.

Success factors in the SITS Industry

What would be the key components for a successful advancement strategy for the SITS sector? Regarding this issue, it is first necessary to make a caveat since this is a young sector subjected to constant technological changes which is still far from having defined supply and market patterns. Anyway, based on the present scenario it is possible to infer that there would be issues related to strategy and business capabilities as well as aspects related to public policy.

The first group would include the following:

i) Identification of market segments with growth potential.

ii) Capacity to compete on costs or innovative services;

iii) Good *marketing* strategy.

iv) Access to venture and working capital.

v) Availability of programming, analysis and *management* skills.

vi) *Networking* mechanisms with other software companies and clients, investors, etc. both at home and abroad.

Regarding public policies, the elements to be considered are:

i) Finance (tax exemptions, subsidies for *marketing*, *venture capital*, etc.).

ii) Investments in education and training.

iii) R&D subsidies.

iv) Telecommunications infrastructure.

v) Use of the state's purchasing capacity to promote the utilization of quality standards in local companies.

vi) Guarantee the protection of intellectual property rights.

In turn, based on the experience of "late entry" countries in the SITS sector, five alternative insertion strategies may be classified:

i) Product exports.

ii) Service exports.

iii) Creation of products for the local market.

iv) Supply of services for the local market.

v)A "Combined" and evolutionary strategy that starts with the supply of products and/or services for the local market followed by the penetration of international markets.

In turn, within the service export strategy, we may distinguish three variants:

i) Development of customized software according to the user-provided specifications.

ii) Development of software under subcontracting terms

iii) Establishment of software development units as joint ventures with foreign companies.

Beyond these general aspects, it is worth analyzing the factors that would have contributed to the success of the countries such as India, Ireland and Israel in this sector:

a) Demand:

The rapid pace at which the SITS world market has grown and the imbalances between the demand and supply of labor in the sector favored exports from countries such as India or Ireland. Regarding the local demand, it was mainly used in Israel as a learning platform for exports, particularly as of the requirements of the Armed Forces in the software and security areas. A relatively sophisticated local demand can be considered a necessary pre-requisite for developing a product exporting SITS sector, while its role is less important if the aim is to export services.

b) "National" strategies and visions:

In these three cases, there have been strategies supported by public and/or private institutions depending on the case, specifically oriented to the development of the SITS sector and particularly to its exports. In turn, there have been *ex ante* visions regarding the specialization strategies to be followed, and for each different case certain *"brands per country"* were developed. These brands identified India as a service exporter, Ireland as a country of attraction of multinational companies and Israel as an exporter of innovative products developed by local companies.

In turn, such countries had demonstrated that they were capable of flexibly adapting themselves to certain changes in the scenarios in which they operated. Therefore, in view of the progressive loss of competitiveness-price due to the appearance of countries competing with lower salaries and due to a *brain drain effect* and to the increase of labor costs in India, Indian companies have moved upwards in the value scale from *body shopping* and *onsite* programming to *offshore* programming, development of more complex tasks, specialization in certain vertical sectors and dissemination of quality standards.

On its part, Ireland has also faced problems due to increasing labor costs and the *brain drain* that has aroused fears over the possible exit of multinational companies that develop activities of localization/ customization of software packages in that country. This is the reason why the government has tried to encourage the emergence of a local base of *entrepreneurs* (for example, promoting the birth of *spin offs* of multinational subsidiaries). At the same time,

they have been trying to develop new specializations in areas such as services for complex projects and specific product niches.

c) Confidence-building in international relations:

Due to different reasons, highly educated people from these countries have moved to the United States and other developed countries. There is a bright side to the *brain drain,* however, since exporting activities in these countries have many times started as a result of the relationships made possible by expatriated people residing in the developed world. The development of the sector in these countries continued stimulating and refueling the *brain drain* process, which resulted in many expatriates returning to their native countries to set up SITS companies there. In addition to the personal bonds, the governments of these countries and the business sectors promoted the exporting activity through the granting of subsidies, participation at fares and exhibitions, setting up subsidiaries abroad, supply of information, etc.

The incentives for the setting up of multinational subsidiaries in countries such as Ireland and India have also favored the links between the SITS sector and export markets. In turn, the creation of long lasting bonds with the customers has played a key role for which companies from these countries had to construct for themselves a reputation of reliability by complying with the set objectives, budgets, terms, quality standards, etc. Other aspects that have favored the creation of these confidence-based links are the more widespread acceptance of CMM and ISO quality standards and the gradual improvement of the intellectual property legislation.

d) Characteristics of the SITS sector:

Among the important factors in this area we might mention:

i) Prevalence of small and medium sized enterprises and a relatively high level of competition within the sector (especially in Israel).

ii) Creation of *clusters:* in these three cases, SITS companies tend to locate near one another leading to agglomeration economies, which is beneficial (especially due to the access to a common infrastructure –on occasions subsidized by the government -), exchange of information and knowledge and improvement of the “market profile”.

iii) Associativity: the SITS companies, often encouraged by business associations and government institutions, have frequently associated with one another in areas such as market research, business management and dissemination of best practices.

e) Local Inputs /Infrastructure:

This includes:

i) Human resources: even though in India and Israel there was already an extensive number of qualified human resources, a key factor -and probably the most important one for the development of the sector- has been that the government has stimulated the training of highly qualified personnel at world-class institutions. In this regard, some authors attach more importance to the capability of human resources than to costs, as evidenced by the success achieved by these countries in entering export markets. Other important factors have been the demonstrated proficiency in the English language and knowledge of export markets as a result of "expatriated professionals".

ii) Technology: it especially includes access to IT infrastructure, modern telecommunications and international prices.

iii) Finance: governments have stimulated the supply of working and venture capital for SITS companies through subsidies, preferential loans, exemptions, etc. In the case of Israel, the role of the venture capital industry was very important.

iv) Research and development (R&D): In these three cases, there have been investments in R & D made by governments (generally through tax exemptions and subsidies) and the private sectors This was particularly key in the case of Israel, whereas in India, the results of the R & D efforts have been less successful.

v) Others: these include government actions for the supply of transportation infrastructure and business services, dissemination of best practices, support to business associations, removal of bureaucratic barriers, etc.

To summarize this section, it is worth mentioning that even though these three countries have succeeded in entering the global chains of value in this industry, so far (except for Israel) they have all carried out essentially routine tasks and low value added jobs (coding, debugging, translating, programming, etc.), profiting from the advantages of lower labor costs as well as from the existence of different incentives.

In this regard, the experience of countries of late entry in the SITS sector shows that the activities that triggered the development of these sectors may condition their future progress. Thus, the implementation of these routine activities narrows the sources of competitive advantages (strongly linking them to the labor costs) and making them similar in different countries that follow behind, which must compete among one another (on prices) to access the same market with the resulting transfer of income to foreign clients.

This is very important since there are many countries that wish to insert themselves in the SITS market and many of them want to do business competing on low costs. Faced with this scenario, even though it is obviously difficult to make progress on an area based on product design and innovative solutions, such area becomes potentially attractive for countries with qualified resources and technological capacities since it may ensure in the long term a more sustainable development of the sector and better profits for the country where that sector is located.

The role of clusters

A cluster may be defined as “a geographically delimited grouping of similar inter-related or complementary companies with active channels for commercial transactions, communications and dialogue, sharing a specialized infrastructure, labor and service markets and facing similar opportunities and threats.”

This definition emphasizes the importance of the role of social interaction and company cooperation in the determination of the cluster’s dynamics. In this manner, the concept reflects the systematic and interactive nature of innovation and constitutes an appropriate framework for the development and implementation of a new form of local “government”, one that goes beyond the mere development and implementation of public policies.

Clusters have played an important role in boosting competitiveness in many developed and developing countries. Many of these countries (and regions within them) are adopting this concept for the design and implementation of new policy approaches and to create and strengthen territorial/sectoral systems to render the national or regional economy more dynamic, gain entry into international markets and create job opportunities requiring increasingly higher qualifications.

At a time in which coded knowledge is disseminated much faster and globally than ever –partly due to information technologies and communications – tacit knowledge, which is less mobile geographically, becomes more important as a basis for the generation of sustainable competitive advantages, being geographical proximity an important factor for its development.

On the one hand, even though technology facilitates interaction across long distances, interpersonal contact is still fundamental for a great amount of information exchange processes. On the other hand, communicating tacit knowledge requires a high level of mutual trust and understanding, which is linked to the language, culture and shared values. Thus, regional competitive capacity is not only related to physical and human resources of a region but also to the knowledge "embedded" in the region's industrial and institutional structure.

Since these regional capacities are valuable, rare and difficult to imitate in other places, they become long lasting competitive advantages for the companies located in those regions that possess them. This is the reason why so much importance is attached at present to the local environment as a space for creation and permanent recreation of localized competitive advantages. Recent studies have highlighted the territorial dimension and the importance of creating and strengthening local networks as a means of transmitting knowledge and capabilities.

Thus, the local productive system becomes an open system in which competitiveness is based on cognitive factors requiring an institutional "atmosphere" to be translated and disseminated as business management learning processes. The change and the adaptation of the territory as a collective system to the changing conditions of global competition become the axes for the institutional promotion of competencies by building a bridge between the productive sector and its territorial base.

Thus, acting on territorial competitiveness implies permanently strengthening and recreating the capacity of the territory to successfully compete in the global market. This capacity is based on the development of knowledge and innovation in the production of goods and services, process in which the creation of a network of local agents and their interaction with the rest of the world plays an important role.

However, local positive aspects do not necessarily imply the existence of a competitive capacity. The fact that some regions have had satisfactory results in the global competition and that, in the last few years, there have been some very successful cases (for example Silicon Valley, the Research Triangle in Northern Carolina, Route 128 in the Boston Area, the different industrial Italian districts, the southern districts of Sweden, etc.) must not be lineally extrapolated to assert that any region or local area might generate similar processes to increase its competitive capacity. For this to be possible, a series of local conditions, that is to say in the provinces/regions, and also national and supranational conditions must be met. Without these conditions, it will be impossible - or very difficult - to implement a successful project for the creation of this competitive capacity.

Through the analysis of the experience of some of the most famous clusters in the ICT area, the following may be concluded: In the first place, the importance of the involvement of the State at different levels is worth emphasizing. In most cases, the origin of clusters can be related to some type of policy or State action, many times, not aimed at developing a cluster in the area or at promoting the information technology sector; for example, the setting up of a plant for military strategic reasons (Silicon Glen in Scotland). Other times, these actions are directly or indirectly related to the promotion of the technology sector such as the establishment of a university (Bangalore, India), a research laboratory or urban planning efforts (Cambridge, England).

Once the “cluster” phenomenon has reached a certain level of development, different state actions will tend to reinforce this process as in the case of the allocation of additional funds to universities for the creation of research projects together with the industry (Scotland), international cluster “marketing” actions (Bangalore), or regional development policies (Galway, Ireland).

In the second place, a very important feature to be mentioned is the entrepreneurial culture. Even though the specific cultures of the different regions are very diverse, there is a characteristic common to all cases: the existence or promotion of an entrepreneurial culture. In effect, the presence of the Brahmin caste was appositive influence for the emergence of an entrepreneurial spirit that rapidly developed into the cluster of Bangalore. In the case of Cambridge, the new entrepreneurships are very informal in style. They are teams of entrepreneurs very closely associated with university life and involved in the research wave that started with the break-up of the classical dichotomy between academic and business life.

In the cases of Ireland and Scotland where the entrepreneurial culture was not adequately developed, public programs aimed at promoting such culture and creating new dynamic companies were implemented, especially in technological areas. Both Enterprise Ireland and Scottish Enterprise implemented programs with these purposes and achieved interesting results.

In the third place, another issue that must be highlighted is the complementarity between foreign and local companies. Even though in the case of Ireland, in which foreign investment was the most relevant factor, the government is actively promoting the creation of local companies and their insertion in foreign markets. In some cases, the setting up of a foreign company helps to strengthen the expansion of the cluster (such as the case of Texas Instruments in Bangalore), while in other cases, it is the result of a process to generate local capabilities (such as Microsoft research laboratory in Cambridge). In yet other cases, foreign direct investment is both a pro and a con due to the fact that recurring crises oblige the government to provide permanent support to sustain localization advantages (Scotland).

Finally, the wide sectoral approach is an important aspect to take into account for policy-design purposes. In effect, the case of Cambridge shows the potentiality of a wide approach, in which the most innovative and dynamic companies are not ICT companies but companies incorporating ICT in an intensive manner. The case of Ireland is also interesting since the program for regional development based on technology- intensive sectors targets a wide range of sectors, leaving room for the specialization of the different regions according to their own profile. The case of Scotland, by contrast, shows the limitations posed by an excessive specialization on mature products with the subsequent negative effects that repeated crises bear on the region. This does not imply that there must not be a specialization but rather, that it must flexible enough to enable it to adapt to changes quickly; enough innovative capacity to help the cluster develop and an accurate vision to lead companies and institutions towards more dynamic niches.

THE SITS SECTOR IN ARGENTINA

Brief history and the situation at present

During approximately 40 years of evolution, the SITS sector has had a significant expansion in Argentina. This expansion has mainly been spontaneous in view of the lack of public policies to stimulate the sector. Likewise, this happened in a macroeconomic and institutional environment that has not been very favorable for the progress of an innovation and knowledge-based sector.

The SITS sector was born in the 1960's and developed on the basis of a marked inward-looking market structure in the decades that followed. By the mid 1980's the first diagnoses on the situation of the activity were produced. These diagnoses showed that even though the use of imported software was clearly predominant, there was already a SITS sector developing steadily in Argentina. At least 300 companies operated in the SITS sector at that time. Two hundred companies out of these three hundred worked on software development even though not necessarily with the aim of marketing it separately (since in some cases, such developments were "embedded" in different types of equipment). It must be pointed out that these estimates did not include companies and institutions that developed software for internal use ("self-developers").

While the basic software (operating systems for example) and utilities programs were mainly imported, the application programs (used at that time mainly for administrative, accounting and tax purposes) were supplied by local firms. The need to consider the country's accounting and tax regulations peculiarities was the determining factor for the presence of local supply of that market item in particular.

Regarding IT services, at the same time a similar survey had detected the existence of 300 companies specialized in data processing. Most of them were small and concentrated on issues such as system consulting, software development and installation, data processing, etc.

A survey performed later showed that by the mid 1990's there were 300 companies active in software production and/or distribution, with approximately 3,000 people employed in software-related activities and approximately 1,500 in service supply. One third of the market, which amounted to approximately USD 190 million, was supplied by national companies and the rest by imports. Exports were infrequent even though there were companies looking for foreign partners that participated in international exhibitions with a view to entering other markets.

The most recent studies show that in the year 2002 there were more than 500 companies in the sector posting sales for over USD 400 million – that would amount to USD 725 million if we included the licenses for the sales of foreign products – and exported about USD 70 million – twice the amount in 2000 - (table 4). This increase in exports was initially the result of a downturn in the local market favored by the new exchange rate context. At present, however, even in the context of a real recovery of the local market, the interest of SITS companies in exporting products has increased, as we will see below.

TABLE 4
SALES ESTIMATES OF THE SITS SECTOR AND ITS COMPOSITION. 2000-2002
(MILLION $ AND USD, %)

	Current prices					Stable prices	
	2000		2002		Var. 00-02	2002	Var. 00-02
Activity	$	%	$	%	%	$	%
Software products sale	975	*49*	1,210	*52*	24.2	971	-0.2
-developed in Argentina	345	*17*	210	*9*	-39.0	169	-51.0
-developed abroad	630	*32*	1,000	*43*	59.2	802	27.8
Professional services sales	1,015	*51*	1,115	*48*	9.6	895	-12.0
Total sales	1,990	*100*	2,325	*100*	16.8	1,867	-6.2
Employment	15,000		14,500		-3		
Exports USD	35		70		100		

Source: López (2003).

Most of the companies of the sector are national companies with less than 50 employees but the highest percentage of sales is contributed by foreign companies and from the few companies that have more than 50 employees (tables 5 and 6).

The most recent estimates show that the sales in the sector would amount to approximately ARG$ 3.3 billion or USD 1.1 billion – approximately 0.7% of the GDP – and that the number of jobs would be around 40,000 (these figures include recently installed *call* and *contact* centers – see below -).

The available export figures in the meantime show an important variation since different studies use different definitions to estimate them. However, it is clear that in any case, they have continued growing at a fast pace after 2002.

TABLE 5

SALES, EMPLOYMENT AND EXPORTS OF THE SITS SECTOR BY COMPANY TYPE. 2000-2002 (%)

	Sales		Employment		Exports	
By origin	**2000**	**2002**	**2000**	**2002**	**2000**	**2002**
Foreing companies	66%	81%	42%	36%	73%	53%
National companies	34%	19%	58%	64%	27%	47%
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
By size						
Large [1]	86%	93%	72%	82%	70%	71%
Medium [2]	12%	5%	21%	15%	27%	28%
Small [3]	2%	2%	7%	3%	3%	1%
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
By activity						
Local product companies [4]	18%	5%	33%	20%	75%	22%
Foreign product companies [5]	37%	56%	18%	41%	0%	31%
Service providers [6]	46%	39%	49%	39%	25%	47%
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

1: 50 or more employees
2: between 10 and 50 employees
3. 10 or less employees
4: companies (local and foreign) which main SITS related activity is the development of software products in Argentina.
5: companies (local and foreign) which main SITS related activity is the marketing and distribution of products developed abroad.
6: companies (local and foreign) which main SITS related activity is the supply of professional services (Customized developments, solutions integration and implementation, software consulting, etc.)
Source: López (2003).

TABLE 6

COMPANIES IN THE SITS SECTOR CLASSIFIED BY SALES RANGE. 2000-2002 (%)

Range	2000	2002
Less than one million per year	46%	46%
Between $ 1 and 2 million per year	22%	19%
Between $2 and 5 million per year	13%	14%
Between $5 and 15 million per year	10%	5%
More than $15 million per yaer	9%	15%

Source: López (2003).

A recent comprehensive assessment indicates that at present, SITS exports amount to USD 170 million. In order to appreciate the relevance of this figure, it is worth quoting that in 2003 textiles and garments or wine exports were at the same level or even lower.

Argentina's potential as an international service supply center is also confirmed upon analyzing the investments made as of the year 2002 for the setting up of *call centers, contact centers, etc.,* which have already created many jobs. This is an activity in which the labor cost is a decisive factor and therefore, it might be supposed that within a scenario of progressive recovery of the local salaries' purchasing power, measured in dollars, Argentina's attractiveness for these types of investments would gradually decrease. However, the observed trend ratifies that it is still possible to take advantage of the capacity of local labor in order to supply third markets in SITS related activities and to position Argentina in the world map of countries having the capacity to successfully compete in this industry.

Other encouraging indicators in this regard result from the decision of Motorola – before the devaluation – to invest in a software development center located in the city of Cordoba, aimed at generating global corporate solutions or at the installation of a *software factory* in the local IBM subsidiary (CMM level 3 certified).

Importance of the sector in the economy of Argentina

Even though developed countries – particularly the United States – have experienced controversies some years ago related to the economic impact of SITS, recent evidence clearly shows that SITS production and use, has had significantly positive impacts on productivity – and consequently on the possibilities of development – of countries as well as sectors and productive companies.

We have already seen that SITS exports are equal or exceed those of traditional industry sectors in Argentina. The contribution of the sector to the GDP is equal or exceeds that of traditional industries such as shoemaking, spun and woven textiles, electric appliances and consumer electronics.

As we have seen, the number of jobs in the SITS sector would amount to 40,000 people. In comparison, in the last 20 years the maximum number of jobs available in the car sector has barely exceeded 26,000 and in 2002, the terminals employed less than 12,000 people.

On the other hand, this sector shows some characteristics that make it particularly attractive for public policy decision makers:

i) It is a work intensive activity that can rapidly generate qualified employment with relatively low capital investment.

ii) There are many opportunities in the international markets that may be leveraged, not only with relatively low investments but also with equally reduced imports requirements. In other words, the sector may make a significant contribution for the improvement of the country's balance of trade.

iii) The activity offers expansion opportunities not only to large companies, but also to a large amount of existing small and medium sized enterprises and new entrepreneurships.

iv) Competition in the sector, though not immune to the cost and price situation, is mainly based on the development of capacities related to innovation, quality, etc. Therefore, the sector generates positive impacts on the economy as a whole since it continuously produces new knowledge and human resources.

v) Contrary to what happened in other regions, the consolidation of a specific country as a preferential site for investments of large companies that are worldwide leaders of the SITS sector has not been experienced yet in Latin America – as has been the case in countries such as Ireland in Europe or India and Singapore in Asia -. Argentina, as we will see later, **does** have a series of key advantages to become a preferential site for investments in Latin America

However, the relevance of the sector exceeds the intrinsic characteristics or its direct contribution to the GDP or employment creation. Since this industry produces general-purpose technology, its development benefits the economy and society as a whole. This is mainly because the use of software and IT services not only improves the efficiency, quality and innovation capacity of the whole productive sector but also acts as a key tool to meet the needs of other sectors such as education, health, government, etc.

Why is it important to count on the local supply if possible, to meet these needs?

i) The availability of a SITS local supply increases the advantages for users –especially when users are SMEs -, since it enables them to have access to a supply more in line with their needs and probably at a cost that better adapts to their payment possibilities.

ii) Since innovation is an interactive process, the existence of local supply and demand may lead to a virtuous cycle in which both SITS producers and users may learn and improve their competencies and capabilities through the exchange of

information and processes, mediated or not by the market. As a result, both productivity and innovative capacity of the SITS sector as well as the social and economic impact in the use of SITS are increased.

Based on all this, we believe that the development of the SITS sector will be closely linked to the progress of the Argentine economy. Our aim is thus to implement a positive retrofitting process through the generation of increasingly wider, innovative and qualified software supply and local IT services, correct dissemination and increasingly efficient use of such products and services and the emergence of a sophisticated local demand to enhance the learning process in the SITS production sector.

Characteristics of the local supply

In general terms, the SITS sector may be characterized as a sector integrated by three groups of companies:

i) A relatively small number of large companies, almost all foreign companies, mainly devoted to the marketing of foreign products and to the rendering of IT services – essentially associated to the implementation of software packages for large clients including the State.

ii) A relatively small number of small and medium sized local companies that develop software and IT services mainly for the company management area.

iii) A very heterogeneous group of local companies, many of them relatively young and small, devoted to the development of local software products such as the supply of several IT services. An important part of these companies basically subsists by catering for different demand types since they find it very difficult to find sustainable specialization niches.

More recently, companies devoted to the operation of call and contact centers, and those that have installed software factories in the country have joined this group.

Regarding geographical distribution, most SITS companies are located in the city of Buenos Aires, and some of them are located in the greater Buenos Aires area. The provinces of Buenos Aires, Cordoba and Santa Fe concentrate most of the remaining supply. This geographical concentration is due to the fact that these regions meet a large proportion of the SITS demand. Nevertheless, there are SITS companies in all the provinces of Argentina.

Traditionally, software local developers have concentrated on areas of accounting and business management in which they leveraged the advantages derived from a better capacity of adaptability to the needs typical of local customers and, usually, to fluctuating local accounting and tax regulations. These companies marketed customized applications or products with a certain degree of standardization but with the capability of adapting to specific users' requirements.

However, there is a smaller but dynamic group of generally young business entrepreneurs specialized in other market niches that offer innovative products both in the local market and abroad.

Exports

As stated above, before the devaluation, SITS exports were scarce – and only a few companies exported their products on a regular basis. At present, this situation has changed dramatically and many companies have started to export their products on their own or with trading partners while other companies reveal a high level of interest in doing business at international scale.

A survey carried out in 2002 (Lopez, 2003) showed that more than 60% of SITS companies hoped the role of exports would be of outmost importance for their future development and only less than 5% stated that such role was not going to be so important or was going to be totally negligible.

SITS companies have concentrated their efforts on Latin America countries and to a lesser extent on Spain. In these markets, Argentina has a considerable advantage since they share a common language and their cultures and traditions are similar, in addition to the fact that Argentine professionals are acknowledged in these countries for their experience and skills. The United States has also been a destination chosen by some companies. In many cases, these efforts have been materialized through the installation of offices or through the sending of representatives to the countries to which Argentina wishes to export. On several occasions, consortiums or partnerships have been established in order to reduce costs and risks and to diversify the business supply.

The rapid pace of export growth as well as the important business opportunities that exist at an international level show that there are clear possibilities for Argentine SITS companies to conquer foreign markets in the near future, both in Latin America as well as in other regions. The President's recent trip to China and the opening of new opportunities of investment in this market show that these possibilities are really broad in scope.

This does not necessarily mean that Argentina must try to achieve the same SITS export figures of countries such as India or Ireland. In fact, contrary to the situation in those countries, the development of the SITS sector must not be exclusively based on exports but rather on the domestic market. In this way, it would work as a learning platform for the companies of the sector in that the dissemination of SITS will contribute to the general improvement of the Argentine economy.

In this context, besides the always-welcomed infusion of foreign currency, exports could play other key roles in the development of the SITS sector. On the one hand, exporting companies would deepen their learning processes from the technological standpoint since they would have to meet new requirements regarding quality, delivery lead-times, etc. Therefore, they will accumulate information and knowledge that will help them increase their competitiveness.

On the other hand, exporting generates the possibility of taking advantage of the economies of scale that can help absorb the usually high costs involved in the development of new products. Consequently, exports may favor the increase of the innovative activity in the SITS sector.

The opportunities offered by export markets are within reach of Argentine companies; however, important and sustained efforts are required. On the one hand, credibility is necessary; that is to say, it is necessary to show that there is a commitment to supply foreign customers in spite of local market fluctuations. On the other hand, companies should gain access to information on external markets through commercial intelligence, network creation, etc., and face at the same time improvement processes in quality, post sale services, etc.

In this sense, the adoption of internationally renowned certifications – CMM, for example - is a decisive step to access foreign markets successfully. Even though very few companies have these certifications, the sector is aware of how important it has become to be certified, and many companies are taking complete steps in that direction.

Public policies can clearly help facilitate the development of these pro-export efforts, as well as associative initiatives through consortia, clusters, etc. The design of liaison programs aiming at reaping the benefits of information, business contacts, etc. that stem from the "diaspora" of highly qualified Argentine people that settled abroad would also be a relevant instrument for this purpose.

Human Resources

Argentina relies on a valuable asset to develop SITS activities: the availability of highly qualified human capital that is now competitive in international markets in terms of costs by reason of the devaluation. Table 7 shows this key advantage for the country as well as its relative deterioration during the last 20 years.

TABLE 7
HUMAN CAPITAL RANKING

Ranking		Country	Harbison Myers index [1]	
1998	1985		1998	1985
3	1	United States	50	40
10	6	South corea	36	27
12	10	Spain	35	26
19	22	Ireland	30	22
22	13	Israel	28	25
25	5	Argentina	27	28
29	37	Singapore	23	15
31	3	Uruguay	22	30
32	23	The philippines	22	21
33	36	Chile	21	16
34	34	Costa Rica	21	17
41	38	Hungary	18	15
43	42	Rumania	17	13
45	48	Thailand	16	11
46	43	Colombia	15	13
51	40	Mexico	13	13
55	51	Malaysia	11	9
57	52	Brazil	10	9
59	67	China	10	5
69	60	India	8	7

SOURCE: UNIDO: Industrial Development Report 2002/2003.

1. This index is the percentage average of people enrolled in secondary school and non-university higher education – attaching higher weight to the latter – as a percentage of the total of each age population.

In effect, by the mid 1980's the percentage of the population who had completed higher education studies in Argentina was well above that of nations such as Ireland, Korea, Spain or Israel that are ahead of Argentina at present. Nevertheless, it still occupies a leading position in Latin America and outstrips many other Eastern European countries and nations with powerful SITS industries such as India or China.

The challenge is to maintain this position and reinforce it. There is a consensus in the specific SITS sector that in some segments it is difficult to find qualified people. Thus, there is the need to promote industry-related careers and to stimulate the return of some of the many professionals that have migrated in the last few years.

From the point of view of quality, Argentine SITS professionals are highly valued internationally for their talent and creativity. These advantages must be supplemented with business skills developed in a systematic and professional manner as well as with a promotion of an entrepreneurial culture among Argentine University students.

The creation of highly qualified human resources (PhDs, etc.) is also a pending item in the agenda both for the improvement of research capabilities and to stimulate the creation of human resources.

Finally, it must be pointed out that there is already a wide range of graduate and postgraduate courses to train staff in the SITS sector. The challenge is, on the one hand, to improve the average quality of training offered by available supply and, on the other, to redefine the curricula so that the capabilities acquired by students match the requirements emerging from the evolution of the SITS sector.

Creation of technological poles and clusters

In addition to the increasing importance that the SITS sector is acquiring in Argentina, we are beginning to hear the expression "clusters". In fact, the SITS sector is strongly concentrated in the city of Buenos Aires and in the surrounding outskirts, but there are also significant concentrations of companies in cities such as Rosario, Cordoba and Mendoza. The cases of the poles of Rosario and Cordoba, in particular, show specific levels of progress regarding design and execution of joint actions related to quality, exports, etc.

Likewise, there are also some initiatives that force us to concentrate on the regional aspect of the development of the sector such as for example the implementation of a software factory project in Tandil in order to leverage the good academic level of the "Universidad Nacional del Centro de la Provincia de Buenos Aires" *(National University of the Center of Buenos Aires Province)* and the critical mass of existing human resources; or the municipal project of developing a technological park in Gualeguaychu, Entre Rios; or the project to develop the SITS sector in Jujuy based on the existence of an IT career with a lot of new students, which has earned the support of the provincial government, of different NGOs and large IT multinational companies.

It thus becomes evident that the importance of the regional phenomenon is increasing and that the public policy must view it as a possible driver for the future development of the sector.

Even though existing regional poles have matured at different paces, they all have some common characteristics that are worth mentioning. In the first place, they are all based on the availability of abundant qualified human resources at each location, which costs are generally lower than in Buenos Aires. In the second place, they highlight the importance of Universities as "seedbeds or nurseries" of future entrepreneurial leaders in the field of technology. In the third place, they are a perfect example of business cooperation, as shown by the strong participation of the private sector in their composition and development. Fourthly, they have been supported by municipal and provincial governments and have established cooperation channels with the universities in the area, which denotes a willingness to establish strong institutional bonds, instead of attitudes that have made cooperation between the private and public sector difficult in our country in the past.

There are, thus, strong foundations on which SITS clusters could be built up in Argentina, and on which to base the strategy for the development and international insertion of the sector. Some basic policy guidelines to be considered in this regard are:

i) Coordinate actions among different levels of government (national, provincial, municipal).

ii) Define flexible instruments that may be adapted to the specific needs of regional clusters.

iii) Work on the existing material (do not try to create clusters from "scratch").

iv) Spot and promote local leadership.

v) Define specialization profiles and integrate clusters in value chains.

Technology and telecommunications infrastructure

Technology and telecommunications infrastructure has improved remarkably in Argentina since the beginning of the 1990's. At present, local supply gives these sectors requiring an intensive use of the infrastructure, such as the SITS, the potential to develop. In addition, after the devaluation, the costs in dollars terms–which were high in comparison with international prices after privatizations–, have been noticeably reduced.

Under these conditions, the use of information and communication technologies (ICTs) in Argentina is quite widespread. Table 8 shows that, within Latin America, only Chile and Uruguay outdo Argentina in the use of telephony and Internet. The table also shows that Argentina is quite above the worldwide and Latin American averages. This also provides a very important developing platform for the SITS sector.

Meanwhile, recent surveys show that the use of ICTs in Argentine companies is quite high, as a consequence of the investments made during the last decade. Significantly, this fact is not only applicable to large companies. As per data collected from the survey performed by INDEC *(National Institute of Statistics and Surveys)*–SECYT *(Secretariat of Science and Technology)*–ECLAC (2003), 99% of medium-sized companies and 83% of small ones, within the manufacturing area, have access to Internet, while 98% of medium-sized companies and 75% of small ones use electronic mailing. Besides, the use of mobile phones is quite widespread. In addition, 74% of medium-sized companies and 53% of small ones have a web site. To sum up, it is clear that SITS, and ICTs in general, are in great demand in the local business sector.

However, the spreading of these technologies shows several restrictions: i) in general, ICTs are much more concentrated on the administrative sector than on the productive one; ii) Incorporated technologies have not been so sophisticated, in general, and were applied to quite simple uses; iii) ICT integration into the different sectors of the company has been quite weak; iv) the use of ICTs in relating to other companies and institutions has been even lower; v) there is no evidence showing that ICTs have caused changes in the productive organization. Therefore, due to the weaknesses mentioned above, the impact of ICTs use has not been as positive as would have been expected.

Besides, it is evident that Argentina –like the rest of Latin America– is lagging behind regarding the penetration of information and communication technologies (ICTs) in comparison with developed countries. These differences will become even more noticeable as time goes by, because while said developed countries invest between 4 and 7% of the GDP in ICTs per year, the figures are below 2% in our region –in 2000, only Brazil got a higher value, with 2.4% of GDP– (ALADI, 2003 -Latin America Association for Integration-).

TABLE 8
USE OF IT AND COMMUNICATION TECHNOLOGIES IN ARGENTINA

Country	Internet Users (every 1,000 people)	Telephone Lines (every 1,000 people)	Mobile phone Lines (every 1,000 people)
South Korea	521	486	621
United States of America	502	667	451
Singapore	412	471	724
Israel	277	466	907
Malaysia	273	198	314
Ireland	233	485	774
Chile	201	233	342
Spain	183	434	734
Hungary	148	375	498
Uruguay	119	283	155
Argentina	**101**	**224**	**193**
Costa Rica	93	230	76
Thailand	58	99	123
Brazil	47	218	167
Romania	45	184	172
Mexico	36	137	217
Colombia	27	172	76
China	26	137	110
The Philippines	26	42	150
India	7	38	6
World	**49**	**162**	**160**
Latin America and The Caribbean	**80**	**169**	**153**

Source: UNDP, Human Development Report (2003)

Closing the "digital divide" with the developed countries, as well as closing the digital divide at home –which reflects the differences in the use of ICTs among people, companies, regions and sectors– would clearly favor the possibilities of development of the SITS sector in Argentina. Besides, it seems necessary to encourage a higher use of ICTs in the productive sector and also a more efficient and sophisticated use, in order to expand the domestic market for ICT producers, quantitatively and qualitatively.

Therefore, the State plays a key role as a SITS buyer. There are two issues involved in this respect. On the one hand, it is necessary for the Argentine State –at each level– to increase the use of information technologies as a way to achieve greater efficiency and transparency in management. On the other hand, it is necessary for small and medium-sized local companies to be able to effectively compete in that market which is often difficult to access when short lists or requests for proposals are prepared in such a way as to explicitly leave those companies out of the competition, even though they are capable of supplying the required goods and services from the technological standpoint.

Other conditions of the environment

A key aspect for the development of the SITS industry is the capacity of a country to perform science and technology-related activities. In this, Argentina has a key potential advantage since there is already a group of universities where software research activities are developed –in many cases– with world-class levels of quality.

The establishment of links between these institutions and the productive sector is still in an early stage, but quite promising. The most concrete example is the 'Laboratorio de Investigación y Formación en Informática Avanzada' (LIFIA) *(Laboratory of Advanced IT Research and Training)* of the 'Universidad Nacional de La Plata' *(La Plata National University)*, where excellent activities related to basic research are also carried out. There are other groups devoted to software research that wish to establish closer links with the SITS companies. These groups are in the '*School of Hard and Natural Sciences of the University of Buenos Aires - IT department*', in the National Universities of the Center of the Province of Buenos Aires (ISISTAN), South Region, Rio Cuarto and San Luis and in the 'Centro Internacional de Métodos Computacionales en Ingeniería' –*International Center of Computational Methods in Engineering*– (CIMEC), under the umbrella of CONICET and located in Santa Fe. Although the 'Instituto Tecnológico Buenos Aires' (ITBA) *(Buenos Aires Technological Institute)* does not do any research, it has done some software development jobs for the private sector. Obviously, both the possibility of these groups to develop research activities and their relation with the productive sector should be encouraged through specific policies.

Another key factor for the progress of the SITS sector is access to financing. In our opinion, this is one of the most serious restrictions local companies have to face. The difficulties for *SMEs* to access financing within the credit market in Argentina are very well known. This is even worse when financing is required by those companies that produce intangible assets, develop innovative projects and/or are in their early development stages.

Thus, it is not surprising to see that the SITS sector is especially affected by the deficiencies of the Argentine capital market, due to its intrinsic features (predominance of small and new companies which offer intangible assets and services, low volume of assets which could be used as guarantee against the granting of loans, development of activities subject to a high level of uncertainty –especially when dealing with software development– which banks find difficult to assess, etc.) Traditional banking institutions find it difficult to assess –and finance– such projects (although some improvements have been made in time), and at the same time, the local capital market is not so developed and there are practically no alternative financing mechanisms (venture capital, etc.). It is also true that SITS companies, especially small and medium-sized ones, generally have serious difficulties in drafting viable business plans, which makes their credit situation even worse.

In this scenario, most of the companies use part of their earnings to make investments; others work with informal credit sources (friends, relatives) or develop projects only based on advance payments made by customers, which evidently curtails the possibility of forecasting and materializing expansions, especially those which include export projects.

Up to now, the public preferential financing policies for SMEs have not addressed the specific problem of technologically intensive sectors. It is clear that this is an area that requires the design of instruments and proposals aimed at providing the companies of the sector with better access, both to working capital and to funding for innovative projects and development of new entrepreneurial start-ups.

Finally, the protection of intellectual property rights is also a key issue for the development of the SITS sector. In Argentina, software 'piracy' level is relatively high, in spite of the fact that the domestic legislation is aligned with the international agreements in force within the framework of the treaties signed under the umbrella of the World Trade Organization (WTO) –TRIPs agreement– and the World Intellectual Property Organization (WIPO). The challenge, in this case, consists in boosting the chances to apply such legislation to reduce piracy and to ensure adequate protection to all programs under copyright.

Supportive Public policies

As mentioned before, public policies can play an important role to promote development of this sector. It is important to point out that in the Argentine case, said policies rule an activity which has already had a relatively significant spontaneous development (in other words, it is not a question of "creating" a sector from scratch). Thus, we believe the potential impact of a set of properly designed instruments could be very important.

Fortunately, in the last two years, several initiatives focused on promoting the development of the sector have emerged. Among them, it is worth highlighting the discussion about a Software Industry Promotion Law, approved by the House of Representatives and still under discussion in the Upper House.

The project includes the following benefits, among others:

i) A stable tax system for a period of at least 10 years as of the enforcement of the Law.

ii) A VAT tax credit equal to 70% of effectively paid employer's contributions to social security funds.

iii) Deductibility of 60% of taxable income tax, as long as companies can prove the spending in research and development for the purpose of promoting R&D.

iv) Creation of a Fund for the Promotion of the Software Industry (Fonsoft). The purpose of this Fund would be to finance research and development at universities, research centers and SMEs, as well as SMEs that have adhered to the spending plan in force for quality certification purposes and the development of new entrepreneurial efforts.

Meanwhile, a national law, which establishes that software production must be considered an industrial activity, has already been passed. This generates benefits for the sector, while in several jurisdictions, the gross earnings tax rate for manufacturing activities is lower than for service-related ones (each province must adhere to this law for such rebate to become effective).

Besides, the Upper House gave preliminary approval to a law which declares that the information technology industry is of strategic interest (including software and hardware), although it does not explicitly establish any specific promotional measure.

Another initiative which could not be implemented was the Argentec program, an agency especially dedicated to supporting the SITS sector, prioritizing small and medium-sized companies, in areas such as software certification, export, training, technological innovation, etc. Besides, the 'Instituto Nacional de Tecnología Industrial' (INTI), created a Reference Laboratory of Software Development and Certification, and signed a mutual cooperation agreement with the 'Cámara de Empresas de Software y Servicios Informáticos' (CESSI) in this area.

In the meantime, SECYT has created a special program for ICTs. Also, the Ministry of Foreign Affairs manages a specific program for the development of export markets for the sector.

Besides, in some jurisdictions some specific promotional initiatives are already in operation, or have been at least submitted. In this way, a project to exempt the software sector from the payment of the gross-earnings tax has been submitted in the City of Buenos Aires. However, the government of the city has encouraged the creation of technology exporting groups, including software, which relate SMEs interested in exporting. Subsidies programs especially designed for SITS companies have also been launched and the 'Buenos Aires Technological Pole', which gathers companies of the sector, was created.

Among representatives of the private sector, CESSI has launched some interesting initiatives, including the creation of the 'FinanTIC' program, aimed at developing financial instruments for the ICT sector, and of the 'Agencia Nacional de Promoción de Exportaciones de Tecnologías de la Información' *(National Agency for the Promotion of IT Exports).* A portal of Argentine IT products for export was also launched. Besides, the CESSI signed an agreement with the *'Fundación Exportar'* to promote SITS exports ('Export Tec' Program).

These and other initiatives are the foundations on which to build the strategy for the Argentine SITS sector to compete successfully in order to increase its domestic market share and to aggressively penetrate international markets.

In this context, the '**Foro de Competitividad de Software y Servicios Informáticos'** *(Software and Information Technology Services Competitiveness Forum)* is intended to extend the scope of already existing policies and initiatives as well as reach consensus on an accurate potential development model for the SITS sector and promote new instruments and programs. There seems to be a need of articulating the existing structures rather than creating new ones, of agreeing on a course of action and of including those issues that may seem relevant based on proposed and shared strategic objectives.

Finding a model for the development of the SITS sector

Argentina must find *its own way of development within the SITS sector.* In this search, it is important to take into account the experiences of "late entry countries", but without trying to emulate them since the combination of internal conditions and external circumstances –that have made success possible for those specific cases– cannot be repeated.

Therefore, it is necessary to consider the country's economic, social, historical, scientific, technological and cultural characteristics, which make up the launching platform –already existing at present– from which it will be possible to "jump" into the sector. At the same time, future prospects in the SITS international markets must be considered with the purpose of spotting the real opportunities in those fields in a country such as ours.

The definition of the proper development model for the SITS sector will come as a result of long discussions among stakeholders –the companies, the scientific-technological sector, education institutions, the State–. This is what the "Competitiveness Forum" has striven after in the last few months, and the conclusions contained in this document are the results of such an endeavor.

However, it is necessary to understand that the search for a development model is a process in which the sector's own evolution will certainly define new opportunities, threats and advancement paths. Consequently, the present guidelines are not intended to be an inflexible plan. On the contrary, they define an objective of sectoral development, considered *a priori* as desirable and feasible, but that is nothing else than the first step of a process in which said objective must be evaluated and reviewed in the light of the performance of the sector going forward and of the changes which will be taking place in the internal and external conditions where such process is developed.

It is clear that the definitions adopted in this strategic plan do not intend to close the doors to any kind of startup or activity, as in this stage of the SITS sector development it would be wrong to focus only on a limited number of business models. The idea is to use the set of proposed instruments, besides giving general support to the development of the sector, mainly to promote a path which, under the current circumstances, has been considered as the most suitable one, in accordance with the data available, but which, at the same time, must be flexible enough to adapt to the changes which could take place in the environment and in the sector itself.

The first challenge is to follow a development path based on the innovation and generation of added value, rooted in the most dynamic sectors of the economy and in the areas with the highest potential for technological development, but which can also respond to the needs of social development key areas such as health, education, environment, etc. Based on this, the objective will be the development of state-of-the-art international technological solutions for the

domestic market and for certain specific niches of the international market. In this way, we would not only achieve an excellent platform to turn Argentina into an exporting country, but the SITS sector will also contribute to increasing the general competitiveness of the economy and improve the standard of living of its inhabitants.

The development model must hover around products and services in those specific segments where Argentina has key competencies that can be recognized internationally, and at the same time, represent a clear technological and commercial opportunity at a local, regional and global level.

Initially, the main focal point will be the development of the domestic market targeting the supply of highly innovative and top quality complete solutions for productive clusters, the pre-identified technological niches and strategic areas of public services. At the same time, export strategies related to the chosen sectors will be addressed.

Planned support will be oriented to locally funded businesses and to the businesses based on direct foreign investment in order to promote the performance of technological development activities in the country, the use of local researchers, professionals and technicians and the creation of an internationally recognized "country brand".

An essential component of the model must be the installation and/or strengthening of the *innovation and productivity networks* for the development of IT for key sectors of the national economy and international relevant technological niches. These networks must integrate companies, clusters, productive poles and networks together with the scientific and academic sectors so as to facilitate work and local collaboration on specific subjects among the private and public sectors and the academia. These centers will not be basic research centers, but will be aimed at producing *innovative and profitable* solutions based on the suitable application of mature technologies and the appropriation and empirical application of semi-mature technologies (available to the industry in longer terms –for example, five years–). Such centers will also be a key area for training human resources in accordance with the requirements imposed by the sector's growth.

The State will play an essential role not only in the discussion and the search for a consensus to define the general guidelines for sectoral development, but also as promoter of IT projects and programs in key areas of government services and as integrator of private and public efforts to enable society's widespread use of IT services, human resources training in each of the levels, and research and development efforts.

Why do we believe this model is feasible and desirable in the present circumstances? Argentina faces big technological challenges from the economic and social points of view, and has the economic and human resources to cope with those challenges as long as the decision to do so exists. Entry into the "knowledge society" is one of those challenges; and the

accelerated and efficient incorporation of information technologies is extremely important for the entry to be viable. The development of a vigorous SITS sector with local capabilities of innovation could help in this endeavor, as it generates solutions to meet the specific needs of the local society, especially of those agents, sectors and/or activities that do not find already available market offers to cater for their demands.

At the same time, interactions between SITS suppliers and users generate a learning dynamics and development of competencies which will result in the creation of a virtuous cycle in which SITS producers and users will achieve competitiveness and technological capabilities. This learning process in the domestic market would be useful as a platform for the local companies to penetrate the international market with higher possibilities of success.

Why not start directly with a model that focuses on a vigorous penetration of the world market? In the first place Argentina is not India: it has neither the costs nor the quantity or extensive knowledge of the English language that characterizes the labor force in that country. In the second place Argentina is not Ireland: it is not located next to mainland Europe and it is not capable of attracting mass investments with a policy of tax incentives, due to its difficult fiscal situation.

In this respect, the relation proposed in this paper between the domestic market and exports is aimed at generating a domestic learning platform that plays the same role as, for example, the SITS demand by the Armed Forces in Israel. Without that platform it would have been very difficult for Israeli companies to achieve their globally recognized success. In addition, exports will contribute both to increase the learning processes of the SITS companies and to generate economies of scale that would, in turn, raise investments, especially in R&D activities.

Is this model feasible? Since the end of the XIX Century to the 1970's, history shows that Argentina has enjoyed a glorious tradition that has placed it among the most advanced Latin American countries in the field of science, technology and industrial development. The example of CNEA *(National Atomic Energy Commission),* which allowed the country to reach an independent technological capacity within the nuclear field was, undoubtedly, a leading case in this sense.

Since the late 1950's to the 1970's, and mainly within the IT sector, Argentina was the leader in Latin America. Memorable experiences can be mentioned regarding the design and creation of computers, software, applications, human resources training and research, many of them almost unknown nowadays. For instance, the original experience provided by Manuel Sadosky and his team in the 'Facultad de Ciencias Exactas de la Universidad de Buenos Aires' (UBA) *(School of Hard and Natural Sciences of the University of Buenos Aires)* in the late 1950's; the building up of the first experimental computer in Latin America, the 'Cefiba' *(Experimental Computer of the School of Engineering of the University of Buenos Aires)*, by Humberto Ciancaglini's team in the 'Facultad de Ingeniería de la UBA' *(School of Engineering of the University of Buenos Aires)*

between 1958 and 1962; the innovative project for the assembly of the Ceuns computer *(Experimental Computer of the South National University)* by Jorge Santos between 1960 and 1962; the 'División Fate Electrónica' experience in the early 1970's which included the design and assembly of the famous 'Cifra' calculators and an innovative production project of one minicomputer called the '1000 Series'; the assembly of the specialized computer 'Argenta' between 1977 and 1980 upon the Navy's request.

In parallel to the development of the software and technological services sector, several important systems were self-developed by the public administration and large companies. In this way, the current sector of companies dedicated to software and IT services was established with very encouraging prospects at that time. During the 1980's, through the establishment of the 'Escuela Superior Latinoamericana de Informática (ESLAI) *(Higher IT Latin American School),* the international cooperation with Brazil (PABI) *(Argentine-Brazilian Information Technology Program)* and the 'Programa Nacional de Informática y Electrónica' *(National Program of IT and Electronics),* information technology research gained momentum. These institutions generated expectations on taking up again the path of development and maintaining it so as to try to recover the originally attained regional leadership.

The 1990's were characterized by the opening of the economy, the lack of active policies on industrial promotion and the lack of continuity of public R&D projects. Again this backdrop, the SITS industry was developed, basically to meet domestic demand and focused mainly on customized solutions to management problems. However, encouraged by the great advance of ICTs worldwide –and to a lesser extent at a local level– the relatively affordable prices for equipment, communications and software and, especially, the energy of the local business sector, a relatively small set of competitive companies was developed. After the crisis and the devaluation of 2001, this group of companies achieved a three-fold increase in software and IT services exports.

The gradual development of the academic sector is also important to mention, which based on the progress made in the 1980's and encouraged by the 'FOMEC' program *(Superior Education Quality Improvement Fund)* run by the Secretariat of University Policies of the Ministry of Education has witnessed the graduation of approximately 80 PhDs in IT sciences since 1995 to the present day, thus raising the level of many related careers and consolidating an academic community in this discipline. Another successful effort was the creation of the 'Agencia Nacional de Promoción Científica y Tecnológica' *(National Agency of Scientific and Technological Promotion),* which opened a door to the financing of companies' innovative projects, although its impact was limited because of the difficulties related to the cooperation between scientific institutions and companies, and for not being inserted in an active industrial policy, inexistent at that time.

In this new context, the hope of developing an internationally competitive software and IT services industry has reappeared. However, there is no need to start from scratch; those initial efforts are an 'intangible' launching pad that is frequently a recognition to the 'creativity' of our human resources, but which is supported by a powerful tradition and a long history. That's the reason why we believe that a central element of the development 'model' must be the strengthening of scientific and technological research capabilities.

The actual progress made and the agreement reached among the public, commercial and academic sectors during the development of the SITS Forum constitute a good starting point. At the same time, the positive attitude of the current government, expressed in the laws supporting the sector, the existence of the SITS Forum and other initiatives, definitely raise our growth expectations. Discussions show that it is essential to increase the domestic demand in quantity and quality, encourage exports and promote research, development and human resources training, so that the SITS industry may turn into an internationally dynamic and competitive sector.

To sum up, the 'model' can be conceived, mainly, as an interactive proposal among three main participants: businesses, the academic sector and the State. Rather than proposing a new structure during the first stage, the focus is on generating networks to facilitate positive exchanges, promote creation and development of knowledge, products and services, integration with the national economy and society and the recovery of the technological and industrial tradition of our country. Briefly, this model summarizes the key guidelines of a State long-term policy accepted and practiced by all the public and private players involved in the software and IT services sector.

CHAPTER I- TRAINING OF HUMAN RESOURCES

1.1 INTRODUCTION

Different international experiences as well as the vision and, especially, the development model proposed show that one of the keys for a successful growth program for the SITS sector lies in the promotion and strengthening of a large number of human resources, both quantitatively and qualitatively, at different training and specialization levels.

The proposal of the working group regarding Human Resources Training, mainly consists of a comprehensive medium-term program, focused on setting *Innovation, Entrepreneurship and Productivity Networks* to facilitate the interaction of public, private and academic sectors. This concept is similar to that of clusters, which have been successfully developed in other countries, but taking into account the specific characteristics of Argentina.

The problem of human resources training must consider medium and long-term needs of the sector while it tries to find a solution to urgent problems that companies, the academic sector and the State face in this area at present. In this regard, specific integrated measures are proposed for immediate implementation with a view to creating human resources for the next decades.

The general vision on this subject matter is to integrate the educational and professional training system into an articulated project in order to enable positive interaction among all its levels and with the other proposals made by the Forum for the SITS sector. The first and more obvious relation is the one with the Research and Development sector, but there are also strong inter-relations with all the other thematic focal points discussed at the SITS Forum. During the discussions, every formal education level (university, non-university higher, secondary and elementary) was identified as a sector to work with, as well as the 'informal' education sector (training centers, academies, "in-company" training) and the certification mechanisms.

During the first stage (2005-2007) university, non-university and high school technical education would be addressed, considering these levels as the most relevant ones, due to their size, capacity to train professionals and technicians, knowledge and results, and historical tradition. It has been suggested that the FOMENI program *(Fund for the Improvement in IT Training)* can be integrated by integrating these educational levels and prioritizing the creation and consolidation of innovation networks investment when investment is available. The FOMENI program schedule is annexed hereto for reference purposes.

The rest of this document summarizes the main ideas on Innovation and Productivity Networks as well as their main problems, goals, instruments, actions and responsible people in university, secondary and non-university technical levels in the ICTs area. Finally, a preliminary draft of the 'FOMENI' program is presented.

1.1.1 Innovation, Entrepreneurship and Productivity Networks

The main purpose of the *Innovation, Entrepreneurship and Productivity Networks* (RIEP) is to solve one of the crucial problems found in the numerous studies on the situation of the SITS sector and ICTs in general, namely, the considerable difficulties of the business, educational, scientific and public sectors to interact and integrate a joint development project of a knowledge-intensive technological sector. This situation has been identified as one of the main "real impediments" for growth.

These networks are conceived in such a way as to promote innovation, productivity, specialization, research, development and resources training around two key objectives: one of them is to strongly foster the insertion of ICTs into dynamic sectors of our national and regional economies, promoting in the first place, the appropriation, correct application and development of mature technologies in them. These sectors –among which it is possible to mention the agricultural and food industry, the energy sector, medicine and health, education, contents in Spanish and entertainment– can be included among those in which Argentina enjoys well known competitive advantages at an international level, in addition to having capital availability for the incorporation of technology and an important tradition in the use of scientific and technological results. These sectors, apart from improving their own competitiveness, can act as a school for ICTs technicians, professionals and researchers who, in general terms, still have a lot to learn before they can put their skills to work for the production, marketing and creation of sound technological solutions. Historically, many state and private institutions are associated to these sectors. They have a long and famous tradition in the field of research and development and their interaction with those sectors can result in an important contribution to improve the quality of human resources training in the ICT sector.

On the other hand, it is suggested that Networks should be created in certain focal areas. These networks are specific to the ICT sector and mainly related to software development. Thus, the emphasis is laid on innovation and research applied to partially developed technologies which will be implemented throughout the industry in no less than five years. In these cases, the objective is their experimental appropriation and application. The intention with technological prospective studies is to promote areas related to IT security (in networks and equipment), web engineering, advanced architecture and software design, software verification and validation, quality of processes, products, data, industrial and robotic automation. In order to choose these areas correctly, it is necessary to consider the capabilities of current research and development groups and those of the existing innovative companies that will have to play a decisive role for their implementation. Interaction with organizations and institutes specialized in other disciplines must also be contemplated.

Each of these networks *must* be integrated by companies, clusters or poles, universities, non-university higher and/or technical institutions, and the local public sector or the sector related to the specific focal point of the network. This condition is essential for the network to achieve its main purpose.

Besides, the constitution of these networks will facilitate the design of a policy for innovation, research, development and human resources training activities, focusing on specialization in applications and technologies to promote the sector competitiveness and its insertion in the key productive areas of the economy. These networks will:

1. Allow regular assessment of key technological areas.
2. Progressively increase the focus on specific subjects and objectives in the most dynamic and consolidated areas.
3. Enable a follow-up and evaluation of the work teams' performance in order to control capabilities, levels, etc.
4. Program human resources training, specialized in quantity and quality at each level and perform systematic assessments.

A central aspect of the proposal is related to the entrepreneurship concept: this is the time to define not only a strategic plan for the sector but also to *identify and promote the emergence of the main players that will implement that plan.* Interaction among the private, academic and government sectors for the creation of a SITS competitive industry appears as a clear principle of the long-term strategy. However, the questions about *how to guarantee the articulation* of the different participants for the realization of our mission and the *type of SITS industry to be promoted are still pending.* In this regard, the entrepreneurial community can be defined as the "piece of the puzzle" which naturally meets these requirements, provides short and medium-term guidance, and offers the industry innovative content. New start-ups are the real propelling engines of innovative industries because of their characteristics: capacity to identify new markets and innovative solutions, structural flexibility, talent integration capability, willingness to assume risks and self-improvement vocation. Such start-ups are the perfect convergence vehicle to build up a new kind of industry based on innovation, know-how, and creativity. The RIEPs are the suitable instrument for building up, generating and disseminating the entrepreneurship culture through education and research as they relate to production and to the actual economic and technological problems. Entrepreneurship -unlike what the misleading but quite widespread belief dictates- is not part of the entrepreneurs' genetic code. As international experience shows, it is necessary to instill an entrepreneurship culture into young people while they are at university and even in high school. This culture will not develop and spread in isolation and disconnected from the real problems of the economy, society and technology. However, within the framework of the centers and networks connecting the main participants of the creation, development, production, marketing and use process, said culture shall be able to expand and disseminate.

Finally, one important aspect included in the proposal is that these networks will have to be self-financed after an incubation period of approximately three years, during which the State must provide contributions.

1.1.2 Non-university Higher Technical Education and Secondary School Technical Education.

This section analyzes the need of establishing a Human Resources technical training program at the non-university and secondary levels. At both levels, the lack of a policy for technicians training purposes has become evident. Professional profiles, curricula or the teachers` training required at these educational levels are not yet clear.

Consequently, both sectors proposals include as a initial step-up an analysis of the situation and needs of the business and public sectors, with the purpose of defining professional profiles and, then, determining the training to be offered.

1.1.3 Senior Technician Level

Standardization (Second semester, 2004, eventually first semester, 2005)
Objective: to agree on standard Professional Profiles based on the occupational analysis, and to use them as a reference for the type of training to be provided.

Nowadays, there are several hundreds of official and private educational institutions that award the System Analyst degree (with some differences in the degree titles and a wide variety of curricula, some of them with orientations) after 2 to 4 years of studies. These offers, which relevance and quality level depend more on the institution than on the curricula, compete with university technical degrees (which are all similar as regards duration, some of them focused on general rather than on specific subjects). There are also courses (some of them offered by official institutions) to help students sit for certificate-awarding exams (many times international ones and restricted to a product domain). Such courses are established by private companies and, sometimes, replace, supplement or add market value to official non-university and university institutions.

Based on an occupational assessment with the participation of the main players in the labor market, a project is proposed. It consists of agreeing on Professional Profiles that may help as a reference to develop updated curricula for training the human resources required by the SITS Strategic Plan. The current System Analyst degrees (which may be related to approximately a dozen of professional profiles) could give rise to a couple of more specific and updated Profiles based on competencies. At the same time, it would be convenient to analyze if there is any other additional profile related to electronics, control or communications that can be standardized or integrated.

The participants to the Forum (CESSI, CADIE *–Argentine Board of Educational Interchange–*, Cluster of Cordoba, Poles of Rosario and Buenos Aires, etc., with SADIO *–Argentine Society of IT and Operative Research–* and other professional entities) must commit to organizing a support group (a kind of wide CoNE-T Forum) to be run and supported by an agency of the Ministry of Education, Science and Technology (INET has shown to be experienced on this matter). The aim of this group shall be to develop an occupational analysis project in order to determine which professional profiles are or will be required and to analyze and specify each of them, from an occupational standpoint. So, it will be necessary to interview knowledgeable people (professionals, employees), panels (of professionals who perform these activities) and related people, in order to define one or several Professional Profiles from the information compiled at those interviews. Said profiles will include:

- Qualifications of individuals as professional workers,
- Functions and activities that said professionals develop and should develop,
- Criteria based on what the market deems to be good performance of these functions and activities,
- Fields and conditions of professional practice.

The function of the organizations and companies involved in the Forum is to contribute knowledgeable people (technicians, supervisors, directors who help to analyze the tasks performed by those professional technicians) who can do some research of the types of products and services to be required, the organization of the projects which will develop those services, and the technology that such projects will need, as well as the personal and technical features the market requires or will require from those working on the projects.

The Ministry already has the method and the human resources in place (the INET, National Institute of Technological Education, has developed professional profiles since 1996, although its technical team has been reduced in number). Two or three (part-time) professionals should be employed, traveling expenses should be paid for (such as for panels or interviews in Cordoba, Rosario and in any other place) and the profile must be validated by the corresponding CoNET Commission, the organization that advises on its relevance, and the people in charge of Non-university Technical Education in the provinces and the Autonomous City of Buenos Aires.

It would be necessary to include in the budget additional funds to hire some extra employees for the technical team (experts, sociologists who participate as observers and inform about the information gathered as a result of the exchange in technicians' panels or interview key informers, pay market experts for technical enquiries and other small charges). This additional amount depends on the number of different members considered necessary and it is possible to estimate between 10,000 and 20,000 pesos *(Current Argentine Currency)* per Professional Profile defined.

Development of Curricular Bases (2005)

Objective: to design, specify technical and instructional methods and agree on general curricula nationwide.

Once Professional Profile(s) are determined and defined, the Ministry of Education, Science and Technology shall develop the Curricular Bases (options and specializations may be included) to provide training on the capabilities of each specific profile, agree on these curricular bases with the people responsible in each province and submit them to the 'Consejo Federal de Cultura y Educación' *(Federal Council of Culture and Education)*.

The Ministry has the method and human resources available (the INET has been developing competence –based Curricular Bases since 1999 for Secondary School Technical Education). A professional team should be appointed (made up of specialized professionals and educational psychologists), traveling expenses should be paid (for example, for regional meetings aimed at showing the progress of the work done) and consultation of technicians, professionals and educators should be financed. This process should be contemplated in the budgets of the relevant organizations. Should this not be the case, it would be convenient to contemplate additional funding to cover consultations and meetings expenses.

People in charge of Non-University Technical Education in the provinces shall discuss and agree on Curricular Bases resulting from this process before submitting them to the 'Consejo Federal de Cultura y Educación', which is the organization in charge of approving said curricular bases for the Ministry to validate them through a resolution. Once said resolution is passed, the provinces and the Autonomous City of Buenos Aires shall proceed to implement them.

Complementary Observations

An additional and recurrent problem that non-university technical education is facing, especially regarding those technologies known as "hard", is the number of dropouts. Consequently, its activity is inefficient (less students graduate per year at a higher cost of education per student) and the funds invested by the State do not achieve the expected results. In addition, many students have full time jobs with good salaries while they are training themselves, which deters them on many occasions from completing their studies.

The working team members must consider granting scholarships to their future professionals and agreeing with companies on offering them part-time jobs. Additionally, those members consider it important to establish a program to follow-up and assess the educational projects to evaluate these types of problems, detect weaknesses and difficulties, and help in finding the right solutions for them.

Another problem considered by many members of the Forum was the fact that when it comes to appointing technical teachers, people with teaching degrees take priority over professionals. Therefore, in many cases, there are good

teachers who are not knowledgeable of the profession they are training their students in and do not regularly take refresher courses, while professionals capable of setting a good professional model are not considered. It would be thus advisable to try to change these rules to allow professionals to be appointed as teachers, and offer them supplementary teacher training courses so that they can acquire the required teaching methodology.

1.1.4. Secondary School Junior Technician Level

Review of Offer and Standardization (second semester, 2004 – first semester, 2005)

Objective: To review the current offer and agree on any additional Professional Profile that may be deemed necessary, based on the occupational analysis.

At present, Secondary School courses offer two types of trainings for junior technicians, in some cases with changes and quite significant differences regarding the quality of offers:

IT Technician – It is a six-year course taught at the 'Escuela Técnica' *(Technical School)*, based on a Curriculum developed at the times of CONET as the foundations to the programmer-analyst higher education course. This is taught in about 35 sites distributed throughout the City of Buenos Aires, Neuquén and Río Negro.

Professional and Personal IT Technician – It is taught in accordance with the Federal Education Law, approved by the CoNE-T and CFCyE. This is a 3 to 4 year course that is taken in the last three to four years of the Polimodal school cycle. It is implemented in almost 140 sites of the remaining provinces (with differences in some cases), except for Cordoba. Its basic model is a Professional Profile agreed upon with representatives of companies, professionals and workers organizations. The target would be the training of Help Desk operators, or end user's supporting technicians who solve operational problems related to hardware, data, software and networks.

The proposal aims at reviewing the industry and users' needs and determining the advantage of training at secondary school level programmer-analysts (working towards the IT Technician profile) or any other technician related to electronic elements installation or operation, control or communications (currently Electronic Technicians have a professional profile highly specialized in production).

In a similar way to the project suggested for the University curricula, a work team of the SSI Forum supported by the INET from the Ministry of Education, Science and Technology, will survey the professional field to determine whether secondary school level is suitable to train technicians in software development.

In case the Secondary School level is deemed suitable to that effect, an occupational analysis should be performed with the support and cooperation of

the members of the Forum. Such analysis would be similar to the analysis for non-university technicians and would specify the Professional Profile this training should target. The profile should be different from the one targeted by the higher level of education.

A similar procedure is required in the field of electronics and communications, and if the objective is to find a suitable professional profile different from the current profile for Electronic Technician, a similar project must be implemented. The additional costs of these projects are similar to the ones estimated for the senior technician level (about 10,000 to 20,000 pesos per each profile).

Once profiles are validated by the CoNE-T, the INET (after consulting experts and the provinces) will draft the corresponding curricular bases and submit them to the CFCyE for its approval. Once the Ministry issues a resolution on them, they will be considered the reference model for educational offers in every jurisdiction.

High School Technical Teachers Training on ICTs (2005 – 2007)
Nowadays, High School Technical Education shows weaknesses that are not related to the curricula but to the lack of teachers' refresher courses and contact with the professional sector. In some cases, equipment availability is also a problem.

Technology refresher courses and contact with the professional sector
Due to the constant evolution of ICTs, it is practically impossible for the state (provincial and national) to offer proper technology refresher courses on a timely basis, to meet the needs of hundreds or thousands of technical teachers around the national territory.

It is more effective to appoint active professionals and technicians as teachers (mainly in highly technological courses) since they are obliged to keep pace with the latest technological developments in order to remain competitive in the market. In these cases, the State should offer them supplementary training to allow them to accurately fulfill their role as educators.

The Ministry of Education, Science and Technology must draw attention to these issues in those jurisdictions in charge of managing educational institutions of Technical Education in SITS in order to find, agree upon and implement proper solutions (modifications to provincial regulations, development of national and provincial training programs) to these problems.

Update on the required teaching approach

Another different problem is the introduction (in keeping with European and American countries and with what is advised by international institutions) of Technical Education specialization into the professional competences development process.

Technical Vocational Training Courses with theoretical and practical modular curricula were developed and introduced in Argentina as of 1999. They consist of modules based on specific issues that professionals face in their areas of practice. The aim of these modules is to provide the student with basic training and specific techniques to help them solve problems in a context as similar as possible to actual practice. This method facilitates integration of different knowledge and skills in favor of developing those competences that guarantee good professional practice.

Although this program is at an advanced implementation stage, extensive training of teachers on new required educational approaches is not yet complete. Consequently, many teachers are simply following educational guidelines similar to old ones, with lecture-type classes or theory clearly separated from practice, though now using more current titles.

In order to solve this matter, an extensive technical teachers' training and restructuring program has to be implemented by the Ministry of Education, Science and Technology together with the provinces and the Autonomous City of Buenos Aires. Such program should be based on competencies; it should also help teachers understand the educational proposal and develop pedagogical strategies suitable and effective for this kind of training and for the development of the capabilities required to solve the problems this kind of education is intended to solve.

The participation of high School and non-university higher education institutions in the Innovation and Productivity Networks will be considered a key factor for the global improvement of their students and graduates' education. Students and graduates will be educated within an environment, which will facilitate the early connection with the problems of the real world that they might face in their future jobs as technicians and professionals, as well as with those issues related to scientific and technological research. Moreover, the interaction between teachers and students at university shall provide a more accurate definition of specialization profiles, directly related to the demands of the labor market and the key or proprietary technologies of the national ICT sector. The historical experience of the relation between technical schools and production has shown the great advantages of educating technicians in the aforementioned conditions. The resources to achieve those objectives, except for the preliminary proposed studies, will be provided by the FOMENI program.

1.1.5 University Education

University education in those areas related to the software and services sector –although these observations are also valid for the ICTs in general- has shown remarkable progress in the last decade. However, it is an academic sector that still evidences serious shortcomings in the training of professionals and researchers capable of leading the development of a technological sector such as SITS. Many critical problems have been identified in this sector, apart from the chronic lack of financing for universities and scientific institutions and,

particularly, the teachers and researchers' extremely low wages. These problems may be divided into three categories:

1.2 PROBLEMS

Problems related to academic excellence:

- Weak scientific production and lukewarm encouragement of innovation
- Few full-time teachers
- Few and weak PhD and Master's degrees programs

Problems related to the interaction with the environment

- Universities' dissociation or weak association with the productive and public sectors.
- Poor vocation for interdisciplinary methodology.
- Poor articulation with the rest of the educational system.

Problems related to professionals training

- Unilateralism / disparity in University courses.
- Weak training in behavioral aspects (entrepreneurship, vocation for innovation, etc.) and business related issues (strategic planning, marketing, etc.).
- Few graduates from regular undergraduate courses (bachelor degrees, engineering), preference for vocational courses.

1.3 OBJECTIVES

The proposed objectives, considered as solutions to the problems discussed above, can be clearly understood if they are also separated into categories.

Regarding professional training:

- Integral targeted training in the field not only of software and services, but also of ICTs.
- Balance among the 5 characteristics that should be present in all training (basic, technological, commercial, systemic and applications), respecting traditions and autonomy.
- Flexible curricula. 'Consenso de Bologna' *(Bologna Consensus)*

Regarding interaction with the sector and, partially, with academic excellence:

- Training focused on the 'vision' and 'model' of ICT development defined by the SITS Forum, considering the key areas and technologies, interaction with the business and public sectors and integration of the education system through the Innovation, Entrepreneurship and Productivity Networks.

There are other aspects related to academic excellence, which require special treatment such as research in basic areas and PhD training programs on those areas. Therefore, intensive actions are required for:

- international cooperation,
- postgraduate scholarships,
- research programs and projects,

Some of these actions are considered in the FOMENI program and others in the conclusions of the R&D work group.

1.4 ACTIONS

'Fondo para el Mejoramiento de la Enseñanza de la Informática' – Fund for the improvement in IT training (FOMENI)

1.4.1 General Characteristics of the Fund

The Fund is integrated by: the State and the Provinces, Public and Private Universities, ICT sector Companies and Companies which demand ICT technology. The percentages are yet to be defined (about 75% of the funds are public and 25% are private funds).

Although FOMENI was created as an instrument to promote human resources training at the three already mentioned levels, it will prioritize the allocation of its resources, taking into account the general aims of the model and the subsequent strategic plan for the development of the SITS sector. Thus, it shall encourage the creation of Innovation, Entrepreneurship and Productivity Networks. Consequently, it will prioritize the projects of associations between companies, universities, high school and non-university institutions, and the public sector, with a view to creating networks in the economic sectors and key technological areas, such as the ones mentioned in Section 1.1.2. In addition to this, the participation of institutions from different parts of the world will be advisable, mainly in those networks related to the dynamic economic sectors where their territorial relations so require.

Regarding educational institutions, those which submit institutional plans aimed at solving problems and achieving the objectives proposed in Sections 1.1.3 and 1.1.4 will be prioritized.

This fund will operate from 2005 to 2014 with regular reviews three times a year.

The fund finances:

1. **Innovation, Entrepreneurship and Productivity Networks**: subsidizing for a pre-established term -initially 3 years- the creation of networks formed by

companies, educational institutions, research centers and the public sector, pursuant to what is described in Section 1.1.2.

2. **Higher Education Teachers Training**: aimed at increasing the number of full-time teachers with R&D plans focused on relevant research lines and application areas, and improving university and non-university teachers' qualifications. The fund will also finance the participation of company staff for the delivery of courses at educational institutions as well as teachers' internships in companies as consultants.

3. **Link between the education system and the company**: both training of companies' staff in the educational system (university, non-university and secondary school), and teachers doing internships in companies and support of joint projects between both sectors.

4. **International Cooperation**: supporting international cooperation projects in the relevant areas of research and application. These funds will supplement the funds granted by R&D funding institutions (CONICET, SeCyT, etc.) any time the subject matter of cooperation is in line with previously identified thematic focal points.

5. **Postgraduate Course Programs**: granting internal, external and mixed scholarships for researchers' training in relevant research lines and areas of application. Local and foreign specialists' traveling and lodging expenses will also be financed. These funds will supplement those granted by R&D funding institutions (CONICET, SeCyT, etc.).

6. **Infrastructure**: of computing systems, networks, libraries, etc. especially focused on relevant research lines and areas of application, as well as on graduate and postgraduate teachers' activities.

7. **Educational System Integration**: covering programs and specific actions focused first on the integration of university, non-university and high school education levels. The integration of the basic IT programs in ICTs –promoted by the National Government– and in the informal education system is foreseen in the medium term.

1.4.2 Lines of finance

1. Development of Innovation and Productivity Networks

It refers to a financing plan for the consolidation of the centers that combine activities of innovation, research, development, teaching and business corporate developments aimed at specializing in specific areas and issues or market niches and that show the potential to achieve productive and/or technological progress of optimal level. The aim is to improve the level of inter-institutional relationships and complementarity and encourage joint programs of technological and trade qualification and development.

2. Higher Education Teachers` Training

It consists of supporting public and private non-university and university higher education institutions in order to improve the quality of their regular teaching staff in undergraduate courses, increasing the quantity of full-time research teachers, the recruitment of researchers for specific plans or improving the quality of existing staff.

3. The educational system- business relationship

It comprises financing to improve the relationship or exchange among companies and non-university and university technical education institutions, by means of actions performed through

a) non-university and university technical training delivered to companies' regular staff,

b) teachers' internships in companies facilities,

c) development of R&D groups in business environments with the participation of university specialists and

d) development of R&D joint projects

4. International cooperation

International cooperation projects shall be encouraged by financing traveling and lodging expenses of researchers and teachers' academic trips.

5. Postgraduate course programs

It refers to the financing for the implementation and strengthening of PhD programs, Master degrees or specialization courses for professionals.

The support is focused on the financing of:

a) internal, external or mixed scholarships for graduates,

b) temporary hiring of visiting professors and researchers,

c) expenses for the exchange of research tutors or directors' that must fulfill these functions on a temporary basis, collaborating in postgraduate programs of institutions where they do not regularly work.

6. Infrastructure improvement

It consists in the financing of institutional development projects considering the set-up or improvement of computing systems, local or external IT and telecommunications networks, broadband links, enhancement of telecommunications, libraries, documentation, etc.

7. Educational system integration

It refers to the financing of isolated actions or programs for the integration of qualification and improvement activities of non-university and technical institutions and for the follow-up and on-going training of teaching staff and competence-based elementary, secondary and technical educational programs for technical staff training. IT literacy programs and informal training delivered at training centers.

Contributions to the Human Resources and Research and Development Thematic Group.

Title: Programa Estratégico Tecnología de la Información y Comunicación *(IT and Communications Strategic Program)*
Author: Dr. H. Daniel Patiño. Coordinator of the Information and Communication Technology (ICTs) Strategic Program. Secretariat of Science, Technique and Productive Innovation.

Title: Trabajadores Informáticos (*IT workers)*
Authors: José Borello, Analía Erbes, Verónica Robert, Sonia Roitter and Gabriel Yoguel
Universidad Nacional de General Sarmiento *(National University of General Sarmiento)*

Title: Técnicos Medios en TIC **(***ICT Secondary School technicians)*
Author: Hector Monteverde. SADIO

Title: Técnicos Superiores en TIC *(ICT Senior technicians)*
Author: Hector Monteverde. SADIO

Title: Educación, RRHH e I&D (*Education, Human Resources and Research and Development)*
Author: Dr. Roberto Perazzo. ITBA

Title: Investigación, desarrollo y recursos humanos de calidad: tres pilares que fortalecen a la industria del software. *(Quality research, development and human resources: three pillars that strengthen the software industry)*
Author: CESSI

Title: Comentarios al documento de RRHH 10-03-2004 *(Comments to Human Resources 03-10-04 document)*
Author: Dr. Roberto Perazzo. ITBA

Title: Competencias tecnológicas de los trabajadores informáticos. (Summary) *(Technological competencies of IT workers)*
Authors: José Borello, Analía Erbes, Verónica Robert, Sonia Roitter and Gabriel Yoguel. Universidad Nacional de General Sarmiento

Title: Aporte para el Grupo de RRHH e I&D *(Contribution for the HHRR ad R&D Group)*
Author: Ernesto Krawchik, CEO Idea Factory

Title: Aporte para el Grupo de RRHH e I&D *(Contribution for the HHRR ad R&D Group)*
Author: Jonathan Altszul. CORE ST.

CHAPTER II – INTERNAL MARKET STRATEGIES

2. ICT SUPPLY AND DEMAND OBSERVATORY

2.1 INTRODUCTION. What is this about?

During the SITS Forum, some topics were dealt with by several Thematic Groups, constituting what we could call "crucial issues", as was the case of the SITS development "model" to be implemented, or the Human Resources issue, among others.

Specifically, the issue is related, firstly, **to the possibility of having information about ICT supply and the demand available. This information should be permanently updated and ready to be classified, segmented and prioritized by a technological tool**. But although this is important, it constitutes only one aspect of the problem. Because, there is also the need - for multiple reasons having to do with the profile and the characteristics of the productive structure of Argentina (and of most of Latin America)- to work for the benefit of matching ICT supply and demand. That is why in the Observatory Thematic Group, the phrase "**An Observatory for action**" recurred many times, making reference to the need to think about the problem as if it were a movie, and not a static image

As we were saying, the profile that this type of observatory will adopt is inextricably linked to the difficulties suffered by the productive sector as a whole. Thus, in the 1990`s we witnessed a quick penetration and development of ICTs in the corporate sector. As this market became saturated, and supply started to move towards the sector of SMEs, serious problems appeared that are still unresolved.

Some opinion polls carried out in 2003 about the implementation and use of ICTs by SMEs [1] are revealing. On the one hand, they showed that the level of ICT equipment installed is reasonable in relation to the size and the characteristics of the companies surveyed, although too heavily oriented to administrative-accounting tasks at the expense of productive activities, but when asked about the use of that installed capacity (recently, since the end of the currency board system), there appears a serious problem of underutilization of that installed capacity, due to which its impact on the competitiveness of the company is limited. In another survey in the same year[2], there were asymmetries detected between the assessment of the company's old capacities and the effective incorporation and use of ICTs. It does not escape us that the profile and idiosyncrasy of SME sector has an enormous importance in Argentina; nor is foreign to us the enormous challenge imposed to their survival

[1] IMES, Survey of 60 companies about equipment and use of ICTs, in the town of Gral. San Martín

[2] Universidad Nacional de General Sarmiento, Survey about capacities, equipment and use of ICTs

by the macroeconomic, exchange and relative price structure that prevailed in the 1990`s.

Overall, we could say that 10% of the productive SME sector has incorporated technology, management tools, and is involved in, or is part of some sort of network because of the trade relations that it holds with a large company, a hypermarket, etc. So, these SME need, awarely or unawarely, to incorporate technology. They can also benefit, because of their relations and management capacity, from the public policies offering funding or subsidies through different government agencies[3].

The remaining 90% of SMEs have very few institutional relations, be it with government agencies, Business Chambers or Universities, and, in general, it is very difficult for them to find any connection whatsoever between their daily problems and the solutions offered by ICTs. **The problem is compounded by a disarticulated supply that is, on occasion, also unrelated to the specific problems that these enterprises have to face.**

All these issues are conducive to emphasizing the double –although ultimately one in essence- role to be played by the observatory: that of permanently surveying and updating supply and demand information, on the one hand and, on the other, the need to think about steps to be taken in the territory, targeting productive sectors or regions, with the purpose of encouraging competitiveness by improving the impact of ICTs on the productive sector.

During the Forum, the human resources and R & D plan was devised, with a strong networking component. The networks to be established would become future centers of excellence, targeted at the most relevant sectors of the national economy and at technological niches where Argentina may enjoy comparative advantages that could become competitive in future. It seems only logical that the Observatory we are conceiving, at a territorial level, joins these networks, since, for example, the demand survey would be a very valuable input to guide new research efforts and to train the necessary human resources to meet the actual needs of the sectoral or regional productive sector.

However, the goals of the Observatory go well beyond human resource training, research and development undertakings, or even the interaction between supply and demand of products and services; in effect, the Observatory must become a core instrument for the purpose of defining policies for the sector, to guide investment and lending efforts. In turn, it is an indispensable knowledge base for the generation of a business environment for the ICT sector that will be fundamental for the creation of a competitive, innovative and dynamic business sector, an academic sector in line with the actual human resource needs and a scientific and technological sector that aligns production with the country's needs.

[3] IMES, San Martín SME Observatory, evaluation of the impact of national and provincial public policies

2.2 PROBLEMS. Where do we stand?

The general outline furnished so far has taken us to the specific description of the problems which, as we said, are about information, on the one hand, and about interaction, on the other.

2.2.1 Lack of reliable information about the supply in general and about the exportable supply in particular

This is common to many productive sectors. In the case of SITS, the activity and presence of Chambers, Poles and Clusters is positive to get to know the most relevant companies in each region, although the general phenomenon that we described above about the low level of institutional insertion recorded by SMEs also appears here, which leads, as a result, to the lack of centralized information about their existence and their activities.

But beyond the awareness of the existence of these companies and individual supply, there is another clear problem: the absence of shared information and criteria to classify, segment and qualify all the available supply. This is also applicable to the information about the supply that would qualify to compete in international markets, that is available but in a very fragmented manner.

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2.2.2 Lack of information about the profile and the characteristics of the demand

The two surveys in 2003 about previously installed capacity, equipment and the use of ICTs showed the enormous quantity and quality of the information that can be obtained by this means. And, in the opposite sense, they revealed the actual absence of territorial information, especially of information obtained not to be published, but to act and modify the penetration of ICTs in the productive sector.

That lack of updated information aimed at detecting the actual needs of companies brings a direct impact to bear on the possibility to improve the degree of penetration of ICTs. Since there is no information available, it is not possible to do a segmentation or classification according to the crucial issues detected in order to meet the actual needs of the productive sector, with best-suited supply, training, etc.

2.2.3 Lack of a technological tool

Since there was no systematic analysis of the supply and the demand with the purpose of improving their interaction and the exporting capacity, there is no technological tool either for such a purpose, or for the necessary interaction within regions, sectors and even at a regional and national level.

2.2.4 Problems of supply and demand mismatch at regional and productive sector levels.

This is evident in the case of micro businesses and small and medium-sized enterprises, for the reasons described above, such as the degree of isolation and the impossibility on the demand side to envisage the opportunities offered by technology, and on the supply side, the lack of knowledge about actual needs and resource-driven production (instead of demand-driven).

This is compounded by the low development management capacity at the territorial level in Argentina, which makes it impossible to approach companies in order to gain their confidence, with the purpose of trying to understand their problems and actual needs.

2.3 OBJECTIVES. Where are we heading for?

The resolution of the problems described above cannot be considered in an isolated manner, but within the general framework of the strategic plan, and in coordination with the objectives set for other areas, especially the ones related to Research and Development and Human Resources.

2.3.1 Coordination of the activities in the Observatory and of the activities of R & D and Human Resources at the territorial level

Clearly, this is a general goal, since it boils down to interacting at the territorial level with the networks that target the most dynamic sectors of the national economy, made up by universities, ICT companies and provincial or municipal governments. This is about building a bridge between the needs and the shortcomings detected in the local-regional productive fabric - the assignment entrusted to the Observatory- the activities performed by university research teams, and the supply available, to the extent that it can meet those needs. Likewise, the profile and training of local-regional human resources shall be correlated to the characteristics and the needs of the sector or region where they belong.

2.3.2 Getting to know the ICT supply and demand types

This goal will allow us to get to know the total available supply, but it is also necessary to work on the design of parameters to segment and classify it, as well as the possibility to rate it, in order to streamline evaluation of the supply by demanders.

Concerning the demand, the goal will be to get to know it in practical terms, in order to understand the situation of the companies, to segment and classify needs, to imagine promotion and problem-solving actions, as well as a way to direct research and development and human resource training actions.

2.3.3 Facilitation of interaction between ICT supply and demand

The purpose is to remove the existing hindrances that work against a better and more pervasive penetration of ICTs into the productive sector. Thus, the objectives shall be aimed at achieving a better supply–demand match, as well as at the improvement of the local-regional management capacity allowing for a swift resolution of cultural, organizational and confidence-related problems of SMEs acting in the territory, based on proximity relations.

To achieve these goals, the role played by **tutors or "translators**" is of outmost importance. They shall be trained to be able to understand what is happening to the companies, to learn their way in the pre-diagnostic phase, and to detect the needs (that might be related to equipment, use or training), and eventually cooperate in matching those with the wide supply of public policies of national and provincial agencies.

2.4 ACTIONS

2.4.1 CONSTITUTION OF A PERMANENT NATIONAL OBSERVATORY BY INTEGRATING THE REGIONAL OBSERVATORIES IN ORDER TO VISUALIZE THE TOTAL AVAILABLE SUPPLY AND DEMAND REQUIRED, AS WELL AS TO CONTRIBUTE TO THE DESIGN OF POLICIES FOR THE SECTOR.

2.4.2 ESTABLISHMENT OF REGIONAL OBSERVATORIES IN PERMANENT INTERACTION WITH THE R & D AND HUMAN RESOURCE TRAINING NETWORKS, IN ORDER TO FACILITATE THE INTERACTION BETWEEN SUPPLY AND DEMAND.

2.4.3 CENSUS AND PERMANENT UPDATE OF THE GENERAL AND EXPORTABLE SUPPLY, AS WELL AS THE DEMAND TYPES IN PRODUCTIVE REGIONS AND SECTORS

Contributions for the ICT Observatory Thematic Focal Point

Title : ICT Demand Survey - OBS (Draft)
Autor: Roberto Gabriel Spotorno – ICTs Forum

Title: ICT Observatory Status 05-05
Author; Roberto Gabriel Spotorno – SITS Forum

Title: SPGA Project (Revision 1)
Author: IT Department - Universidad Nacional de Rio Cuarto.

Title: IT Broad Sense
Author: Andrés Dmitruk

Title: The supply and demand Observatory and the Competitiveness and Productivity Center
Author: IMES

Title: Table of Characteristics
Author: IMES

Title: Information and Knowledge: the diffusion of ICTs in the Argentine manufacturing industry
Author: José Borello, Analía Erbes, Verónica Robert, Sonia Roitter and Gabriel Yoguel. Universidad Nacional de General Sarmiento

CHAPTER III- THE LEGAL FRAMEWORK FOR THE COMPETITIVENESS OF THE SECTOR

3.1 Introduction

The growth and development of the SITS sector is based on the existence of a legal framework that not only promotes its development, but that is also prone to generating a favorable ground for all relevant initiatives. That is the reason why we will discuss the law specifically promoting the sector, as well as a general digital agenda. This agenda will be briefly described, since deeper and more detailed guidelines shall be further discussed in the years ahead. We deemed it appropriate to discuss the venture capital bill for technology companies separately.

3.2 Software Industry Promotion Law

Firstly, this law evidences the importance that the National Government attaches to the sector, not only because of its inherent significance, but also for the competitiveness it generates for the economy as a whole. Together with this, there is a horizon of certainty envisioned for the next few years concerning the fiscal and tax treatment, which will undoubtedly result into rising investment levels.

The tax benefits are expected to remove the asymmetries with neighboring countries and to boost the sector's competitiveness.

In a nutshell, the bill contemplates:

1) the establishment of a stable tax system for a period of 10 years with the purpose of sending a signal of predictability to those willing to invest in this sector.
2) a VAT tax credit equal to 70% of effectively paid employer's contributions to social security funds. This is a major competitive advantage if we consider that the software industry needs intensive skilled labor, being this component –labor- the determining factor in calculating production cost.
3) deductibility of 60% of taxable income tax, as long as companies can prove the spending in research and development for the purpose of promoting R&D.

The creation of a Fund for the Promotion of the Software Industry (Fonsoft) is also contemplated. The purpose of this Fund would be to finance research and development at universities, research centers and SMEs, as well as SMEs that have adhered to the plan in force for quality certification purposes and the development of new entrepreneurial efforts.

It is also stated that on the Internet page of the Enforcement Authority the list of registered companies and the total amount of the tax benefit granted to each company are to be published. This is unheard–of since only the implementation of transparent criteria in the management and administration of promotion regimes as the one described above can do away with the old crafty promotion schemes executed in our country.

In conclusion, we believe that this initiative has to do with a key question of the globalized world we live in: how a non-central country should think and resolve its successful global insertion in the value creation and trading chain and create skilled jobs at the same time to stop subsidizing central countries with the permanent drain on its most qualified human resources.

3.3 The Digital Agenda

Among the legal provisions that shall be enforced to support the movement towards a virtual world, and to improve the intellectual property regime, the following is proposed:

- Criminal legislation to punish illegal behavior conducive to damaging IT assets (equipment, data, communications) and the use of IT systems in order to damage other legitimate interests.

- Streamlining of the intellectual property legal regime. In fact, copywrite protects software. The origins of this legal protection are found in the law passed in 1933 in Argentina, with provisions focused on the “traditional” creative genres and problems that were typical of the first quarter of last century. For some of the provisions not to have a negative impact on the competitiveness of software authors, it is advisable to introduce in the Argentine legislation some of the modifications that have allowed other countries to guarantee computer program developers a friendly legal environment and a leveled playing field when having to compete internationally.

- Increased responsibility and accountability on the side of Internet service providers (ISPs) protecting the legitimate interests of third parties and providing ISPs with a “safe port”, so that they can seamlessly operate without running any risk of being at a disadvantage vis-à-vis their peers in other jurisdictions.

- A legal framework for electronically distributed e-mail and instant messages, including spam protection and safeguards in case of attacks against users´ virtual identity.

- Legislation on the instrumental aspects of e-mailing, including contracting options, self-regulation frameworks and means of payment.

- Reform of the substantive legislation in force, by expanding the general legal definition of “writing” and “signature” to include those produced by electronic means, so as to remove obstacles and foster the utilization of electronic messages in lieu of instruments in paper form in public and private activities of all sorts.

- Trade secrecy legal framework, aimed at safeguarding the legitimate interests of software developers especially in the research and development phases.

- Acceptance of electronic invoices for accounting and tax purposes, including its acknowledgment as a negotiable executive title.

3.4 Venture Capital Law for technology-based companies

For over four years, the National Congress analyzed, discussed and perfected an essential legal instrument for business and technological development in Argentina, as the national venture capital framework for technology-based companies. **This bill was approved by unanimity in both houses of the National Congress**, but in the last week of December 2001, during one of the worst crisis ever lived in Argentina, it was vetoed completely by the National Executive. The urgent issues that had to be addressed thereon did not allow Congress to review the issue and reject the presidential veto, with the subsequent expiration of terms of the bill.

At the onset of the current legislative session, some of the signing representatives received a note from the Software and IT Services Competitiveness Forum urging them to review and submit the bill again, since the reasons that gave rise to the bill are still current, and Argentina badly needs to promote the national venture capital development framework.

That is why the bill was once again submitted, among others, by Representative Ferreira from Tierra del Fuego, who has strongly pushed for the approval thereof during his tenure.

We think this initiative is more than fitting at a time when Argentina has taken again the path of institutional normalization and growth, and when the items being given priority on the public agenda are the need to grow in a sustained manner, higher number of jobs for skilled labor, sustainability of a productive and development model and medium and long term planning**. We believe that this bill, aimed at technology-based, knowledge-intensive companies is a perfect match for the agenda that is being installed in Argentina.**

We thought it important, given the depth of the arguments presented, to reproduce on this strategic plan, the arguments on which the bill approved in 2001[4] was substantiated:

[4] The text in italics is part of the original project approved in 2001.

"Government active policies are usually grounded on 'market failures' on the one hand, and on the benefits that those policies will entail for the community as a whole, on the other.
The topic that occupies us hovers around the 'failures' that the conventional financial market exhibits with respect to the funding of innovative technology-based small and medium-sized enterprises.
We refer to those promising small and medium-sized enterprises that produce innovative goods or services by incorporating knowledge through technology.
In general, these small and medium-sized enterprises do not meet the requirements, nor do they have the equity that the conventional financial system usually requires to have access to the economic resources that they need to start business.
Radical or incremental innovations of products, processes, marketing, occur more frequently when an entrepreneur (innovative businessman) or a techno-entrepreneur (technologist developing an innovative idea) perceives there is a market opportunity and has the necessary funds to turn the idea into a product and then bring the product to the market.
The nature of innovation itself, made worse in the case of small and medium-sized entrepreneurs because of their equity and management weaknesses make conventional banking institutions be suspicious about ***these projects which strength lies precisely in the nature of the undertaking and not in the equity available to that effect****.*
It happens to be that banks justify such an attitude on the fact that they are the repositories, the custodians of other people's money, and on the fact that they are subject to regulations that prevent them from making investments that entail a certain degree of risk, as is the case of innovations.
However, experience shows that many of those investments generate profits that far exceed the ***market's current interest rates.***
In the developed world, governments have encouraged capital raising to cater for that market failure *justifying their actions on the fact that innovation development leads to economic growth and new jobs.*

In our country there are some instruments aimed at increasing technological innovation, SMEs modernization, job creation and export promotion.
Such is the case of the Secretariat of Science and Technology of the National Scientific and Technological Promotion Agency that through its funds, the FONCYT and FONTAR, provides resources for the first phase of the innovative work development, as well as Law N°23,877 on the promotion and encouragement of technological innovation, or the Productive Dynamization Program managed by the Interior Ministry, o the Fundación Exportar, which operates under the umbrella of the Foreign Affairs Ministry. Like other instruments being run by the SME Secretariat of the Presidency of the Nation, the Labor Ministry, on its part, has programs in place for workers' training.
And there is a whole set of instruments at the provincial level, as the ones fostered by the Federal Investment Council (Consejo Federal de Inversiones) or the Institute of Buenos Aires Business Development (Instituto de Desarrollo Empresario Bonaerense).
On the other hand, in the last two years, instruments have been geared towards redressing the failures of the financial market as evidenced by the creation of the reciprocal guarantee companies or mutual funds.

However, none of the programs or instruments renders financial assistance ***to bring to the market the innovations*** *that have proven to be technologically and economically feasible. Many projects well funded by those instruments have remained at the prototype or pilot phase in the demonstration unit, because there were no funds* ***to bring them to the market****.*

In summary, we have in Argentina a whole set of incentives to promote innovations and exports. ***However, we do not have the instruments to bring those innovations to the market successfully.***
This bill intends to make up for those shortcomings, ***by proposing the creation of a venture capital system in the Argentine Republic.***

With the exhaustion of "fordism" as the economic growth model of choice, in the 1970´s people started to see the beauties of small and medium-sized enterprises in the new economy. Thus, a high percentage of innovations worldwide were originated in small and medium-sized enterprises that considered knowledge the indispensable tool to grow.

Conglomerates of technology-based companies represented the identity of Silicon Valley or Road 128 in the United States, the former around the Universities that settled in the region and the latter because of the thrive of the Massachusetts Institute of Technology.

There are also joint ventures between laboratories and scientific and technological research institutes such as Sophia Antípolis in France, or the Japanese techno polis, or Brazil's sustained investment in the development of technological parks or technology-based company incubators in the 1980´s.

The fact is that in building the new institutional scaffolding introduced by the globalization of the economy, it may seem that technology-based small and medium-sized companies will be essential components of the new techno-economic paradigm. *The efforts made by more developed nations to encourage the creation, consolidation and growth of SMEs do seem to head this way.*

The 1970´s showed relentless efforts by Sates to encourage the establishment of technological or scientific parks, science or technology-based ***companies in the hope that by closing the gap between the world of knowledge and the world production, the economy would grow faster, bringing with it a better quality of life for their people.***

These programs were strongly knowledge supply-side oriented*. In the 1980´s, those active policies are emphasized being* ***now knowledge demand-side oriented, that is, company oriented.*** *The fundamental sign of those times are the projects aimed at encouraging an association between the world of production and the world of knowledge.*

Finally, the 1990´s proved that those active policies fostered by governments are more demand oriented, trying to generate, especially in SMEs the capacity necessary to absorb technology.

However, there is more to a new innovative product than the mere concern over its follow-up, no matter where it has its origins: in a laboratory, out of the partnering between the laboratory and the company, or in the company that incorporated the knowledge.

Besides, since the 1970´s there has started to appear a trend that today moves tens of thousands of millions of dollars in the world known as venture capital programs.

Venture capital investment is a form of financial intermediation through which companies receive financing primarily from investment funds which, in turn, are financed by investors seeking high returns on their investments. Venture capitalists are involved in the business, but ***not*** *in the activities performed by their "partner client" and establish a close relationship with the innovator by contributing their management capacity and encouraging good business practices.*

With regard to funding, the programs promoted by governments ***cover various stages along the path of growth of a business or company.***

There are three stages broadly considered along the path of development of a business or company:

-Start-up
-Growth and development
-Consolidation and maturity

During the start-up phase, the undertaking is not ***yet*** *approved and the business project is at an irreducible minimum.*

A new venture may need several infusions of cash from venture capitalists as the business progresses:

*1. The **seed capital** is money used for the initial investment in a project or startup company, for proof-of-concept, market research or initial product development.*
Venture capitals have proven to be essential to finance innovative ventures, basically in support of technology-based small and medium-sized companies. For their development it is a priority to generate a legal and institutional framework within which existing resources can be channeled, since experience has proved the strength that a secondary market of specific values gives to the venture capital system. As an example, we outline below some programs implemented elsewhere in the world, their typology, their purposes and the countries that implemented them.

*2. The **start-up capital** is used for hiring staff, renting office space, purchasing servers and other IT infrastructure, purchasing inventories, equipping the production system, and other activities involved in starting the business market.*

*3. The **fist-stage financing** will allow the company to make its first manufactures and sales. During the growth and development phase, the product has proved its potential at a small or prototype scale but its management and commercial development is yet to be developed.*
In these cases the venture capital contributes:
***A. Second stage financing**: working capital is provided to expand plant capacity.*
***B. Third-stage financing**: provided for further expansion of the company which sales are also on the rise.*
***C. Bridge financing**: financing extended to a person, company, or other entity, using existing assets as collateral in order to acquire new assets. Bridge financing is usually short-term.*

TYPOLOGY-OBJECTIVES-EXAMPLES

- *Direct capital contributions*
- *Government capital contributions: these are direct contributions by the Treasury to set up venture companies or funds.*
- *Low interest rate Government loans or grants for the constitution of venture capitals. (Belgium: Investment Company for Flanders, Denmark: Business Development Finance, to mention but a few).*
- ***Tax and financial incentives***
- *Tax incentives, credits (United Kingdom)*
- *Tax exemptions*
- *Investment guarantees*
- *Regulations*

During the consolidation and maturity phase, the company tends to stabilize vis-à-vis its competitors and must develop more sophisticated marketing systems.

In these cases, the venture capital contributes resources to reorganize the company, to consolidate in the conventional financial market, to improve its management in order to privatize it if is state-owned, among others.
***In summary, technology-based companies usually incur into higher expenses and run more risks at their onset and during their development than other small and medium-sized enterprises**, due to the fact that conventional bankers fail to understand commercially unproven innovations and the difficulties inherent to assess their potential markets, many times because they are not capable of grasping the beauties of innovation.*
Therefore, new and small entrepreneurs are at a disadvantage to develop their innovations vis-à-vis bigger or older companies.

***Internationally, venture capital operations have been on the rise**. In almost all nations there have been associations of venture capital institutions set up.*

In Spain, the Asociación de Capitales de Riesgo (ASCRI) informed that there were 48 venture capital institutions that raised funds for almost 230 billion pesetas funding 723 enterprises (1997 data).

In Germany, in 1995 a program called Venture Capital for Small High Technology Firms was created for the 1995-2000 period, to provide funds for companies that have developed new products or services, that were set up no longer than 10 years before, with less than 50 employees and no more than 10 million marks in annual sales (40 million marks and 250 employees in the case of Eastern Germany). A three million-mark loan reimbursable over ten years is the maximum facility provided by the State.

In Sweden, the amount of venture capital funds available is estimated to be 6.5 billion Swedish crowns.

In Finland, the funds are mainly state-provided and they are estimated to be in the tune of 100 million dollars.

In Canada, the characteristic is that the funds are regional with the State contributing a major part.

The European Union created the European Investment Found (EIF) in 1994 as the specialized financial institution for the support of the creation, growth and development of Small and Medium-sized Enterprises (SMEs). Its venture capital portfolio amounts today to about EUR 2.5 billion, with a strong focus on early-stage investments

In Denmark, loans are granted for SME research and development projects. They account for 50% of the total amount of projects between 200,000 and 100 million Danish crowns. Until September 1996, 1.1 billion Danish crowns had been awarded to 633 projects of 430 companies.

In Italy, according to the Italian Association of Venture Capitals between 1996 and 1997 the number of companies that obtained funding grew by 20% and investments by 17%. In 1997, 93 companies were provided with start-up and seed capital and 82 with third-stage financing.

***The bill we are submitting is based on the experience of other nations, without neglecting our own context**.*
Therefore, in the first chapter it is stated the scope and objective of the law shall be the support of the creation, growth and development of technology-based companies and of a new business culture capable of generating wealth and genuine jobs and of competing with efficient and competitive quality at a global level.

***To define technology-based companies**, the SELA document was summarized as follows: "Technology-based companies offer interesting alternatives to the region", suggesting a profile description for the new type of companies that is in line with the new techno-economic paradigm.*
Thus, the future trend to increase the knowledge content in new or perfected products is emphasized. Knowledge is also incorporated in the design, functionality, in the shapes and resilience, becoming an optimum productive practice; in the introduction of new materials and the recycling thereof, in the use of energy, protection of the environment. Production is tailored to meet demand and the company develops more technological dynamism. It also has a new organizational scheme in place, for production and marketing purposes.
***Likewise, the innovation concepts were revisited** and various kinds of innovations were included, thus expanding the scope of the law.*

The criteria to conceptualize risk investments were taken from the best practices in the field, in the same way as for venture capital companies and funds.
In the second chapter, the national venture capital system and the enforcement authority are defined.

In the third chapter, the general criteria for the establishment of venture capital firms and funds are created and established, also following the international experience in the field.

With regard to the operation of the system, described in chapter four, the main aspects that we thought could not be devolved to the regulatory provisions of the law were considered.

Chapter five empowers the national Executive to create a series of instruments to encourage the establishment of venture capital companies and funds.
The key intention is to lay the foundations for the private sector to invest in technology-based company projects.

Chapter six describes the functions of the enforcement authority and the establishment of the system's guiding council prioritizing the participation of the private sector in it, so as to make it more agile.

As we said, based on a SITS Forum Initiative, this Venture Capital Bill was submitted again and it is being considered as we speak in the relevant committees of the House of Representatives.

3.5 ACTIONS

3.5.1 APPROVAL AND REGULATION OF THE SOFTWARE INDUSTRY PROMOTION LAW

3.5.2 FOSTERING OF A DIGITAL LEGISLATIVE AGENDA

3.5.3 APPROVAL AND REGULATION OF THE NATIONAL VENTURE CAPITAL LAW FOR TECHNOLOGY-BASED COMPANIES

Contributions for the Intellectual Property and Free Software Thematic Focal Point

Title: The requirements of the SITS Industry for internal and external competitiveness
Author: Martín Carranza Torres. CESSI

Title: Free Software & Open Source – Definitions and Terms.
Author: Pablo B. Barrera . CELIX

Title: The Legislative Agenda
Author: Dr. Antonio Millé.

CHAPTER IV. EXTERNAL MARKET STRATEGY

4.1 INTRODUCTION

The structure of the current Thematic Group includes the description of problems, the objectives of the plan, and the necessary instruments to meet those objectives. According to this methodology, the problems are defined as the gap between the current situation and the desirable situation expressed in the objectives; and the instruments are the means to overcome the problems.

Before describing the instruments and the actions, in the case of the chapter on exports there must be a strategic instance called "International Positioning Strategy" that will serve as a reference point for the deployment of the instruments and actions contemplated in the plan.

4.1.1 Evolution of Argentine exports. Problems related to their positioning in the International Market

In the year 2003, the Software and Information Technology Services exports amounted to USD 170 million, according to the sector's Chamber, which represents a growth rate of 41.66% for the year 2003.

Although exports accounted for 17.43% of the sector's total sales in 2003, amounting to USD 975 million, Argentina is far from the performance levels achieved by leading countries such as India (76%), Ireland (85%) and Israel (73%).

Even considering that 17.43% of exports over total sales took place after the devaluation of the peso, this is a record figure. In 2000, the sector seemed to be strongly oriented to the domestic market, being exports –made by a small number of companies- marginal compared to total sales (USD 35 million, les than 2% of total sales).

The reduction in total ICT sales due to the recession started in 1998; software and IT services exports gradually ceased being insignificant compared with domestic market operations. Exports rose from USD 35 million in 2000, to USD 70 million in 2002, reaching USD 170 million in 2003. According to the sector's Chamber they are expected to reach USD 220 million in 2004.

These exports go mainly to Latin America, with some significant shipments to the USA. Although it seems reasonable to start export trading in some more accessible markets (also from a cultural point of view) such as Latin America and Spain, it is necessary to bear in mind that these markets do not account for more than 4% of the world market. Consequently, a medium or long-term plan for the sector should take into account the US market –accounting for around 50% of the world market- the EU, China and Japan, not only because of its volume but also because of the funding possibilities and links that might result from the contacts established between our professionals and technicians and

more demanding external customers/users. There is also the possibility to learn about and try to adapt top-of-the-line technologies. A relevant and not so developed aspect is the utilization of the diaspora of Argentine professionals abroad, that has not been a minor issue in the development of experiences such as the one in India. These Argentines professionals can be important at the time of generating contacts, training high-quality human resources, etc.

Argentina has better positioned and more competitive software products and services in Latin American especially in Mexico, Chile and Brazil, because of language and cultural affinities. The Latin American market is a market that is within the reach of the Argentine software industry but that is very small for a sustainable export development strategy.

Secondly, the exporting efforts towards the USA, Canada and Spain have resulted into some SITS firms opening sales offices abroad prior to the 2002 devaluation of the peso, basically trying to replicate the relations established domestically.

4.1.2 The Software world market. Main exporters

The bulk of the ICT market is in developed countries and, in particular, in the United States and Canada (34% of the ICT world market and 48% of the SITS market in 2004). The global software and IT service market structure shows that the main producers and importers are the United States and Canada, becoming not only the world's largest consumer market of software products and services but also the most open in software and IT services (SITS) trade. The US and Canada are followed by the European Union in terms of global consumption of SITS coming from emerging countries

Table I	Sales (Million USD)[1]	Exports	Exp/Sales	USA+Can/ TotalExports	EU/Total exports
India	10,200	7,800	76%	63%	26%
Ireland	10,000	8,500	85%	N/d	70%
Israel	4,100	3,000	73%	38%	37%

Source: JICA-ECLAC Study. Sources of Economic growth in Argentina: The case of the software and IT service industry. Buenos Aires, 2003.

From the analysis of the destination of software and IT service exports from late developed countries, the US and Canadian markets stand out as the most open, since the bulk of exports from Ireland go to the interior of the European Union as seen on Table I.

WORLD SOFTWARE SCENARIO

Table I	Sales (Million USD)[1]	Exports	Exp/Sales	USA+Can/ TotalExports	EU/Total exports
India	10,200	7,800	76%	63%	26%
Ireland	10,000	8,500	85%	N/d	70%
Israel	4,100	3,000	73%	38%	37%

Source: JICA-ECLAC Study. Sources of Economic growth in Argentina: The case of the software and IT service industry. Buenos Aires, 2003.

Argentina is far from the performance (export/production ratio) achieved by leading countries such as India (76%), Ireland (85%) and Israel (73%).

Specialists agree that it is difficult to assess the number of jobs in the IT service sector since they have become “off-shore” jobs (outsourced abroad, particularly in India and China). But the best estimates say that there are around 300,000 to 500,000 jobs off shore in the US and Canadian service sector.

According to Robert Samuelson`s column in the Washington Post, John McCarthy from Forrester Research forecasts an increase of 3.3 million jobs by 2015, including 1.7 million of low-skilled back office jobs such as call centers and others; and 473,000 jobs will move from the IT service sector to Software Factories offshore.

Leading Latin American economies look at the North American market as their potential for growth. The Brazilian software association, Softex, will be taking 18 companies from the sector to the United States in February this year to promote software exports in the e-government and e-banking, business intelligence, outsourcing and offshore services.

Another strategy used in the region to access the North American market is the triangulation mechanism with Indian companies that already dominate the marketing of IT services in that market. In his latest trip to India, President Luiz Ignacio Lula da Silva brought with him a group of Brazilian software companies.

4.2 ARGENTINE SUPPLY ANALYSIS

In the last five years, Argentina has witnesses a major transformation of its software sector. Many of the companies that were born in the shelter of the domestic market growth targeted foreign markets, especially the Latin American markets, as from the recession that started in 1998.

4.2.1 Market segments and niches

Another phenomenon was the appearance of "software factories", such as Idea Factory, a company of the BGH group –the founder of the Tandil Technological Pole, Patagonia, Patagonia Technologies, and ARConsortium, a consortium of companies with offices in Miami.

We can find examples of Argentine exporting companies that require the support of government agencies to improve their positioning; for example, Pectra Technologies, of the Roggio Group, with offices in Houston intends to gain a foothold in the consulting business, Hexact with offices in several countries and Softlab in IT services for the oil industry, or Novamens in software for collaborative work.

Another outstanding segment is the one related to e-learning, content production and entertainment. The EDUTIC consortium, which stands out in the sector of educational content in Spanish for the American market, comprises 30 Argentine e-learning and content-producing companies, such as Competir.com , El Príncipe or Tecnonexo.

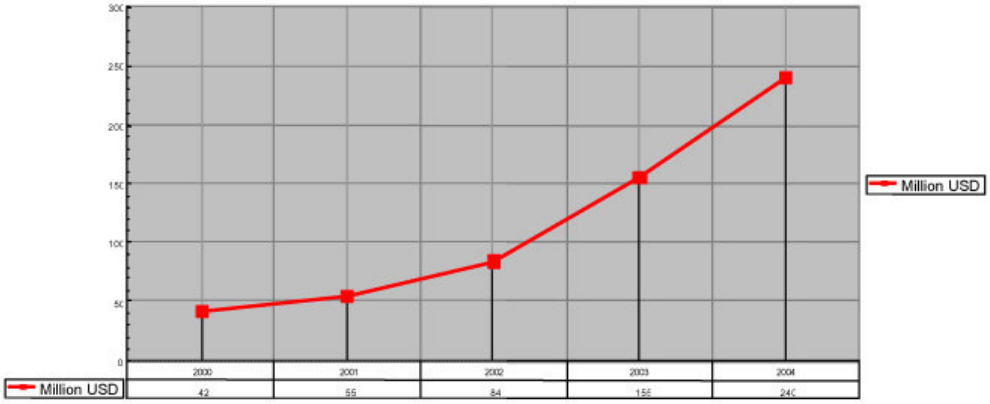
There are also leading technological companies such as Fuego Technologies www.fuego.com founded by Argentine technology entrepreneurs Emilio Lopez-Gabeiras and Félix Racca.

There is no doubt whatsoever that any of these companies may improve their competitiveness and positioning to reach highly competitive market niches such as the United States, Canada or Europe, as is the case with CORE Security Technologies. CORE is an example of what the Argentine software industry can reproduce. CORE Security Technologies http://www.coresecurity.com, a company set up in Argentina with capital contributions from the Pegasus Fund, with a majority of Argentine shareholders though, is dominant in the security

software segment with clients such as the US Marines, the US Air Force, NASA, IBM, Microsoft, Accenture, KPMG, Northrop Grumman, inter alia. The company has 15 sales people and a team of 50 engineers and programmers engaged in research and development based in Argentina.

4.2.2 Software and Services Exports Increase

Software and service export estimates



Source: JIC-ECLAC Study. Sources of Economic growth in Argentina: The case of the software and IT service industry. Buenos Aires, 2003. Software and IT Service export estimates

A segment that developed, that can continue growing and that is an engine of growth for the rest of the SITS industry because it drives the local IT SME quality processes is the Development Centers of big corporations such as Motorola, NEC, IBM, Endesa and EDS. This is a fundamental vector of the SITS industry that also requires a strategic alliance between the private sector and the government.

4.2.3 Differentiating Factors. Strengthens

- **Physical infrastructure**
- **Knowledge infrastructure [HHRR+ R & D],**
- **Innovation Capacity,**
- **Value chains that enable better access to external markets.**
- **Diaspora**

THE ARGENTINE DIASPORA

COUNTRY	TOTAL	
Spain	290,603	31%
USA	272,524	29%
Israel	72,231	8%
Paraguay	43,954	5%
Brazil	42,929	5%
Chile	36,989	4%
Uruguay	30,268	3%
Venezuela	27,750	3%
Germany	22,190	2%
Italy	19,349	2%
Canada	17,147	2%
Mexico	14,997	2%
France	10,502	1%
Australia	10,000	1%

- **Technological clusters,**
- **Price,**
- **Export barriers,**
- **Management capacity**

4.2.4 Export barriers. Weaknesses

Marketing capacity. Aggressive trade policy.
Reliability and credibility of vendors.
Reduced domestic market.
Absence of financial support
Low cultural and quality certification development

Not very much oriented to innovation and establishment of university+company+government technological poles

4.3 OBJECTIVES

4.3.1 General objectives

- To position the Argentine Software Industry in international markets
- To identify the niches and segments of international demand
- To identify and promote exportable supply
  To implement a Marketing Plan to position Argentina as an internationally competitive country for the development of SITS. Adopting the branding "Argentina: a place for innovation"
- To design and implement a precise methodology to measure SITS exports
- To promote diversification of exportable supply, working heavily on the country's software and IT service industry abroad
- To articulate SITS companies with other industries and exporting activities of Argentina
- To achieve the critical mass of supply necessary to arise the interest of "decision makers"
- To generate a training program for foreign service diplomats in the problems inherent to the SITS sector
- To develop a product and process certification culture
- To design an international trade negotiation policy
- To encourage the creation of export consortia

4.3.2 International Positioning Strategy

Differentiating factors across segments. Analysis of the software differentiating factors on a market-by-market basis. The SWOT Analysis

A combination of differentiating factors such as world-class human resources, communications infrastructure and competitive costs is sufficient reason for the Argentine software and IT service industry to have a stronger presence in Latin America by means of the distribution and implementation of solutions, and to enter the North American market as a vendor both in the offshore outsourcing segment and, in particular, in the Software Factory and Call Centers segments, as is the case of competitive applications for specific segments.

Argentina exhibits one of the highest rates of non-native English speakers in all Spanish America, and Spanish is the language spreading the fastest after English in North America; besides, there is no time difference with the East Coast of the United Sates and very small time difference with the West Coast.

If the Argentina SITS industry managed to capture only 1% of the offshore market to be created in the next 10 years in the United Sates, according to Forrester Research, 33,000 new highly skilled jobs, which would not be

dependant on the domestic market, would be created. More than twice the total of direct jobs in the Argentine software industry in 2002 (14,500).

But the SITS industry in Argentina is not only within the reach of the service offshorization segment. Argentina also has market niches in which it can introduce competitive value-added products and services, both in Latin America, and in North America and Europe.

4.4 ACTIONS AND INSTRUMENTS OF THE INTERNATIONAL POSITIONING PLAN

Communication Tools

Logos, Mottos, Collective Brand, International Positioning Strategy

STRENGTHENING THE COUNTRY POSITIONING PROGRAM AS “A PLACE FOR INNOVATION” IN THE SITS SECTOR, TARGETING A MAXIMUM OF 5 MARKETS AND 5 VERTICAL SECTORS OF THE INDUSTRY.

STRENGTHENING NEGOTIATING STRATEGIES IN ORDER TO INCLUDE THE NEEDS OF THE SECTOR IN TARGET MARKETS.

Export Promotion

ENCOURAGE ASSOCIATIVITY AND CLUSTERING OF SUPPLY TO GAIN SCALE AND COMPETITIVENESS

CARRY OUT A PERMANENT AND DYNAMIC SURVEY OF EXPORTABLE SUPPLY AND DEMAND IN TARGET MARKETS. CREATE A RESEARCH CENTER (INTERNATIONAL OBSERVATORY) OF TARGET AND STRATEGIC MARKETS

STRENGTHEN THE TRADE MISSION PROGRAM FOR TARGET COUNTRIES PARTICIPATING IN MAJOR INTERNATIONAL EVENTS

Foreign market research and identification of unmet demands. Presence in fairs, trade and institutional missions. Technology Day in the target country. Promotion of consortia and networking. International negotiations. Training Seminars for Companies. Foreign Service Training. Strategic Alliances, Uruguay, Mexico, Costa Rica.

ENCOURAGE MORE WIDESPREAD UTILIZATION OF TECHNOLOGY ACROSS EXPORTABLE SUPPLY IN ARGENTINA AS WELL AS THE CREATION OF EXPORTABLE SUPPLY FOR SELECTED SECTORS.

TRANSFORM THE CURRENT WORK GROUP INTO A PERMANENT COMMITTEE IN CHARGE OF MONITORING AND DEFINING THE NICHES AND TARGET MARKETS TO BE PROMOTED, AS WELL AS THE RELATIONS WITH PRODUCTIVE SECTORS.

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Participation of:

- CICOMRA
- CORE ST
- Secretariat of Trade and Government Economic Relations of the Government of the City of Buenos Aires
- Fundación Exportar
- INTI
- EDUTIC
- Rosario Technological Pole
- ADVA
- IT Pole Buenos Aires

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CHAPTER V - RESEARCH AND DEVELOPMENT

5.1 INTRODUCTION

Research and development activities are key for the growth of a technology-based sector such as SITS and ICTs, in general. Basic and applied research as well as technology and development are equally important at the time of thinking about a growth program. It is, however, necessary to define profiles and policies that will lead to the prioritization of activities in view of the needs, current and potential capabilities and the opportunities envisaged in our country. In this sense, the vision and the model of development for the sector work as a reference framework to design the general guidelines and schedule the steps to be taken in the field of research and development.

The general definitions introduced in the development model proposed strongly emphasize the fact that R & D activities must be basically geared towards promoting innovation and the insertion of IT technologies in the dynamic segments of the national economy and in specific ICT areas, in which conditions are ripe for the appropriation and development of semi-mature technologies that might become competitive advantages in the medium term and eventually be converted or be part of exportable products and services. This vision that could be described as niche-oriented, sets a pretty accurate reference framework to outline a general R & D program for the next few years. This does not exclude at all the support to basic research or the development of projects in "top-of-the-line" technologies. It merely encourages setting general priorities for the promotion of special technological target-oriented segments and projects.

The creation of Innovation and Productivity Networks, proposed in the development model and described in the document on Human Resources Training, intends to put into actions the ideas described above. In fact, the prioritization of projects and initiatives established in those networks defines how to allocate resources with the purpose of strengthening certain application or topical areas that are considered strategic and, in doing so, to have increasingly clear specialization profiles for the SITS sector in Argentina. In turn, those networks shall try to solve the key problems described in previous studies on the sector and in discussions and documents of the SITS Forum: the shortcomings in human resource training for the growth of the sector and the very low interaction between businessmen, academia and the State. This issue, that is, the rebuilding of the so-called "Sabato`s triangle" is crucial if one intends to define the objectives and the instruments necessary in R & D; concerning this issue the following is suggested:

GENERAL VISION: To produce a general cultural change among scientists, technologists, businessmen and policy-makers to move from the science and technology lineal development model to the non-lineal one. The motto to be coined should be: "technology push and demand pull".

On the basis of this vision, we herein present the most concerning issues for the sector's three main players and we also outline a number of objectives and the actions that should be taken to address those issues.

5.2 PROBLEMS

General/ Structural

Absence of public policies for decades to promote R&D in IT

No definition of priorities and guidelines for R & D in line with the needs of the industry and society

Low public and private investment in R & D

No structures or practical instruments for the interaction between players

Scientific/Academic sector

Reduced number of R & D groups in Universities and, if any, in general very week, except for a few.

Low interaction between the R & D sector and the private sector. Very low transfer of results and technology.

Very few PhDs and researchers and extremely week post-graduate programs that are still at a very early stage.

Shortage of basic infrastructure for research purposes (computation equipment, networks, libraries, buildings, etc)

Extremely low wages compared with those offered in the professional market.

Low interaction with other scientific and technological disciplines.

Low interaction with international excellence centers.

Private sector

Very week research efforts, if any.

Inadequate incentives for the development of innovations and major technology-based content activities.

Development of "non-socialized" technological innovations

Hardly any interaction with R & D centers.

Public sector

Very week research efforts, if any.

Relatively complex "non-socialized" development activities (especially the national public sector).

Hardly any interaction with R & D centers.

5.3 OBJECTIVES

Objectives/Actions

A significant number of the actions to be implemented are related to the integration of public and private R & D groups in the Innovation Networks mentioned above. Within the context of these networks, at least at an early stage of their maturity process (3 to 5 years) there will be technological development and research activities carried out, predictably with low activity in the area of basic and applied research. However, it is indispensable to encourage this kind of activities in the medium and long terms, both for the well-known reasons relative to the construction and consolidation of a sound scientific, technological and education system, and for the specific needs inherent to the maturity and growth of the networks and the ICT sector in particular. As developments and applications reach higher degrees of complexity, the transfer of the results obtained through basic and applied research will be fundamental.
In this sense, the strategic role to be played by CONICET and the FONCYT and ANPCYT programs are worthwhile mentioning, since they can drive the growth in qualitative and quantitative terms of world-class research staff, the development of basic and applied R & D programs and projects, the training of PhDs and international cooperation. These strategic aspects should be in line with the long-term needs in the application and thematic areas, foreseeing the country's future needs relative to the specialization profiles that are defined with increasing accuracy and the general course that technologies take worldwide.
The actions suggested are the following:

- To implement a dynamic strategy whereby R&D projects shall be promoted in the application areas mentioned in the document on Human Resources Training. These activities shall be carried out basically within the context of the Innovation Networks. However, other proposals and projects shall be considered for support through the regular SeCyt, CONICET mechanisms.

- To define "key" scientific and technological areas in computer science and engineering and carry out regular evaluations thereof; in the document on Human Resource Training a group –still temporary-of potential areas is mentioned. At the same time, a significant portion of the activities shall be carried out within the context of the Innovation Networks; yet another, no less significant portion, shall be carried out outside of the networks, at least at the beginning. The basic and applied research activities on these topics and related topics must be actively supported through traditional development mechanisms. A key aspect, related to this type of activities and that makes them indispensable in the medium and long term, is the possibility of progressively identifying a subset of these technologies in which our country has reached such a mature stage as to be poised to make a "technological leap" forward.

- **Technology Foresights:** Our country doe not have significant experience in this field, unlike Japan, France ("100 key technologies"), the UK (Foresight), etc. It is of outmost importance to move forward in this field and with a practical mind frame, along the lines of the French project: the technologies that are of interest are precisely those "…in which social and economic impacts are discernible and from which the actions of the industry and society can contribute results in the short and long terms". The time horizon is 10 years.

The SeCyt has set up a Technology Observatory with a section especially devoted to ICTs, and it is necessary to see if the orientation adopted matches the goals set.

Some general recommendations that will boost the effectiveness of the measures proposed:

- To progressively focus topics and objectives in more dynamic and consolidated areas.

- To follow up and assess the performance of work groups to survey qualifications, levels, etc.

- To aggressively strengthen post-graduate courses, especially PhDs, thus encouraging thesis writing in key areas and technologies. (See HHRR program for further details) To encourage the repatriation of Argentine researchers and the establishment of strong relations with those who have settled abroad.

- To aggressively promote international cooperation in R & D lines (See HHRR program for further details)

ACTIONS TO ESTABLISH LINKS BETWEEN THE SCIENTIFIC-ACADEMIC SECTOR AND THE INDUSTRY:

For the short term (1 Year):

Together with the establishment of Innovation Networks we recommend:

- Developing SME-oriented promotion, dissemination and training actions in order to expand the response to calls placed for ANR (non-reimbursable contributions)

- Undertaking joint actions with Technological Units under the umbrella of the SETCIP to play a more significant role in the promotion of calls placed by ANPCYT. This scheme should contemplate the implementation of especially targeted incentives.

For the medium term (3 years):

- To call for the presentation of projects more specifically oriented to developing innovative products and IT solutions. Calls should be oriented to solving well-defined problems that could serve as the basis for future business developments. These calls should be supplemented with the activities carried out by the Innovation Networks and those performed under the umbrella of the FONCYT for defined application areas.

Instruments

- **Innovation and Productivity Networks.** Their description is found in the Document of the HHRR Training Group

- The ANCYPT instruments (FONCYT, FONTAR) and the PAV (Vacant Area) program for IT are inadequate. From the methodological point of view their structures, selection and follow-up mechanisms are correct, but it is necessary to gradually align their objectives and content with the strategy and actions suggested for the SITS sector. In particular, for the case of FONTAR, it is advisable to modify some criteria or create new tools for innovators and SMEs.

- The SeCyt`s ICT program is, overall, in line with the vision and the development model suggested by the SITS Forum. It is necessary to reach consensus and prioritize objectives and actions for it to become a basic tool for the success of the Strategic Plan of the SITS sector.

- CONICET fulfills its role as enabler of acceptable basic research, in particular concerning the scientific quality requirements to be met; its value is strategic more than anything else in the attainment of medium and long-term objectives. In this sense, the quantitative and qualitative growth of research staff and interns should be encouraged in IT, Electronics and other ICT related disciplines, as well as the promotion of fundamental and applied research lines in relation to the thematic areas selected by the SITS Forum and most advanced international trends

5.4 ACTIONS

5.4.1 Creation of an innovation network for the Agribusiness
5.4.2 Creation of an IT security innovation network
5.4.3 Promotion of specific lines of finance for the innovation in R & D in SITS companies
5.4.4 Foster the creation of an Observatory in charge of identifying future technological capabilities

Contributions received for the Research and Development Thematic Focal Point (see Chapter I – Training of Human Resources)

CHAPTER VI - FINANCE AND INVESTMENT*

6.1 INTRODUCTION

One of the most characteristic and original features of the Software and IT Services (SITS) industry is how fast new and small enterprises arise to fill specific business niches and meet technological needs. A phenomenon that makes innovative ideas and solutions spread as start-ups.

In this sense, many countries have decided to set special regulatory frameworks to promptly cater for the growth of this sector with a truly promotion-oriented philosophy. Incentives range from the supply of facilities for the creation of new businesses, such as risk investment, intellectual property-related issues, mobility of the labor force, the role of the State, to the introduction of flexibility in business transactions.

Apart from passing legislation, most of the countries that prepared the field early on to stimulate the SITS sector's growth and competitiveness also tried to facilitate access to funding. An example would be the setting of partnerships between industrial investors and professionals such as the Israeli Yozma funds, the partnerships established between the Taiwanese IT sector and Silicon Valley in the USA, etc.

World Bank analyst Nagy Hanna states that: "the **transnational** software startup is a sophisticated arrangement, pioneered by Israeli and Taiwanese high-tech entrepreneurs and financiers, which involves forming an international startup business from resources located in several countries, with facilities located in the globally optimal locations. For example, suppose an Irish software R&D lab invents a LAN security algorithm. They might partner with a Singaporean device manufacturer to design and build a portable LAN security-testing device. They might get financing in both Singapore and New York, then move their headquarters to Washington, D.C., their first regional target."

Another feature of SITS companies is that their products are intangible and their value is highly variable depending on the context, to a large extent. That is the reason why the development of IT programs and solutions has been seen as a risk and that is why in development countries there has been a low participation of investment capital from more conservative financial sectors.

Under these conditions, a true and decisive Sate policy has resolved these problems in various forms. Some national Strategic Plans were aimed at raising capital from multinationals, rather than at mobilizing local capital. Mostly companies without a domestic market adequately developed to attract foreign firms preferred this mode of action.

Examples: IBM was attracted to Taiwan by a local institution supported by the government. The Irish State worked hard to attract investments from outside

* This report shall be submitted on the basis of the contribution made by CESSI.

the country that finally created 7,000 software-related jobs, and Hungarians set out to suspending or reducing tax payments and rates to benefit those that set up joint ventures with local firms.

Brazil, instead, is an example of the implementation of a public policy to benefit the local economy in the long run, stimulating local capital raising. To this end, the national bank gave a push to the SITS industry with significant investments, despite their intangibility.

India, on its part, used national financial institutions to channel millions of dollars provided by Western lending institutions. The money raised was mostly used as equity and working capital to give financial support to small companies. In Ireland, apart from the association of companies from different countries local capital was stimulated by means of loans and subsidies.

"The Ministry of Trade and Industry recommends the Nation and its agencies to strengthen the Software sector by means of an Industrial Promotion program for domestic and foreign projects, the creation of venture capitals to help the startups, assistance in marketing-related issues, encouragement of SITS demand through the clear intervention of the public sector in education an in other related areas, dissemination of the advantages that computing has for society and promotion of the identification of new market applications." (1986)

Both the Israelis and the Taiwanese chose to reduce taxes to national firms showing some kind of commitment to the development of IT products and services

Geographically closer, Uruguay (through Executive Orders No. 386 and 387 passed in the year 2000) decided to award a number of tax exemptions and rebates to technology service exports in segments such as the VAT. Prior to that, and through Executive Order No. 84/999 dated March 1999, franchises had been approved " to stimulate software product competitiveness", and the following year it decided to exempt "income resulting from the manufacturing of logic supports" from paying the Industrial and Trade Income Tax (ITIT). "Such exemption will be in force for the fiscal year ended as of January 1, 2001 and up until December 31, 2004."

On the other hand, the Investment Law (Nº 16-906) declared the promotion and protection of investments made by national and foreign capital within the territory of Uruguay to be of national interest and it stated that "the admission and treatment of investments made by foreign investors shall be equal to the one afforded to nationals". The same law exempted the payment of Equity Tax on fixed assets, Value Added Tax and Excise Tax on the imported goods necessary for the production of the sector and the reimbursement of the Value Added Tax incurred into in the purchase thereof in the domestic market.

Other exemptions were the payment of Equity Tax and the establishment of an accelerated depreciation system for Industry and Trade Income Tax purposes. The legislation also entitled the Executive to reduce by up to three points the

rate of employer's contribution to social security for the manufacturing industry. To enjoy those benefits, the Uruguayan legislation provides that investments should be aimed at improving competitiveness, facilitate the increase and diversification of exports, especially those incorporating more national value added, generate productive employment directly or indirectly, facilitate productive integration by adding value along the production chain, encourage micro, small and medium-sized enterprises to perform activities -given their effective capacity of technological innovation and of generation of productive employment-, and contribute to geographic decentralization, with a significant use of local labor and inputs.

With regard to Venture Capital, Brazil, Singapore and Greece represent some successful cases concerning the support of this core area to fund the SITS sector.

- Brazil: The Brazilian government resorts to BNDES, the Brazilian Economic and Social Development Bank, and to BNDESPar, its investment branch, to help solve capital shortage problems. In meetings held for a similar study in which Brazilian IT company executives were interviewed, they mentioned the BNDES as one of the most useful programs implemented by the Brazilian government. The industry representatives requested that more similar programs be available. For the four industries, the government earmarked 550 million reales (USD 189 million), mainly through the government investment branch called Finep, as well as 14,5 billion reales in funds from the national development bank BNDES. EIBNDES renamed its current software support scheme, Prosoft, as Program for the Development of the National Software Industry and Related Services. The unit has been expanded until July 2007 and financing will target three categories: national software companies, national software purchasers and export projects.

- Greece: Section 28 of Law 2843/2000 established the New Fund for the Development of the New Economy. The aim of the Fund, which amounts to 450 million Euros, is to financially support venture capital companies and fund early stage ventures as well as prototype development. For the achievement of this aim the fund shall be subsidized by the state's budget, by privatization income and by the sale of other assets or the transfer of rights. It is too early to assess its success, but the objectives are admirable.

- Singapore: Singapore has since 1999 striven to create conditions that will stimulate and support high-tech enterprises, or technopreneurship. This development of entrepreneurial high-tech businesses is a key component of Singapore's economic strategy in the 21st century. The aim is to develop new economic activities and new markets that can supplement Singapore's role as a manufacturing base for multinational corporations and as a services hub for the region. The broad thrust of what must be done to ensure the technology sector flourishes is outlined in Technopreneurship 21, or T21. Meanwhile, a range of programs help small companies get onto the fast track of high-tech enterprise. Technopreneurship 21, or T21, spells out what must be done if Singapore's technology sector is to flourish. Four key

areas have been identified for special attention: Education, Facilities, Regulations, and Financing.

6.2 NATIONAL CONTEXT

6.2.1 State programs

With regard to R & D, State financing is of special importance for basic research. The new scientific advances may raise ideas or lead to innovative research work on the part of Universities, and the development of practical applications by the private sector. Despite the fact that society is usually the final recipient of the benefits of basic research in the long term in the form of new products and technologies, in the short term this type of research is too general to be accounted for as to convince shareholders, and too costly to be sustained from a financial point of view. Although companies increasingly incur into research and development expenses, there are some basic areas of scientific development that only the State (and Universities) can support:

a) R & D programs funded by the Argentine government. There are programs to fun research and development carried out by universities and specific agencies devoted to these activities; such is the case of the National Council of Scientific and Technical Research (CONICET). Recently, CONICET declared IT a specific and independent research area.
b) The Science and Technology Secretariat (SECyT) suggested that the subsidies/scholarships for research in IT should be awarded not only for the research carried out by CONICET but also by universities (public and private) and other research groups. The SECyT also has programs to fund research and development activities through FONTAR and FONCYT
c) A fund was created to provide financing to companies and public and private institutions so as to promote technological innovation and modernization. Such fund, the FONTAR, finances three different categories of projects:
    - Technological Development: New products, devices, materials, processes and services (credits, tax incentives and subsidies)
    - Technological streamlining: Improvement of products and processes. Training of staff and quality certification (credits and tax incentives).
    - Technological services: Strengthening of the supply of public and private technological services, promoting the improvement and installation of highly qualified services. Expenses on infrastructure, equipment and training are also catered for.

Besides, FONTAR also contemplates the provision of financial aid for training, technical assistance and Technology Consulting programs.

6.2.2 Strengths, Weaknesses, Opportunities and Threats

The Argentine position is good compared to other countries in the region with regard to its capital raising capacity, depending on a combination of factors that facilitate the access to capital or not, namely:

- The size, labor relations and banking finance availability of a country in particular.
- The evolution of shares, bonds and the level of maturity of capital markets
- Investment portfolios and direct foreign investment flows
- Macroeconomic and institutional contexts and the rating of the sovereign debt.

All of the above requires that the Argentine debt problem be resolved so that industrial growth can take off, domestic consumption recover and exports increase.

With a stronger State Policy in the R & D area, Argentina has some measures at an early stage that will allow it to significantly improve its capacity to finance R & D in the areas of Software and IT Services.

Recently, CONICET declared IT a specific and independent research area. Besides, a Commission was set up to assess and promote the research and development activities in this field. This formal acknowledgment will provide engineers and mathematicians with a more specific environment to develop new ideas and technologies. By declaring IT an independent research and development category, there arises a whole new series of opportunities through dedicated funds for new projects, assessment of activities and projects by peer groups, funds for scholarships, subsidies for research fellows, among others.

But there are more micro and macroeconomic aspects for the country as a whole that bring a negative impact on the forecasts of growth and expansion of the SITS industry, namely:

- Inadequate legal infrastructure for the development of Venture Capital companies.
- No Credit as an engine for growth
- Inadequate legal, tax and financial understanding of the scope and use of intangible goods.
- Shortage of reassurance mechanisms or guarantees to obtain loans in the private sector, at reasonable rates.
- Low level of direct foreign investment

6.3 OBJECTIVES

It is of public domain that there is a credit crunch, and an unmet demand of financial instruments; so, it is possible to think that the State may target its actions to develop the sector indirectly.

Firstly, by engaging in generating and/or fexibilizing stock exchange instruments and the regulations in force for capital markets, by generating a new genuine source of funding for the sector, as happens with most central countries. This is especially valid for software and IT services, where companies` own fixed assets are usually very low, and their products intangible, due to which it is more difficult to get financing.

Likewise, by using its capacity to attract and raise venture capital funds for technology projects, it would be expanding the availability of reinsurance or collateral mechanisms.

Moreover, the State should devise an incentive plan for the technification of Small and Medium-Sized Enterprises (SMEs). It is necessary to take into account here that such a course of action, apart from contemplating the provision of credits and funding for the purchase of components, should also include a genuine policy for training and re-training people on the importance of these technologies in today's world.

Steps should be taken for technification to become the driving force for the growth of exports and/or the development of companies from different sectors. Those companies that build added value and more technification into their products should be the first to enjoy the benefit of export promotion programs, because their exports shall endure in time, even if macro-economic variables becomes less competitive than today's.

The conceptual axes of the strategic plan with regard to SITS financing are the following:

6.3.1 Access and Development of Capital Markets

To access and develop capital markets it is necessary:

a) To deregulate capital markets and unblock venture capital financing. "Venture capital plays a major role because it bridges the financial gap existing in the case of innovative projects carried out by new enterprises and its also provides new businesses with management expertise".
b) To have seed capital available. And bear in mind that, like government-driven research and development, investments should be encouraged regardless of the type of technology in question.
c) To permit the use of stock options which may facilitate the entry of companies, since they are a way for new companies to attract, retain and motivate their employees, especially at initial stages, when the viability of those firms is uncertain and when they lack tangible assets to offer as a collateral. To go public and sell stock is another way to raise capital on one's own.
d) To facilitate access to venture capital in Argentina. One way to do this would be by enforcing tax incentives. Although not a definite indicator, it is useful to analyze the Irish case. One of the principal causes of the growth recorded in Ireland by the software industry has been its tax

policy. In Ireland, all manufacturing and service industries doing business internationally are levied a special tax rate of 10% (that will be upped to 12.5% pursuant to the new agreement entered into with the EU). The evidence of the benefits brought by the reduction in the tax rate can be found in the gross capital formation. In 2000, direct foreign investment (DFI) accounted for [sic] 85.4% of gross capital formation in Ireland. As a comparison, in Argentina direct foreign investment accounted for 25.7% of gross capital formation in the same year (the last year for which World Bank figures are available).

e) To create instruments that guarantee the participation of institutional investors, through the existing scheme of Reciprocal Guarantee Companies, Trust Funds and Financial Trusts. The implementation mechanisms should be revised for institutional investors to really have access to these instruments.
f) To facilitate the access to Existing Capital by strengthening and tailoring the current provisional scheme for Private Pension Funds (AFJP) to be applied more easily to productive investments.

6.3.2 Research and Development Funds

- To make management more efficient to ensure that the maximum possible funds reach productive and applied technology projects. To this end, we recommend:

    a) To support projects and activities conducive to generating new scientific and technological know-how – both in basic and applied thematic areas- carried out by researchers that belong to non-profit public and private institutions settled in the country.
    b) To improve evaluation processes in the case of public calls by following procedures put in place to ensure transparency, quality and relevance of the projects to be funded.
    c) To work with companies requesting grants, because more often than not they do not know how to draft a business proposal or correctly fill out the forms.
    d) To help the industry market the research work, once the project is ready and the funds used for research and development purposes earmarked. In this case, communication shall be improved between the industry, the government and lending institutions.

- To prioritize allocation of funds. Public calls for FONCYT and FONTAR projects exclusively aimed at five large areas: Edutainment, Agribusiness, Industrial IT, Medicine and health, and e-government

- To expand the fiscal credit and technology consultancy framework to accommodate the development and adoption of ICTs in any one of the

previously mentioned areas. The funds may be limited at the beginning but they will grow depending on the characteristics of previous calls. If this process is approached with synergy, the terms and conditions of the public calls can become more specific and accurate as more professionals and technicians join the projects.

- Financing and private lending. To overhaul the financial system as a whole and its regulatory framework, the following should be addressed:

    - Adjustment of SMEs Classification in financial system rules regarding the provision required for the credit lines earmarked to this segment of the economy.

    - Flexibilization of specific regulations to allow for interest rate reductions

6.3.3 Legal and Tax Update

In a nutshell:

- An attempt should be made to Reduce Legal Costs. The venture capital industry needs flexible organizational models. In this sense, Argentina has a long way to go.
- There should be a modification of all those legal and tax clauses that block the investment of private capital in risk projects and the shortage of funds should be addressed in those cases in which the access to finance represents a major hindrance for business.
- Generate Tax Incentives. There are several fronts here, such as the already mentioned Software Industry Promotion bill and the tax incentive scheme governing the operations of Reciprocal Guarantee Companies, among others.
- To reduce the tax burden imposed on SMEs of the sector, especially during the worst two years of the crisis.

6.4 ACTIONS

1. PROMOTION OF SPECIFIC LINES OF FINANCE FOR INNOVATION AND R & D IN SOFTWARE AND IT SERVICE COMPANIES

2. SPECIFIC CALLS FOR COMPANIES OF THE SECTOR FOR THE PROMOTION OF PROGRAMS OF NATIONAL AND PROVINCIAL ORGANIZATIONS

3. CREATION OF CREDIT LINES TO FINANCE *SITS* DEMAND

4. CREATION OF CREDIT LINES FOR THE COMPANIES OF THE SECTOR

5. CREATION OF A WORK TEAM TO PROMOTE, IDENTIFY AND CAPTURE DIRECT FOREIGN INVESTMENT AND CREATE STRATEGIC ALLIANCES

6. CREATION OF A TRUST FUND WITH PRIVATE AND STATE CONTRIBUTIONS

7. APPROVAL OF THE LAW ON VENTURE CAPITAL FOR TECHNOLOGY-BASED COMPANIES AND ITS REGULATORY FRAMEWORK

Contributions received for the Finance Thematic Focal Point

Title: Contribution of the CESSI Financing Commission
Author: CESSI

CHAPTER VII - QUALITY

7.1 INTRODUCTION. What is it about?

Although only some experts talk about the generation of a culture of quality, all agree on the fact that the increase in competitiveness has been the main driver behind the dissemination of quality certifications.

But there are another two basic reasons that account for the huge spreading of certifications all over the world: the need to grant additional assurance to customers of our products and services to differentiate them from our competitors´.

Argentina is not immune to this global movement, and if it is to become a major player of the Software and Information Technology Services (SITS) industry it must bear in mind that it is indispensable to reinforce and even create, if necessary, a strong Culture of Quality with regard to products themselves and to the processes in place to bring them to the market.

In this sense, one of the purposes of this Strategic Plan is to instill quality features in the various technology players for the sector to position itself in the international market. It is indispensable that Argentina be recognized in the world by the quality of its IT- related products and services.

The mission of the Strategic Plan shall be to define and implement quality features in all the activities related to IT products and services, geared towards setting minimum performance standards to enable the insertion of local companies in the global markets; and that these minimum performance standards be transformed into minimum requirements for the sector.

7.1.1 Some conceptual definitions

The industrial sector was the first to see the earliest reference standards for certification purposes. This sector (together with the construction and trade sectors) is the one with the highest number of quality certificates. However, currently, certification practices have pervaded all productive and service sectors –no matter the size of the company, or government agency, or activity sector.

Certification programs -administered by an independent third party- include on-going testing and quality assurance audits of products, processes, services, people or management systems to determine that they are in conformity with the standards or technical specifications.
This certification comes after the implementation of quality management systems, which, by optimizing processes and dedicated resources, are translated into cost and time savings. By certifying these systems, it is explicitly

stated that the company is in keeping with certain quality standards, which confers prestige among consumers and competitors.

The standards are developed by Technical Standardization Committees, where all parties interested in the product, service or process are represented: manufacturers, consumers and users, the State, the scientific community. Thus, the standard, which is approved by consensus of all stakeholders, determines the technical quality characteristics that a product, service or process should have for it to be awarded the certification in keeping with that standard.

There are hundreds of different quality certifications, and reference standards. However, a classification may be established based on the object of the certification: companies, products, services, processes, people, and management models. It is important to make clear that each certification is only valid for the object for which it is awarded; that is, if a product or service is quality certified, that does not imply that the company manufacturing that product or rendering that service is also certified. When the management system is certified, it does not mean that all products and services coming from that organization are also certified.

The following are some of the advantages offered by being up to Quality Standards on the part of companies and public agencies:

- **Cost reduction**. This is due to the fact that by enforcing quality standards resources are optimized and errors and duplications of efforts are reduced.
- **Differentiation vis-à-vis the competition**. The company becomes more prestigious, reinforces its image and more markets are opened to it.
- **Better company management and organization**. More competitiveness.

7.1.2 Present quality map

Principal Standards:

Currently the principal quality standards implemented worldwide are the 9000 family of the International Organization for Standardization (ISO), the SEI-CMM Model (Capability Maturity Model) and the P-CMM (People Capability Maturity Model).

a) **ISO Standards**. They are of European origin and the most widely disseminated model is the ISO 9000 that is a "generic management system standard". "Generic" means that the same standards can be applied to any organization, large or small, whatever its product. It consists of five documents, three about quality assurance models and two guideline documents called ISO 9000 and ISO 9004.

b) **CMM,** designed by the Software Engineering Institute (SEI) founded in 1984 in Carnegie Mellon University, Pittsburgh (USA), defines the characteristics of a mature, capable process. It identifies the practices that are basic to implementing effective processes and addresses advanced practices. It also assigns to associated practices five maturity levels ranging from unrepeatable to mature. Typically a path through the various practices is recommended for achieving higher levels of maturity and improving an organization's processes. The SEI is a federally funded research and development center sponsored by the U.S. Department of Defense, which created it to improve the software-related products that the Department outsourced. The products it got from external vendors showed serious flaws and development projects; they were always behind schedule and exceeded estimated costs. CMM has become a quality reference of choice for the software industry. The implementation of CMM helps an organization in achieving improved quality of the products, processes and systems, improvement in productivity, and reduced cycle time for projects. This official evaluation is highly coveted in the United Sates and other developed countries, to such an extent that in the USA government and defense agencies do not hire software vendors with less than CMM Level 3.

c) **People Capability Maturity Model (P-CMM).** This is an organizational change model designed on the premise that improved workforce practices will not survive unless an organization's behavior changes to support them. It was developed to guide systems and software organizations in attracting, motivating, and retaining talented technical staff. The practices in the model help an organization develop the workforce required to execute business strategies, characterize the maturity of workforce practices, set priorities for improving workforce capability, and become an employer of choice. It also has five maturity levels.

d) **The CMMi Model**. The purpose of this model is to provide guidance for improving the organization's processes and the ability to manage the development, acquisition, and maintenance of products and services. CMMi provides a process improvement framework that helps integrate multiple disciplines with the main focus on software and systems engineering.

The IT boom in India, with professionals and products spread all over the world, is based on CMM practices. But beyond the fact that this is one of the certifications with the highest reputation internationally, what should be noted about the Indian case is the existence of company certifications.

Being technology an activity that changes all the time with regard to its developments, requirements, scopes and progress, it is only logical that also

standards certifying its products and processes evolve and change. So, this is not about setting rigid guidelines to select standards on the part of Argentina, standards that should be assessed as the need arises, but about striving for the adoption of a culture of quality in our country, whatever this may be, in accordance with the changes in technology and the markets.

7.1.3 The situation in Latin America

Along the lines of this trend that is widespread in more developed countries, the issue of quality certification is increasingly sensitive, even in Latin America. It is a fact that the number of companies introducing quality assurance methods and standards into their software production processes is on the rise. So, it is easy to forecast a potential market growth of an almost explosive type for the next five years.

At present, the model has been adopted by companies of all types in over 45 countries around the world, and in Latin America there have already been official evaluations reported in Argentina, Brazil, Colombia and Venezuela.

Chile, for example, developed a Project Development Team (PROFO) to improve the operation of a group of companies that are willing to commit themselves to the materialization of a shared project. This allows companies to resolve management and marketing problems that due to their nature or magnitude are better confronted jointly. The purpose is to increase exports for participating companies. To this end, a certification assuring that they are up to an internationally recognized quality standard will surely help. They also intend to streamline their internal processes so as to improve the competitiveness of the companies and meet the needs of more demanding markets; and position the brand image of their products and services with a quality seal and raise the confidence and loyalty of their customers at home.

Another example is Mexico. When the country decided to put together an integral Digital Development Plan, it concluded that its advanced software development processes were less productive than desired, that the absence of certification prevented them from entering international markets; they also detected a low number of local entities with quality certified software processes, which resulted into high certification costs if they were to retain the services of international firms for such purpose. Therefore, initiatives were implemented to support training in quality processes and facilitate certification, among other steps.

At the same time, the Center for Engineering Software Excellence of Venezuela (CEIsoft) was created with the objective of providing training, professional certification and education. Research and development projects by local companies and universities are crucial to bridge the digital divide. So, this initiative undertaken by public and private

institutions sharing the vision that the software industry is strategic for the country due to the fact that it “can contribute significantly to generate wealth, social welfare, public and private modernization, improvement in education, services, better quality of life and human development”.

The institution set out to training human resources in the industrial process of software development, to diagnosing and certifying software development processes and also to educating demand with regard to software quality. To ensure that these activities be geared towards the development of world-class standards of living, the CEIsoft entered into an agreement with the European Software Institute (ESI) which mission is to contribute to the development of the Information Society and increase software industry competitiveness for its member states.

Brazil, one of the best positioned countries in South America with regard to certified entities in the SITS industry, launched in 1993 the Subcommittee of Software Quality and Productivity – SSQP/SW, aimed at reaching international standards on quality and productivity in the software sector. This Subcommittee seeks to promote a continuous improvement effort to achieve customer satisfaction, the improvement of the work environment for employees in the software industry and, in the country as a whole, to increase business competitiveness of the Brazilian software sector. Before that, in 1990, the Brazilian Board of Quality and Productivity – PBQP- was created by the Federal Government to help the effort of industry modernization through the Quality and Productivity promotion, seeking to meet international standards and to increase the competitiveness of goods and services manufactured in Brazil. SOFTEX 2000 was another program launched as "a decisive contribution for a change in focus of the Brazilian information technology industry from hardware to software, from the domestic market to the international market, and from the production and distribution on a small scale to a large scale.”

In summary, and according to the figures provided by SEI, the number of evaluations carried out during 2003 worldwide was 200 in the case of the CMMi Model (43 for every 100 were organizations outside the USA), while those evaluated by CMM amounted to 1,593.

It is important to note that the five leading countries in software exports have a total of 2,275 CMM-certified companies (at different levels). India, for example, third in the ranking of international SITS trade, had in March 2003 a total of 46 CMM Level 5 companies, the maximum possible level for that standard.

For most Latin American countries the number of firms and bodies is, on average, inferior to 10, while Brazil, Mexico and Chile have 23, 22 and 13 companies, respectively. In Argentina, as of June 2004, nine companies had that certification.

7.1.4 Comparison between CMM and ISO Standards

While the ISO 9001 standard is more focused on the client-vendor relationship, with the purpose of reducing the risk inherent in hiring software vendors; CMM is more focused on defining the characteristics of the company's development process.

- ISO 9001 covers various aspects such as hardware, software, material, services, documents, customer post-sale service, and other aspects unrelated to the development process per se, while CMM only involves the customer during the requirements specification phase, being limited to the production process in a more specific and effective manner.

- ISO 9001 is a very general standard since it was conceived for companies from all sectors, and it is not as detailed as CMM. The CMM model was born for the specific purpose of evaluating software product development, being in itself a very thorough tool.

- CMM starts a continuous improvement process and encourages the organization to progress to superior levels, while ISO 9001 does the same but more timidly and, in practice, companies only strive to maintain the certification.

- The SEI is discontinuing CMM Software and recommends migrating to CMMi.

7.1.5. The CMM Standard and its Application Worldwide

Assessments during 2003

	Number of organizations assessed	Levels reached	Outside of the USA
CMMi	200	2 – 35% , 3 - 21%	43%
SW-CMM	1593	2 - 43% , 3 - 27%	57%

- 51% of CMM Maturity Level 2 assessments are SMEs with less than 100 employees
- The average time to progress from the initial level to a CMM Maturity Level 2 is 24 months, and from CMM Level 2 to CMM Level 3 is 20 months.

(Source: SEI)

Leading Exporting Countries

	CMMi	SW-CMM
USA	134	1838
Canada	n/d	67
India	5	330
Ireland	n/d	< 10
Israel	n/d	30

(Source: SEI)

Example of a country that based its market access strategy on quality: India

SEI Quality Assessment	N° of Companies by 31st March, 2003
SEI CMMi	5
SEI CMM Level 5	46
SEI CMM Level 4	38
SEI CMM Level 3	34
SEI CMM Level 2	16
PCMM Level 5	2
PCMM Level 4	2
PCMM Level 3	6
PCMM Level 2	12

(Source: Nasscom)

7.1.6 CMM-Certified Companies in Latin America

	CMMI	SW-CMM
Argentina	1	< 10
Brazil		23
Chile	1	12
Colombia	1	< 10
Costa Rica		< 10
Mexico		22
Uruguay		< 10
Venezuela		< 10
Peru		< 10

(Source: SEI)

7.2 PROBLEMS. Where do we stand?

7.2.1 The Argentine outlook

Up until the year 2003, the only CMM certified companies were multinationals such as Motorola or IBM. As from the year 2004, there have appeared some relevant initiatives for SMEs in Cordoba and Tandil, conducive to the CMM certification. Thus, through an agreement between the Rosario Technological Pole and IRAM, there are two companies that have already been CMM certified: SUASOR and COA; another 6 companies in Rosario have a defined assessment date. IRAM is already working on an area that is specifically software quality oriented.

In Argentina there is no institution that takes care of all software quality aspects ranging from the certification of standards up to the testing of products. In this sense, the Rosario Technological Pole is working on the IT Quality Center project where consultancy and testing support shall be provided.

7.2.2 The SWOT matrix summary

Strengthens

- Well-trained and up-dated professional resources. High percentage of university professionals
- Initial awareness about quality standards

- Rising number of companies with international certifications

Weaknesses

- No updated university curricula
- High costs for the implementation of projects aimed at improving standards of living
- Most of the companies are SMEs
- ICT company management is not accustomed to planning for the medium and long term
- Excessive financing red-tape

Opportunities

- Exporting possibilities thanks to the advantage provided by the exchange rate
- Good infrastructure base installed in the country that is not 100% utilized right now
- Good local economic period that improves the capacity and willingness to invest in software companies

Threats

- To be late for the incorporation of quality standards compared with other countries
- To stick to a model that is changing all the time

On the other hand, it is necessary to bear in mind that despite the advantages of the certification and of applying the procedures established by the standards, some companies –especially small and medium-sized companies- are reluctant to be assessed, since these processes demand a great effort and entail some difficulties.

- A large economic investment, to which we should add maintenance costs, tests on products, and other related costs such as training costs.
- Internal reorganization of the company: certification sometimes requires a “change of culture in the company” and overcoming many organizational difficulties.

7.2.3 Creation of a quality process for everybody

One of the proposals received within the framework of the SITS Forum stated that, being the SITS industry a “producer of quality solutions and high

intellectual value added", one of the objectives should be the creation of the conditions necessary to assure its long-term growth and international competitiveness, for it to occupy a leading position in Latin American and the world. Likewise, it is advised that there should be no discussion as to which world-class standards should be adopted by the SITS industry, because this should be up to each company, be it from the supply or the demand side. It is taken for granted that it is an indispensable condition to ensure the quality of processes, products and services.

To that end, it is advisable to work towards the achievement of a two-fold objective, namely, to facilitate and create the necessary conditions and means for an increasing number of companies to access the extremely costly certification programs, for all those businesses that are aware of the importance thereof and that operate in sectors that so require.

The incorporation of ICTs in SMEs is still considered a costly, remote, unknown, inaccessible undertaking and, therefore, not a priority; however, it is closer than what most people imagine. The training in the use of "applied technologies" to your business processes shall contribute to its demystification, making businessmen aware of how they can become one of the most useful tools for their business.

To achieve the Quality objective, the following directly related basic development strategies should be considered:

- To strengthen the software and local services industry by preparing it to compete in international markets, in the development and assurance of the quality of its products and services.

- To prioritize the domestic market, mainly the SME segment, as the foundations on which to build up knowledge and expertise in quality processes.

- In a second phase, to approach Latin America, in order to gain economy of scale, especially thinking about the SME segment, because we have a better understanding of them.

- On the basis of this well planned and sustained development, to be prepared to reach other more developed markets that without exception demand world-class practices.

- To provide programs for the basic assessment of products, concept tests and pilot programs of service quality assurance.

- To insert companies in world-class chains, developing a learning cycle in design methodologies and quality assurance.

- To do performance benchmarking, by using Best Practices to identify the characteristics that world-class products and services should necessarily have.

The whole undertaking will be successful if the culture of processes assuring quality in keeping with certain standards is inculcated from the very beginning as a way to differentiate the products or services being offered, based on basic attainable requirements, because if, early on, objectives seem to be difficult to achieve given the investment that should be made, very few will be ready to take this path.

It is necessary, then, to design and encourage an efficient centralized assistance effort to coordinate throughout the national territory strategies aimed at raising awareness among companies, both on the side of supply as well as demand, at least in basic quality concepts.

The main challenges to be addressed for the successful digital integration of SME chain values are the following:

- Lack of knowledge among business leaders and managers about the intelligent integration of ICTs into their processes. Given this shortcoming, it is unthinkable that they can set quality evaluation criteria.

- The prolonged learning curve for business leaders and managers in the use of ICTs affects their capacity to determine in the short term their impact at the time of hiring.

- The mistrust of organizations in the effectiveness of new technologies and applications as a means to improve their performance in the short and long terms makes it imperative to avoid frustrations over quality-related technical failures, as in the case of the absence of a manual, technical support, maintenance policies, etc.

- Incapacity on the part of the software industry to influence its customers with regard to the value added to the company by controlled-quality products.

These inhibitors increase emerging technology costs, slow down their adoption, discourage investment in ICTs, and help support a generic SITS industry without volume, or specialization in process innovation for each one of the country's public and private strategic sectors involved in productive activities.

The objective is to offer these leaders, businessmen and/or managers, a minimum base of potential SITS users to at least be able to carry out an assessment, in accordance with their needs, as an option to the impossibility of undertaking a technical assessment to, then, decide on their acquisition.

7.2.4 Product Certification: the regional case

To this end, it is advisable to consider The Instituto de Estudos Econômicos em Software – IEES (Institute of Economic Studies in Software) which is a non-profit society established in 1998. IEES's mission is the production of information about the software market and market research methodologies, aiming to improve the technical capacity and commercialization of software companies. It elaborated two methodologies: Produto OK! And Servicio OK! These methodologies have been especially designed to evaluate software and system packages with an already installed base, which is why this process is not recommended for products that have not yet been implemented. This methodology was fine tuned in time based on the IEES customer satisfaction-oriented standard, which -unlike other more traditional methodologies focused on technical aspects- emphasizes customers` point of view.

Therefore, the methodology consists of the following components:

- Model of contracting and marketing: direct or through distribution channels
- If there is a system of distribution channels and/or sales reps, analyze the evaluation and certification processes involved for the selection and/or recruitment thereof
- Details, characteristics and duration of the warranty
- Maintenance and product update policy
- Geographical coverage and technical support level of service offered
- Minimum technological requirements for the operating platform, database engine, connectivity platform and its development tool,
- To clearly specify the business areas that the solution addresses by market segment, functional areas, technological applications and size of the company.
- To keep record of the implementation. This will be useful to forecast the level of difficulties that customers will face until they see the first results.
- To keep a technical record in order to understand the reliability, usability, portability and interfaces.
- To survey the general opinion of at least 5 to 10 customers, with regard to the services rendered by the company and the usability of the product.
- To annually revalidate customers` satisfaction level, because this adds to the customer service quality in the area of support and maintenance of products and services.

Some of the objectives of this project are aimed at developing a methodology that will allow for reaching various certification levels on the way to the highest possible one, always starting with at least the possibility of being certified at a regional level, then nationally, then, at a Latin American level, to be finally certified internationally.

7.2.5 INTI – European Union Cooperation Agreement

The INTI (the National Institute of Industrial Technology) has entered into a cooperation agreement with the European Union (EU) which scope and objective is to "Improve the efficiency and competitiveness of the Argentine Industry". This agreement comprises eight industrial sectors:

- Timber and its by-products
- Application rocks
- Non metal minerals
- Honey
- Cheese
- Telecommunications
- Microelectronics
- Software

The cooperation agreement shall be in force until the end of the year 2006 and it is based on the contributions of knowledge and equipment by the EU and of other types of equipment, man-hour and constructions by INTI.

The specific objective suggested by the Software sector is: "**To facilitate the access of Argentine Software Companies (ASC) to international trade through the adoption of standards and procedures accepted internationally by the software industry and tested and controlled by Argentine laboratories".** This objective leads to a series of activities to be carried out during this year, with some being extended until the end of the project.

The results for this year are estimated to be the following:

- Identification of potentially exportable products
- Harmonization of Argentine regulations or statutes with international rules and practices working in a coordinated fashion with other private and public organizations that are engaged in software quality promotion in the country, mainly with IRAM.
- To assemble an SPI (Software Process Improvement) laboratory to support Argentine Software Companies.
- To raise the awareness of Argentine Software Companies in the sense that they should improve their production and quality processes if they are to access external market, so that Argentine products become a synonym for high quality.

7.3 OBJECTIVES. Where are we heading for?

7.3.1 General and Specific objectives

Given the international scenario described above, the main Objective of this plan shall be to raise the competitiveness of the Argentine software production sector by introducing minimum performance standards into the production processes. The Specific Objectives can be grouped under four different action areas:

Dissemination
To put the introduction of minimum performance standards and quality standards on the agenda of software producing companies, university academia and the business sector, which will be of basic importance to move on with the program.

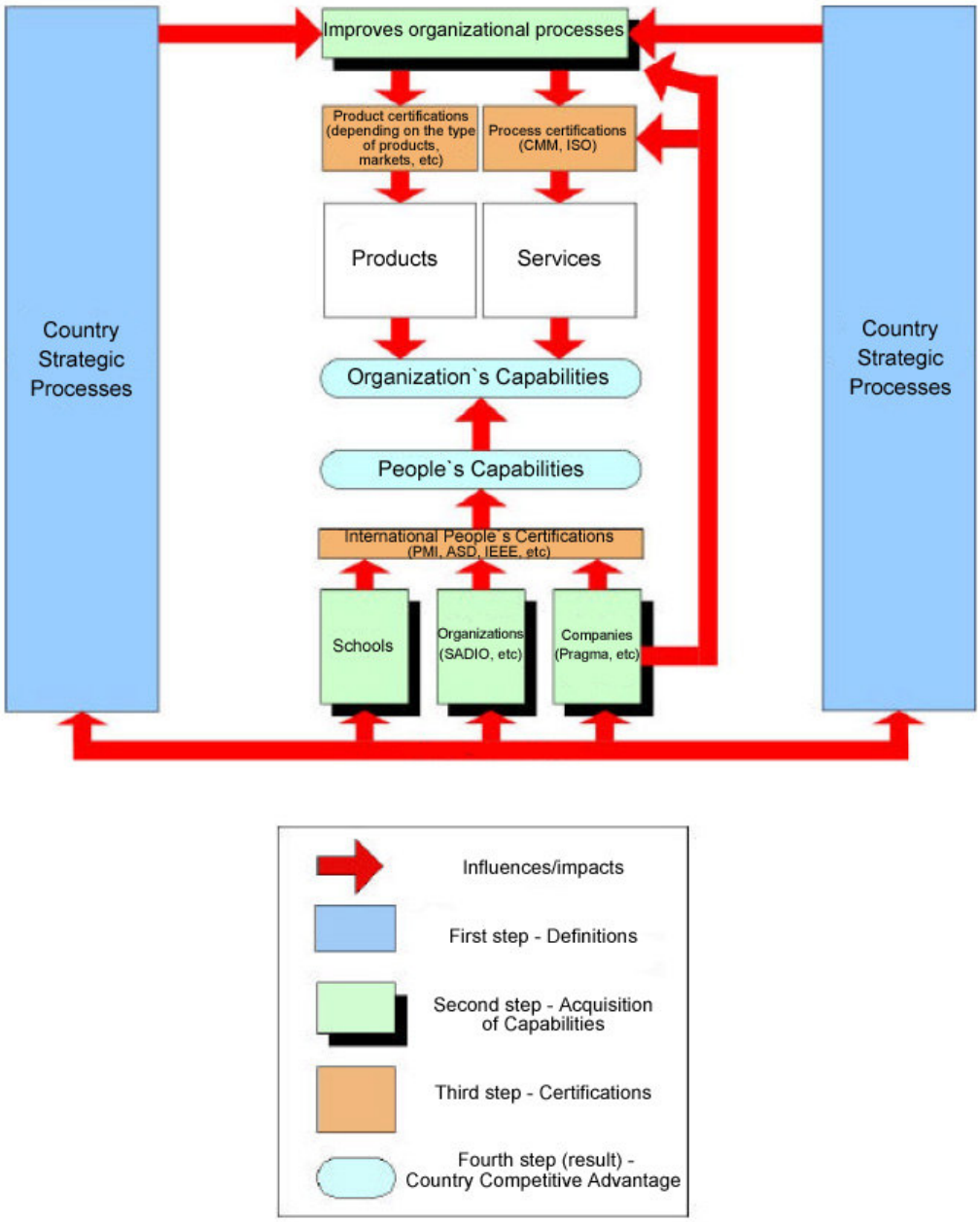
Education
To strengthen human resources training in IT, in order to increase the quantity, skills and diversity of professionals and technicians capable of introducing methodological standards into their daily tasks, in conformity with the requirements of software companies.

Technical support
To the companies that join the program from a technical point of view, in the implementation of international quality systems leading to an increase in competitiveness

Financial support
For companies to introduce improvements to their organizations

7.3.2 Strategic Frame

Below, there follows a chart illustrating the many interrelated aspects to be taken into account if companies are to improve the quality of their potentially marketable products and services.



All these aspects have been divided into stages or steps to be taken sequentially in time, in favor of accurately implementing the improvements to be introduced.

First stage

The purpose of this stage is to define products and processes, and which characteristics and attributes of these products should be streamlined, and up to what extent. This is to say, for example, if the focus is on software management products, parameterization, maintainability and failure tolerance, support, etc are to be considered more in detail. If, instead, the focus is on imbedded systems, the emphasis should be placed on performance; if we take into account the systems to support processes that entail a risk to life, then security and failure-proofness shall be the features to consider. This will give us a clear idea of how much to invest in quality, for each area to be addressed. We believe that the plan should not concentrate on a singly area; nor should it comprise the areas on which Argentine companies do not have any possibility whatsoever to compete. In summary, it is necessary to determine:

- Areas to be comprised
- Quality attributes of those areas

Then, the minimum processes to be expected of a company for software development and maintenance purposes should be defined, and in doing so the level of maturity expected (minimum characteristics expected of processes). This can clearly be related to the quality attributes identified and described in preceding paragraphs

When we speak of processes, we are referring to the following large groups:

- Project management (planning, follow-up, indicators, etc)
- Product management (requirement engineering, architecture, design, testing, etc).
- Support processes (definition and improvement of processes, training, etc).
- Technology management (languages, data base, OS, platforms, etc).

Second stage

The second stage consists of identifying the actors that will cooperate in developing capabilities, be it in the companies, or in people. Consultants collaborating in the development of capabilities in companies and people, intermediate organizations, universities, certifying bodies (people and companies) can be involved in this stage. During this phase, the improvement programs can be defined, as well as the aspects to be included in university curricula, and the events to be developed at different levels, aligned with the characteristics of processes and products defined. The source of funding of the various alternatives analyzed should also be identified. Above all, the costs to be incurred in improving processes and people (trainings).

Third stage

On the basis of the quality attributes defined for the product in question, and the selected processes, it is important to define which product and process certifications, models, standards make up the possible array to be considered by companies and people, to be in keeping with the program under way. We believe that these standards, models, etc, should be already defined by the international market, with regard to the development of IT systems. Upon reaching this stage, there is already a clear idea of the costs of certification/appraisal, etc. That is why the proceedings towards obtaining the funding required at the different levels can be started. It will be possible to put together a scheme related to costs, duration, efforts, investment, etc for each stage in particular. This could be done in relation to the development programs to be pursued by the different companies, for each case in particular.

Fourth stage

The improvements made in each process and product should be analyzed and quantified. This could be done based on a control panel featuring quality aspects, process capability (certification or levels of capacities depending on the model/standard selected), cost and time productivity, etc. The loop is closed (closed cycle) with the analysis of the feedback information obtained through the control panel, based on which areas, products, processes, certifications, models, etc should be redefined. The objective would be to continuously improve the program and its content, which will allow for updating its significant aspect, and for correcting deviations and/or bad definitions established.

Stakeholders and Responsible Parties

The stakeholders and responsible parties shall be: the State, the Group in charge of the Management of the Strategic Plan, private organizations (Chambers, Poles, NGOs), specific Bodies (INTI, IRAM), universities, companies, professionals and students.

7.4 ACTIONS

7.4.1 PROGRAM OF DISSEMINATION OF INFORMATION AND AWARENESS-RAISING ABOUT THE IMPORTANCE OF QUALITY BOTH IN THE IMPROVEMENT OF EFFICIENCY AND COMPETITIVENESS OF BUSINESSES AND IN THEIR POSITIONING IN EXTERNAL MARKETS.

7.4.2 TECHNICAL SUPPORT INSTRUMENTS AND CREATION OF QUALITY CENTERS

7.4.3 FINANCIAL SUPPORT AND SUBSIDIES TO FACILITATE AND ENCOURAGE CERTIFICATION PROCESSES.

7.4.4 IDENTIFICATION AND PROMOTION OF DEVELOPMENT METHODOLOGIES AT DIFFERENT LEVELS, WHICH WILL ALLOW FOR GRADUALLY REACHING A MORE DEMANDING QUALITY LEVEL

Sources:

1. Document of the CESSI Quality Commission for the SITS Forum - 2004
2. Rosario Technological Pole –Contribution for the FSSI – Quality Thematic Focal Point - 2004
3. INTI – Ricardo Ferraro – 2004.
4. Building of a Quality Process for all – Carlos Manzanedo – 2004.
5. Several contributions by the Quality Thematic Group of the SITS Forum – 2004.

Contributions received for the Quality Thematic Focal Point

Title: Quality Commission Contribution
Author: Daniel Yankelevich

Title: Contribution of the Rosario Technological Pole
Author: ROSARIO TECHNOLOGICAL POLE

Title: RMYA Comments
Author: Raúl Martínez

Title: Recommendations
Author: Carlos Manzanedo

Title: Contribution to the Quality Group
Author: Ricardo Ferraro - INTI

CHAPTER VIII- EMBEDDED SOFTWARE AND ELECTRONICS INDUSTRY

INTRODUCTION

This report summarizes the discussions of the Workgroup of "Embedded Software and Electronics Industry" of the SITS Forum. Its drafting is mainly the result of the contribution of the Argentine Chamber of Electronic, Electromechanical and Lighting Industries (CADIE-CADIEM). Its aim is to set the basis for the integration between the Software and IT Services Industry and the Electronics Industry in our country. This aim has guided the establishment of the thematic focal point and the ratification of the Work Group even when the development of the Electronics Industry by far exceeds their scopes. Nevertheless, the technological convergence on which ICTs are based and the increasing development at a global level of the Information or Knowledge Society, clearly indicates that in many of the key development aspects of these disciplines –human resources, research and development, quality processes, etc.- it is impossible to imagine or to plan independent policies for their promotion; as the experts from India indicate: *hardware and software are two sides of the same Information technology golden coin.*

8.1 What is this all about?

The explosive impact of computers and IT technology on our daily activities has generated the need to design and develop computer software systems and to incorporate new technologies for an increasing range of applications. The growing integration of IT and communications, multimedia and the constant and continuous processing in data digitalization, rapidly expands usage opportunities and the complexity of inserted systems (embedded software).

Embedded software is a key component in most electronic devices developed as a result of the appearance of new technologies, including daily consumption products or highly complex telecommunications equipment and industrial uses. It is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function, in contrast with general-purpose computing. In some cases, embedded systems are part of a larger system or product.

Embedded software is used to control electronic products and is usually executed on an internal microprocessor and/or a digital signal processor (DSP) that supports a set of specialized instructions. In general, this software must be extremely reliable, efficient and compact and very accurate in its response to the fast and unpredictable frequency of input/output information transmission (I/O Interfaces).

IT systems included in electronic products that control for example factories, air traffic and power distribution are called real time systems. The main difference between real time systems and IT application systems is the timeliness requirements of the former, and that they are guaranteed and dedicated to a single use.

Microprocessors inserted for real time applications need the integration of software-hardware systems for their implementation. This is the real motivation for the development of electronic products using the integrated HW/SW co-design. The most important industry in our days, data communication, is based on embedded systems. For the communication of data stored in the computer, different types of dedicated software are required to exchange and route data.

In order to achieve the purpose of developing efficient embedded systems, it is necessary to use appropriate architecture systems, interface hardware and peripheral devices as well as implement robust software programs for their control. Consequently, software systems used to control hardware and interface devices are the key element for the development of embedded systems.

Experts' opinion, both nationally and internationally, is that the creation of new microelectronic components, with more processing speed and device density in the chipset shall continue during the next decade and shall lead to the emergence of applications of increased complexity. ***All these shall pave the road for new players to enter the market****.*

THE RELATIONSHIP BETWEEN HARDWARE AND SOFTWARE

Any industry manufactures different types of products; likewise, there are also different types of software.

There is a type of SW known as "embedded software" that contributes to the operation of the machine or device in question. This software is specially developed for that machine or device by the product manufacturer himself or by specialized universities and research and development centers.

Within this embedded SW **different categories may be distinguished:**

- The original or basic SW, which is essential for the operation of the device. This type of technological software is built into the device. It - exists in all personal computers as well as in any other electronic equipment, cellular telephones, car computers, modern medical equipment, TV sets, alarm systems, household appliances, etc. In general, this SW requires a high degree of development effort. This is done by highly skilled labor and the cost is recovered by evenly distributing it among the number of items produced and effectively delivered to the market. In most cases it is not modified during its operating life and it is finally replaced when a new model appears.
- A second type of SW is the one required by equipment or devices built into the devices mentioned in the previous paragraph, but due to specific

conditions such as regulatory requirements of a certain community, existing conditions, or simply habits, it becomes necessary to adapt the original equipment to the specific use required. This is also a technological SW that requires putting forth great efforts and specialized labor, but its disadvantage is that the amount of marketable units through which costs can be recovered is significantly lower. In order to respond to domestic needs, this is the type of SW that is also sometimes developed by communities that are not highly industrialized. This Software is known in Argentina by its English name: “Customized Software”.

- Another type of technological SW of greater complexity and requiring perhaps greater efforts to create is the one devoted to the management and supervision and control of complex systems which operation implies an interrelation of a large amount of equipment or devices. This SW enables, for example, the operation of **voice, video, sound and data communication networks**.

Since these networks are frequently made up of different elements, technologies and standards, the creation and optimization of this type of software is hard work. It thus requires a higher level of specialization and resources of all types.

There follow some specific characteristics of the technological, embedded SW described in the two latter categories above:

1. It requires highly skilled labor, not only staff skilled in IT **and electronics** but also staff with a deep knowledge of the operation of the different elements that make up the environment in which the equipment must operate.
2. People who specialize in one single discipline cannot develop this software
3. Besides programmers, analysts and other IT experts, its development requires the participation of mathematicians, engineers, experts in telecommunications, **electronics,** data transfer, **mechanical and processes-related issues**, etc.
4. Therefore, the development of this type of software can only be done by interdisciplinary teams of people, working closely during long periods. This element cannot be ignored when regulating intellectual property issues, for example.

Electronic products, other than computers, increasingly have programs built-in (embedded software). Generally, these do not appear in the SITS manufacturing statistics because they are not listed on the fact sheet of the product separately; therefore, it is not possible to include them in the statistics on goods and services.

For the ordinary consumer, the word “computer” means a PC. Most consumers do not have any information on the enormous amount of processors that play such an important role in the lives of people. We wake up to the sound of an

alarm set off by a computer; we have breakfast prepared in a digital microwave and drive cars with electronic computerized switchboards.
Thousands of people owe their lives to biomedical instruments such as CT scans, heart monitors and ultrasound machines. Ships of all sizes sail with the help of an embedded system that industriously iterate non-linear positioning equations. CD and **DVD** players reproduce a sound and a **high quality image,** using highly sophisticated elements to correct mistakes, find the right track with great accuracy **and increase interactivity.**

A crucial application is the reduction of consumption of limited natural resources: intelligent boilers use solar energy to keep the right temperature; automated irrigation systems enable a timely use of water; most industrial processes have an automated control system to optimize the use of power and to comply with international environmental protection regulations. It is estimated that electrical engines use 50% of all the electricity produced; therefore, economical engine microprocessors producing slight improvements in their efficiency may generate huge energy savings. The intelligent, automated use of natural resources may be the best short-term environmental improvement so far.

The embedded microprocessor applications share one characteristic; the final product is not a computer, even though a computer is also a collection of processors: the keyboard, the “mouse”, and the printer, among others peripherals, include at least one embedded microprocessor.

In all these cases software is required. This software is run on an embedded microprocessor, a computer directly integrated to the product.
A typically embedded system has a hardware and a software component, known as firmware. The hardware is developed on the basis of a microprocessor, a chipset or a DSP (specific processor for electric signal processing). The software is, in fact, a program that performs specific tasks that can include a real-time operating system (RTOS).

Embedded systems are part of a developed industry in the form of end products, intermediate goods (such as car parts) or capital assets. In the year 2002, more than 6 billion processors of all types (4 to 64 bits, including DSPs) were sold. This surprising amount is 25% lower, due to the world economic crisis, than the sales record figure of 8 billion reached in the previous two years. Out of these 6 billion, only 1.5 % became the computers brain (PCs, Macs, and Unix Work stations) while the remaining 98.5% became part of the embedded systems.

The program of the European Union for the development of Information Society Technology (IST program) specially emphasizes the development of embedded systems, creating a work group called: “Software Technologies, Embedded and Distributed Systems” as part of their strategy of developing what they call “AmI - Ambient Intelligent Environment”. This Ambient Intelligent Environment involves systems that are directly under human control and also systems controlling the human environment, even though humans do not directly control them. AmI will

involve enormous and complex distributed systems that will require development of large software applications and of the infrastructure for its efficient development.

The EUREKA-ITEA Program is another European initiative to promote the development of these types of software- intensive systems.

On the other hand, in the United States, programs such as “Embedded, Everywhere” or initiatives like the IEEE’s creation of the new forum on “Pervasive Computing”, or the organization of the “Embedded Systems Conference”, event that is held annually in the eastern and western coasts, and the various magazine publications ratify the importance attached to Embedded Systems throughout the world.

As has been said, it is very difficult to characterize this industry by means of statistics, since only traditional industries and services are considered for statistical purposes. Nevertheless, there are indexes that reflect the penetration of embedded systems and their importance in the international market. If we consider for example only one of the previously mentioned sectors, such as the car manufacturing sector:

In 1990, the cost of electronics per car amounted to USD 940, while the cost forecasted for the year 2005 amounts to USD 1,720. This will require huge amounts of software. A modern car requires networks of over 30 processors to control its different functions, which are, in turn, controlled by their own embedded software.

Venture Development Corporation (VDC), a Consulting Company in the United States, estimated that the amount of units of embedded devices marketed worldwide in the year 2002 amounted to over 1,7 billion.

This same consulting firm, in a study entitled “Embedded Software Strategic Market”, published the following values corresponding to the software tool market to assist this industry:

Software tool market

	Sales 2002 Million USD	Estimated 2007 Million USD	Annual growth (%)
Development tools	330	525.3	9.5
Design automation	363.4	682.8	13
Testing tools	69	+200	24
Database managers	40	+100	-

Some of the characteristics of embedded system development from the point of view of specialization of human resources required are the following:

The problem the designer faces with these systems is that, in general, there is no clear difference between hardware and software. In many cases, the software is an extension of the hardware; software-controlled algorithms replace hardware components. Many embedded systems operate in real time and the software has to respond to an external event in microseconds. The software and the hardware are strongly interconnected and the performance of both is crucial to the usefulness of the system; at times, programming decisions greatly influence hardware selection.

The programmer of embedded systems is partly an engineer (with hardware knowledge), partly a systems analyst and partly a traditional programmer. Engineers must be trained to strike the right balance between product performance, throughput and costs. In our country, the career in Electronic Engineering provides the basic training for these types of developments.

In the past, embedded systems used to be programmed by hardware designers since they were the only ones who knew the bit and byte details of their latest creation. The increasing complexity of embedded systems should be matched by the corresponding increase in the specialization of the design team. A new group of firmware engineers are finding their way among hardware designers and traditional programmers. Anyway, programmers developing an embedded code would always need to have a detailed knowledge of the software and hardware integrating a system and the interaction with sensors, actuators, etc., that is to say, the interaction with the devices that interface with the real world.

8.2 Where do we stand?

Even though the local manufacturing of electronic devices decreased significantly in our country in the last few years, it has been and still is very important in the economy as a whole from the point of view of imports.

In the 1990's, according to our estimates based on research carried out by FLACSO and INTI, local electronic production amounted to between 12% and 14% of total imports in the country. These imports together with local production (in the decade and according to the specific year) amounted to between 1.5% and 2% of the country's GDP. In 2003, according to INTI, electronic imports (that included a large amount of embedded software) represented 9.36% of the total and 1% of the GDP, **while exports amounted to 139 million dollars.** According to our estimates for that year, import and production would represent 1.6% of the country's GDP.

As a result of an unwise industrial development policy for that sector which was implemented many years ago but worsened during the last decade, local production and, especially, **its level of integration** showed a severe backlash. At present, this situation has started to change, with a lot of impediments though. Probably, the strategic plan of the Software and IT Services Forum will speed up and strengthen this process.

According to data provided by the Group of Industry-related Research Studies of INTI, in 1997, there were approximately 14,500 people working in the industry. This figure decreased later as the local added value also decreased, **although this situation is starting to change at present.**

In effect, the local business sector is now starting to create and develop new products, perform investments, study and open up markets, recruit and train staff, achieve the quality levels required for timely satisfaction of the needs of increasingly demanding users. Approximately 500 companies, many of them small firms, are working in the domestic market producing equipment and systems. Many of these products are being exported. Some examples are:

- Electro medical analyzers to establish clinical parameters.
- **Public** and private switched telephone networks of small and mid capacity **including soft switch types, which include software for convergent networks.**
- . **Digital and analog telephone centers**.
- "Intelligent switches**" that save power**.
- Industrial temperature and humidity controlling devices and other industrial devices.
- People and vehicles access controls.
- Electroencephalograms and electrocardiograms.
- Links for digital and analog radio communications.

- **"Intelligent"** powerful electronic equipment such as permanent power sources, welders, plasma cutting machines, cathode protection machines, **etc.**
- Automatic ticket vending machines for public transport.
- Printers and tax controlling machines.
- Environmental monitoring machines.
- Monitoring, programming and control of radio studies and television.
- Electronic parking meters.
- Electronic wired and wireless alarm systems.
- Control systems for packaging machines.
- Localization systems for agriculture.
- Localization and radio link systems for fleet dispatch and control.
- Rural telephony systems.
- System for telemanagement and street lighting supervision.
- Telephone accessories.
- Banking services and back up equipment terminals.

To start thinking about a human resources and research and development policy, it must be considered that approximately 600 electronic engineers graduate from university every year and that the number of students enrolled is considerably higher than that. There is also an important amount of research and development groups from the regional UTN (National Technological Universities) of Buenos Aires, Cordoba and Rosario, even though these are small groups, and also from the Rector's Department and Schools of Engineering of the National Universities of Buenos Aires, La Plata, La Matanza, Cordoba, Tucuman, San Juan and the Littoral area and from institutions such as INTI, CONEA, CITEFA, CONAE and INVAP. A special program has been created for the ICTs. This program approaches IT as two sides of the same coin: hard and soft.

8.3 Where are we heading for?

A recommendable path for certain countries such as ours is to combine the SITS production for computers with the development of an increasingly complex

manufacturing industry, for example in capital goods and in professional electronic products. This will generate an additional embedded software demand that will enable the expansion of the SITS sector and improve the competitiveness of the manufacturing industry at the same time.

In some sectors of our country, locally produced or imported electronics has an important multiplying effect that will increase with the development of the next generation of proactive computers (in which airbags and ABS anti-locking brake systems are just examples) that will outstrip today's interactive machines in number and economic volumes, and that will require a considerable incorporation of embedded software. This is evident in the following areas:

- Agribusinesses in which the certification of food traceability, especially meat, requires the attachment of chips, information readers and processors to the products, in order to overcome the technical barriers inherent in exporting. These chips with relatively low density integration but high market potential, may not only be designed in our country but after the melting process in some "silicon foundries" is completed abroad, the manufacturing process may be finalized locally, so that they can be built into information processing equipment, also developed in hardware and software in the country.

- Telemanagement, telecontrol and telecommand systems of services, production and natural resources such as: street lighting, exploitation of oil and gas wells, power resources distribution networks, fishing areas, agriculture and livestock production support, maintenance of the cooling chain during the transportation of merchandise, etc. These issues are really relevant in a country as wide as ours with scarcely populated areas, which needs to optimize the use of its resources.

- Systems such as the ones described in previous bullet points and for the same reasons, for their implementation in security-related areas such as: early emergency alert and possible catastrophes, border patrol, control of highways and countries, transport of hazardous substances, etc.

- In telephony, the development of number portability (mobile and fixed) and number pooling, the materialization of the right to universal service for all the inhabitants of the country, and the project of a national network of telephone co-ops offering different flexible options. All this would create new services, contribute to national integration and strengthen the emergence of a local telecommunications industry, both from the hardware and software point of view.

- Increase of the number of households that access information and communication through Internet, taking advantage of the fact that 98% of them have at least one TV set and that its density per household is and will be greater than the penetration of PCs, and that its use is more familiar to the rest of the population. This would imply the development of a network and the necessary software and adaptation devices that will be

probably cheaper than computers, which is a very important issue for low income people and for those who are not interested in all its applications except for the e-mailing and web browsing capabilities. **All this will probably be reinforced in our country during the next decade, with the introduction of Interactive Digital TV, which is already a reality in the United States and in some European countries.**

8.4 Actions

The whole sector in which innovation is important requires active public policies to act as regulating and support systems. **The Organization for Economic Cooperation and Development (OECD) indicates that there have never been significant technological improvements such as IT improvements without the existence of public policies to promote them.**
Both developed and developing countries have implemented long-term actions to promote these business areas; the United States, France, Japan, India and now China are clear examples of this.

This is why we believe that as part of a strategy for a sustainable and significant development of the domestic added value in this sector, the following is required:

- To incorporate among the beneficiaries of the future Software Industry Promotion Law those companies that develop and produce embedded software and related electronics, **(through the regulation of the law, provided the latter is approved by the Senate.)**

- To apply to government procurement and to public services licensees the "PURCHASE ARGENTINE WORK" initiative, not only upon awarding a bid, but also during the work planning phase and the implementation of different systems, which must be done considering the possibility of both developing and manufacturing them locally, **as already contemplated by the applicable law.**

- **To put the embedded software and related hardware on the list of general actions of the SITS Forum for the following purposes:**

- To improve and increase the training of qualified human resources since it has been defined as one of the essential inputs in this sector and it has also been said that Argentina has comparative advantages in this regard. To support the creation and development of embedded software among the technological niches identified in the R&D Program of the SITS Forum and of the institutions devoted to the promotion of science and technology.

- To expand human resources training profiles in order to accommodate ICT professionals to provide them with basic knowledge in electronics,

software and communications as a result of the convergence of these technologies.

- To attract companies, R&D teams, Engineering technical schools and institutes involved in the development of embedded software to the Innovation, Entrepreneurship and Productivity Networks suggested in the SITS Forum Strategic Plan.

- To create lines of credit accessible by companies, especially SMEs, and to promote at the same time the drafting of a special law to encourage the creation of venture capital finance sources.

- To encourage and support exports, promoting the creation of business consortia.

- To create a network of qualified productive services for the manufacturing and development sectors, with the involvement of government institutions and private companies.

CONCLUSIONS

Based on the aforementioned concepts, the challenge to support and strengthen the development of a new Industrial and Information Society is a joint task involving Suppliers of Equipment, Components, Engineering and Services of the Electrical/Electronic sector from CADIE-CADIEM and **CATYA** together with Software Development Sectors grouped in other Chambers and Associations with contributions by Education and Research and Development institutions, with the purpose of expanding the existing Human Resources base and to support innovation.

Contributions received for the Embedded Software and Electronics Industry Thematic group.

Title: Contribución del Ingeniero Dmitruk*. (Contribution by Engineer Dmitruk).*
Author: *Engineer Andres Dmitruk.*

Title: ¿ Es posible tener una gran industria de software... sin participar de la tercera ola de crecimiento de la Electrónica? *(Is it possible to have an important software industry … without taking part in the third wave of growth in the electronic field?)*
Author: Engineer Daniel D. Farías.

Título: Aporte para el Grupo Temático Software Embebido y la Industria Electrónica *(Contribution for the Embedded Software and Electronics Industry. Thematic Group)*.
Author: CADIE

CHAPTER IX -THE STATE AND SOFTWARE DEVELOPMENT

9.1 INTRODUCTION: What is this all about?

When we refer to “The State and Software and IT Services Development” as a Thematic focal point, we are basically referring to two aspects: (i) How to recreate the capacity of the State to encourage the creation of a more competitive industry allowing, in turn, for the creation of strong local industries able to replicate their experiences in other countries and (ii) How to improve the transparency of government’s information and government’s management efficiency through e-government implementation by using ICTs. The private sector can offer different easy- to- implement initiatives to this end.

9. 2 The Problems: Where do we stand?

9.2.1 Problems as presented by the Private Sector

9.2.1.1 CESSI

The Argentine Software and IT Services Business Chamber included this item in the document entitled “Crecer con tecnología” *(Growing with technology)* which was drafted in the year 2003 where it is mentioned that the capacity of the State is needed as a reference for the appropriate use of technology to then be able to create a more competitive industry.

The State should propel the creation of strong local industries, capable of replicating these experiences in other countries. The idea of all this is not to “buy national”, but not to exclude the local supply and to try to support it with measures aimed at offsetting the natural imbalances created by the competition of companies of different sizes. On the other hand, the State should not behave as a private sector competitor when there is enough and efficient supply of the required services, nor should it discriminate any type of bidder creating competitive situations that are different from those in the private market.

The aforementioned document also highlights the need to make State information transparent through the implementation of e-government by means of the use of information technologies, especially through Internet. The State must make more information available to its inhabitants, citizens, or taxpayers (as the case may be), making management processes more transparent at the same time. In this regard, the private sector may offer different initiatives that may be implemented easily to facilitate management.
CESSI recommends the implementation of concrete measures so that some of the aforementioned actions are coordinated at provincial and municipal levels in order to avoid duplication of efforts and costs.

This should take place as a direct result of a National Strategic Plan to facilitate and strengthen the relationship between the State and its citizens. As an example, we can mention the possibility to register and obtain the CUIL number *(single labor identification number)* through the ANSES *(National Social Security Administration)* web page, or to do the necessary form filling through the AFIP *(Federal Public Revenue Service)* web page http://www.afip.gov.ar ./

From the point of view of the relationship between the state and its citizens, the long term vision is to obtain an "events" service; for example, if a citizen changes his/her address, it should be possible for him/her to inform about this through a website and the service would be in charge of reporting the event to the different organizations that require this information (People's Registry, AFIP, Municipality, etc.).

Another issue raised is that of establishing national standards for certain types of information so that the whole public administration (national, provincial or municipal), as well as private institutions linked to the sector are able to exchange data in standardized format and at the lowest possible cost of ownership. Some specific cases of areas where these standards should be established are health, identification of persons, finance, taxes, etc. Therefore, the State would no longer be obliged to use specific technologies and applications, but the information would still be integrated in a manner compatible with the new technologies.

Some examples are:

- AFIP: taxation system
- ANSES: strengthening of Internet services. For example: records of contribution payments, work record, status of a proceeding, etc.
- PAMI: social security benefits control.
- Education: Administrative Area, teacher's record. Expenditures control.
- National Identification and Tax payment System: Coordination of databases of State Owned Institutions.
- Labor Ministry: Internet Labor Exchange.
- Provincial and Municipal Governments: Introduction of Intelligent Management Systems with standardized account plans.
- Foreign Trade: Digital Catalog to promote exports

9.2.1.2 CICOMRA

The Argentine IT and Communications Chamber also includes aspects about the relationship between the State and SITS, in its document drafted in 2003 entitled "Bases para la Formulación de un Plan Estratégico para el sector de informática y comunicaciones en la Argentina" *(Basis for the creation of a Strategic Plan for the IT and Communications Sector in Argentina)*.
In this document, one of the propositions is to contribute to the development of the country from the IT and Communications Technology Sector (ICTs). It suggests the approval of a modern legal framework contemplating the implementation of the Digital Signature, the use of the Electronic Invoice, the recognition of the evidentiary value of electronically generated documents.

Another proposition put forth in the document is to promote the ICT sector demand, carrying forward the initiatives of implementation of technological e-government systems applied to Social Aid in particular. The document also suggests implementing e- government systems at a national, provincial and municipal level in order to improve the transparency of the Public Sector. To that end, the following is recommended:

- To create and implement an e-government plan with the involvement of the academic and business sectors as well as specialized institutions.
- To identify and apply unused lines of credit of Multilateral Organizations allocated to State streamlining purposes.
- To draft a "Virtual Image" Law specifying and regulating the type of information that Government Organizations are required to have available on the web.
- To identify initiatives of other countries that have succeeded in the improvement of Public Administration and citizen involvement.
- To participate actively in International e-government Forums.

9.2.2 Actions proposed by the National Office of IT Technologies of the Public Management Under Secretariat–ONTI-:

Below we summarize some of the activities performed by ONTI:

9.2.2.1 ETAP

Technological Standards for Public Management (Guidelines for the drafting of specifications with the aim of providing public institutions with a tool that will facilitate the rationalization, standardization and homogenization processes related to information technologies acquisition)
Progress is being made to incorporate other issues such as software and hardware development and to develop a quality standard in a gradual and sustainable manner.

9.2.2.2 E-government

This issue shall be strongly developed in the next few years. There is a set of policies being developed, aimed at facilitating citizen-led management, promoting economic growth, improving quality of life and repositioning the country in the world profiting from the potentialities of the New IT and Communication Technologies.

9.2.2.3 Digital Signature

In addition to issuing digital certificates requiring digital signature for their utilization in the National Public Administration, ONTI provides counseling to

public institutions to enable the introduction of technology into their systems. This offers the public sector a completely new possibility to save time and money. ONTI is also helping with the installation of the Digital Signature Infrastructure at a National level that will give legal validity to electronic documents. The utilization of the Digital Signature will also be encouraged throughout the National Government.

9.2.2.4 Joint Strategic Committee for the Information and Knowledge Society

At a national level, work is being done to create a committee to plan the national strategy for the Information and Knowledge Society. This is a jointly coordinated committee, set up at state level and involving also the private and academic sectors and civil society.

9.2.3 Problem Summary

- Lack of technological standards for the Public Administration –ETAPs - for Software and IT Services.

- The State is not positioned as an entity in demand of technology and there is not enough dialogue between the public and the private sectors in order to find common points. In addition, the State is not positioned as a Software development competitor of local companies.

- Lack of articulation in the public sector for the definition of a homogeneous IT policy.

- Lack of implementation of the National e-government Program to facilitate and strengthen the relationship between the State and its Citizens through the use of technology.

- Absence of a Plan to leverage the “digital momentum” and adapt local productivity and efficiency infrastructure of the country at different levels and sectors to the technological needs and possibilities, approaching modernization with new low cost easy-to-implement projects aimed at maximizing productivity of existing systems.

- Absence of a Joint Strategic Committee to plan and coordinate an ICT strategy.

9.3 Where are we heading for?

The resolution of the previously mentioned issues is neither easy to execute nor to implement due to cultural differences among the main participants. At a first stage, it is important to continue with the dialogue started in this Forum with the

people in charge of the area of the national Government in which the problem was identified, and all those that might help to effect a change.

9.3.1 To include within ETAPs standards, the creation of data and communications models to facilitate the integration of applications in the future, regardless of whether these applications are provided by the same vendor or not, so that the whole public administration (national, provincial or municipal), as well as private institutions related to the sector are able to exchange data in standardized format at the lowest possible cost of ownership. Some specific cases of areas where these standards must be established are health, people identification, finances, taxes, etc. Thus, the State would no longer be obliged to use specific technologies and applications and, at the same time, the information would be integrated, as provided by the new technologies.

9.3.2 To detect the areas of conflict between Private Companies and the State and to contemplate mechanisms for their quick resolution. This refers mainly to problems between private companies and the State regulation-enforcement agencies (AFIP, ANSES, National Courthouse, etc.).

9.3.3 To create liaison committees between certain government institutions and the private sector in order to know their plans well in advance and to be able to discuss their feasibility and/or describe the availability of technologies that may be useful to speed up certain processes. These liaison committees should be set up at different government levels and agencies such as AFIP, ANSES, Armed Forces, Ministry of Justice, etc.

9.3.4 To dynamically assess the supply of the private sector: According to the Thematic Group that suggests the setting up of an ICT supply and demand Observatory, it would also be useful to include a survey of the private supply aimed at the public administration.

9.3.5 To support government Digital Signature and Digital Invoicing-related initiatives.

9.4. ACTIONS:

9.4.1 CREATION OF A STANDING COMMITTEE FOR THE REVIEW, ASSESSMENT AND IMPLEMENTATION OF THE STATE ROLE AS KEY TECHNOLOGY REQUIRING ENTITY.

9.4.2 IMPLEMENTATION OF PROGRAMS FOR STRATEGIC AREAS IN ORDER TO PROMOTE THE DEVELOPMENT OF THE COMPANIES OF THE SECTOR.

9.4.3 *SITS* INCLUSION IN THE TECHNICAL STANDARDS FOR THE PUBLIC ADMINISTRATION – ETAPS.

9.4.4 PROMOTION OF THE TECHNOLOGICAL INNOVATION AND ENCOURAGEMENT OF THE LEVERAGING OF THE DIGITAL MOMENTUM

BY DESIGNING AND IMPLEMENTING A NATIONAL E-GOVERNMENT PROGRAM.

9.4.5 SUPPORT THE CREATION OF A JOINT STRATEGIC COMMITTEE FOR THE NATIONAL INFORMATION AND KNOWLEDGE SOCIETY STRATEGY.

ANNEXES
IT ENTREPRENEURS *

1. INTRODUCTION: What are they?

A KEY FACTOR FOR THE DEVELOPMENT OF A DYNAMIC, COMPETITIVE AND WORLD CLASS *SITS* SECTOR.

One of the determining factors for Argentina to be a relevant player in the SITS international market is the existence of a strong entrepreneurial sector, basically made up of young companies with the capability to spot new markets, implement new solutions and attract talents, which, at the same time, have the necessary structural flexibility, and are willing to run risks and wish to progress and develop.

How to promote the emergence of a SITS entrepreneurial sector in Argentina, with the necessary stamina and talent to lead the insertion of the country in the world economy?

In order to be able to answer this question it is first necessary to identify the main values and characteristics required. A skilled entrepreneurial sector to lead this process must be distinguished by:

- Its enthusiasm to generate new projects,
- Its willingness to expand its business beyond trade frontiers and traditional technologies.
- Its social commitment and long-term vision.

Thus, the aim is to achieve the necessary volume of business activity, in line with the differentiating aspects mentioned above, to produce the turnaround dynamism (birth and death of companies) to guarantee the sustained evolution of the sector.

2. THE PROBLEMS: Where do we stand?

There are still important challenges ahead such as the absence of an entrepreneurial tradition, little experience in high technology business management, reduced investment levels (state and private investments) on science and technology and lack of alignment, communication and coordination among private, academic and government sectors.

* Material provided by Jonathan Altszul and Emiliano Kargierman from CORE ST

Moreover, at an academic level, there is no culture or tradition in place to attach importance to the detection of entrepreneurs or on-going training with the aim of fostering an entrepreneurial spirit.
In spite of all these, there are some successful entrepreneurs that have set an example for the development of an entrepreneurial policy.

3. OBJECTIVES: Where are we heading for?

Since our entrepreneurs should be the main architects of the Argentine SITS model, **the strategy should be based on a set of common values: risk running, desire to grow and develop, social awareness, national identity, non stigmatization of failure, creativity and quality.**

A method of promoting development of a culture aimed at encouraging "entrepreneurship" in the SITS sector is based on disseminating knowledge about successful companies so that they can be used as a benchmark for the sector we want to spur. Therefore, it is easy to spread the message that "It can be achieved" and thus motivate a new generation of entrepreneurs.

Entrepreneurship is, in the first place, a cultural issue that must be addressed. The dissemination of knowledge about successful business cases, technology cases and incorporation of the previously mentioned differentiating aspects require an encouraging environment in which young entrepreneurs, professionals, technical experts and researchers can learn, grow and develop going forward. This setting is provided by the Innovation, Entrepreneurship and Productivity networks which are key instruments for the suggested SITS development model.

Likewise, showing that SITS can be successfully produced in Argentina will arise the natural interest of the financial community. This is an important factor for the development of the finance capability necessary to multiply the amount of new business projects and to continue with the development cycle of more advanced companies. In addition to encouraging new entrepreneurs and attracting financial investments we may add the "spill-over" effect of the experiences accumulated by the promoted companies that will be a positive multiplying effect.

Those projects that are on the first stages of implementation may frequently benefit from communication with experienced businesspeople and entrepreneurs, therefore it would **be useful to implement "sponsorship" mechanisms to create programs aimed at reuniting both parties, formally establishing the roles and responsibilities of the "sponsors" and creating an environment that will allow sponsored companies to submit projects, carry out follow ups and share the common problems resulting from the new startups.** In this way, entrepreneurs would not incur in common errors since they will have access to the contacts necessary to help them develop their businesses and offer them a new vision on how to make their business grow.

To sum up, since entrepreneurs will naturally lead the insertion of Argentina in the SITS global market, it is necessary to design a strategy for the creation of an entrepreneurial strategy aimed at encouraging growth and development of a national entrepreneurial sector capable of competing at a global market level.

4. ACTIONS

4.1 Identify and implement specific promotion tools to facilitate and support the creation and growth of startups at each relevant stage (see table 1).

4.2 Position and promote success cases in order to establish benchmarks and models of emulation, as a concrete and tangible evidence of Argentina's opportunities in the SITS market.

WORLD SUMMIT ON THE INFORMATION SOCIETY GENEVA 2003 – TUNIS 2005*

Basic Information:

The UN General Assembly Resolution 56/183 (21 December 2001) endorsed the holding of the **World Summit on the Information Society (WSIS)** in two phases. The first phase took place in Geneva hosted by the Government of Switzerland from 10 to 12 December 2003 and the second phase will take place in Tunis hosted by the Government of Tunisia, from 16 to 18 November 2005.

A High-Level Summit Organizing Committee (HLSOC) has been established under the patronage of Kofi Annan, UN Secretary-General. Its purpose is to coordinate the efforts of the international United Nations family in the preparation, organization and holding of WSIS. The UN agency that holds the leading role in the organization of the Summit is the **International Telecommunication Union (ITU)**, based in Geneva (Switzerland). An **Executive Secretariat (WSIS-ES)** based at the ITU headquarters has been established under the authority of the HLSOC to assist in the preparation of the Summit.

WSIS, while recommending representation from governments at the highest level also invites participation of all relevant UN bodies and other international organizations, non-governmental organizations, private sector, civil society, and media to establish a truly **multi-stakeholder process.**

The **first phase** of WSIS that took place in Geneva hosted by the Government of Switzerland addressed the broad range of themes concerning the Information Society and adopted a Declaration of Principles and Plan of Action (see UN site)**.**

Within this framework, Latin America and the Caribbean held from January 29 to 31, 2003 in Bavaro, Dominican Republic, the Regional Preparatory Ministerial Conference of Latin America and the Caribbean for the World Summit on the Information Society, where the countries represented therein expressed their views in a final document called the "Bavaro Declaration".

THE ARGENTINE POSITION AT THE WSIS

It is clear that the World Summit will not be a determining step to reduce socio-economic disparities between and within countries, but it is yet another change to move ahead in the right direction. For our country this Summit offers a good chance to show a high profile in IT and new technologies, balancing to a certain extent its image as an agricultural and raw material exporting country.

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* Material contributed by Ambassador Ileana Di Giovanni Ministry of Foreing Affairs, Trade and Cult.
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Argentine is actively involved in Summit-related activities together with Mexico and Brazil.

The Summit calls upon government representatives (diplomats, regulators, cultural officers, indigenous populations, etc), private sector representatives (businessmen, chambers) and the civil society in general to participate on an equal footing.

Domestically, Argentina is working hard at the three levels. The challenge of this Summit is the closing of the digital divide, promoting sustainable socio-economic development, social inclusion and the reduction of asymmetries. Notwithstanding how important these subjects are there is no automatic consensus worldwide around them.

The Argentine Delegation in the preparatory meetings has tried to include in the Action Plan issues that are of specific interest to it but that are, at the same time, regionally supported: a) Information and communication technology Infrastructure, b) Cultural Identity and diversity c) cyber-security d) financing

Information and Communication Technology Infrastructure

The Argentine Republic has important communication infrastructure available that is currently underutilized. So, it is of interest to increase its utilization regionally and continentally as well as unoccupied satellite slots and satellite idle capacity.

In this context, the "Bavaro Declaration" (final document of the Regional Preparatory Ministerial Conference of Latin America and the Caribbean for the World Summit on the Information Society) approved various guiding principles and identified priority issues related, among other things, to the infrastructure of information and communication technology.

It should be mentioned that subparagraph i) of the Declaration states that:

> The information society is intrinsically global in nature. Thus, a policy dialogue based on global trends in the information society should take place at the world, regional and subregional levels in order to facilitate:
>
> - The provision of technical assistance aimed at national and regional capacity-building for the maintenance and reinforcement of regional and international cooperation;
> - The sharing of best practices;
> - The sharing of knowledge; and
> - The development of compatible regulations and standards that respect national characteristics and concerns;

And subparagraph h) (priority issues) states that:

> Fostering the efficient use of infrastructure. The optimization of connections among major information networks should be promoted through the creation of regional traffic hubs to reduce interconnection costs and allow the penetration of access networks to be broadened. Fees for the use of networks and infrastructure shall be set on the basis of objective, non-discriminatory parameters;

Concerning the same issues, the Argentine delegation introduced during Prepcom3 (Geneva, August 2003) the following proposals of amendments and additions to the paragraphs dealing with "Information and Communication Technology Infrastructure" of the Draft Plan of Action, which paragraph 11 reads as follows:

> Advances in ICTs provide all communities and social groups with unique opportunities to enhance access to, and participation in, the Information Society. **Infrastructure** is central to this goal of digital inclusion, enabling universal, sustainable, ubiquitous and affordable access to ICTs by all. This will require utilizing existing and new technologies. It will be necessary to:

Actions
a) Study relevant solutions for promoting the development of information and communication infrastructures adapted to the environment, *and relevant to communities*, with particular attention to the needs of remote and rural areas, and marginalized urban areas.
b) Produce a yearly inventory of the best technologies for access to remote and rural areas in order to optimize ICT access costs.
c) Improve connectivity for institutions accessible to the public, such as schools, universities, libraries, post offices, community centers, museums, etc.
d) Undertake international research and development efforts aimed at making available adequate Internet community access equipment for under US$ 100 by 2010, and under US$ 50 by 2015.
e) Utilize unused satellite capacity to improve low-cost connectivity in developing countries.
f) Develop and strengthen national, regional and international broadband network infrastructure to help in providing the capacity to match the needs of countries and their citizens and for the delivery of new services.
g) Reinvigorate the project for the modernization and extension of the existing PANAFTEL network and remove all obstacles to the implementation of the RASCOM (Regional African Satellite Communications Organization) project.
h) Provide all interested countries with appropriate technical assistance for the preparation of network development plans for broadband, Internet and IP.
i) *Put in place plans for a transition to digital TV in all countries by 2010.*
j) *Mobilize financial, scientific, business and citizenry commitment to the development of alternative, renewable* energy sources adapted to the environment for ICTs.

Some of these criteria were introduced in the Action Plan and others in the Buenos Aires Declaration (meeting of expanded Mercosur at the Communications Secretariat) dated April 14, 2004.

Cultural Identity and cultural linguistic diversity and local content

The Argentine delegation has always been convinced that Latin America has a common identity that information and telecommunication technologies can reinforce, permitting an intensification of the scientific and cultural exchange between the countries in the region.

However, there was great reluctance to mention "cultural identity" and cultural diversity together in the Summit documents.

In the "Bavaro Declaration" it is stated that the following guiding principles should be adopted:

> Establishing regional and subregional working groups on specific topics can allow for a smoother, more coherent and harmonious transition to the information society, permit the deployment of regional integration efforts and help to increase bargaining power at the international level. The Latin American and Caribbean countries are committed, as a matter of priority, to more active participation in global forums as well as in existing regional and subregional institutions. They are also committed to the formation of new, and transformation of existing international partnerships through, inter alia, the Latin American and Caribbean Regional Network (LacNet) of the United Nations Information and Communication Technologies (ICT) Task Force. In this regard, the countries of the region call upon the international community to adopt appropriate, creative mechanisms to ensure the full participation and representation of the region in these forums in order to guarantee the widest possible contribution to the process of configuring the global information society

Cybersecurity

Regarding SECURITY, it is necessary to: "Establish appropriate national legislative frameworks that safeguard the public and general interest and intellectual property and that foster electronic communications and transactions. Protection from civil and criminal offences ("cybercrime"), settlement and clearance issues, network security and assurance of the confidentiality of personal information are essential in order to build trust in information networks."

Several courses of action were suggested with special emphasis on regional and international cooperation. There are many Latin American countries, including Argentina, that are drafting new legislative instruments and thinking about international cooperation mechanisms in line with the Council of Europe's 2002 Cybercrime Convention known as the "Budapest Convention"

DIPLOMATIC ACTION

During the preparatory process to Geneva and in many international and regional meetings that followed, diplomatic efforts have been geared towards finding communication alternatives for the region in order to counter the negative effects of globalization with common policies and instruments.
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THE INDUSTRY OF CALL CENTERS AND HELP DESKS IN ARGENTINA

Call centers in Argentina represent a consolidated, world-class, growing industry, which has so far led to the creation of over 20,000 direct jobs.

These 20,000 jobs represent a 60% increase from the 12,000 jobs that this industry recorded in 2003 and an increase of more than 200% from the 6,000 jobs it posted in the year 2002.

The call center industry is one of the industries with the highest employability rate, being almost at the same level as the automobile industry or supermarkets.

It multiples jobs by creating new ones in SITS companies that are vendors of the industry providing technological solutions and equipment for their operations. Education also benefits from the growth of Call Centers since they demand training programs for the staff.

The sales of this industry will amount to around $150 million during this year

This figure represents a mayor growth for the industry which, during last year, recorded sales for $ 45 million and $ 15 million the year before last.

Moreover, the companies that supply technology for Call Centers posted sales for $ 15 million last year, with a $21 million forecast for this year.

Call centers have two competitive advantages in Argentina, namely:

(i) Available and highly trained human resources, being this essential to offer excellent quality of service, which will allow the local industry to compete “on an equal footing” with Call Centers around the world.

(ii) Argentina has one of the best telecommunications infrastructures of Latin America, which gives to the Call Center industry the additional advantage of having multiple connectivity options available to place national and international calls.

Based on the advantages mentioned above, the industry has developed providing services to the following market segments:

- Local companies hiring Customer Service from national Call Centers.

- Local offices of international companies that provide their Customer Service from Argentina to their own national and international operations.

- Call Center companies exporting their services to international corporations.

All of the above provides ample evidence that **the national industry of Call Centers has exhibited a strong growth in sales and employability that is sustainable even before eventual modification of the exchange rate.**

HELP DESKS

Help Desks are one of the highest value added services provided by Call Centers.

The Help Desk service consists of waiting on those users requiring assistance for the operation of products and services, be it to operate them correctly or, else, to resolve the problems that they present.

In general, Help Desk services provide first and second level support. The first level will cater for the problems and questions on the part of users about the basic features of a product or service. More complex enquiries, teleprogramming and telediagnosis are addressed by a higher support level that has the necessary tools for the resolution of the problems enquired about.

To fulfill their duties, the Contact Centers that focus on the Help Desk service are equipped with devises integrating Computing and Telephony (CTI; Computer Telephony Integration), which enables seamless integration with different pieces of customer service software such as CRM, ERP, among others.

Help Desk operators are people that know in detail the product or service in question, who have been trained to offer effective solutions to all the problems that users may have.

This person is trained to answer the enquires of users through the multiple channels available, the most common being telephone calls, but in actuality and based on the application of the convergent technology made up by IT and telecommunications, operators receive technical training to be able to answer by mail, the chat room or videoconferencing on Internet.

They have abandoned their traditional role of telemarketers to become multi-channel platform operators.

Their answers are supported by the application of database programs where the required information is found and on which the requirement history of the user may be built.

Therefore, operators should be skilled in IT if one is to integrate a Help Desk service, apart from good voice quality and proficiency in foreign languages when the service is rendered to users abroad.

- Who hires the Help Desk service?

The companies retaining these services are from different industries.

In Argentina, the service of Contact Centers providing Help Desk assistance is hired by demanding technology-based companies in the area of software, fixed or cellular telephony and access to Internet.

This is the reason why world-class services are provided from Argentina to serve the customers of the most important international companies in this field, such as IBM, MCI, Nokia, AOL, Palm and Motorola, among others.

- Why is Argentina an ideal market for international companies to outsource to local companies one of the most critical elements of their business such as the Help Desk?

Argentina offers a series of highly valuable competitive advantages for the development and growth of the industry of Contact Centers for export.

In the first place, human and professional quality of human resources. Our country has always stood out for having shown excellence at the three levels of education where distinguished professionals were trained in the most varied subjects. Argentina has always irradiated know-how and it is highly thought of not only in Latin America but also in Europe and North America.

Secondly, our country has a sound telecommunications infrastructure. It has a large and varied availability of optical and wireless bandwidth apart from being crisscrossed by telephony, data transmission and Internet access networks laid by the world's leading operators.

On the other hand, our country has an optimally developed *Information Technology* industry, both regarding human resources such as programmers, technicians and engineers, and material resources with vendors and distributors of the most important international firms of the industry being physically located in the country.

- What is the economic importance of the Argentine Contact Centers exporting the Help Desk service?

They generate genuine employment

The jobs offered in Argentina by Contact Centers exporting their services are "new jobs" or else, they are jobs "transferred" from other countries that

Argentina has won in competition with other countries such as Ireland, Brazil, Chile and very recently, Uruguay.

The compensation paid to operators is in the high-end range, even higher that in industries competing for skilled and bilingual human resources such as tourism or education.

Foreign currency is generated and invested in Argentina to improve the installed capacity.

And, basically, large numbers of youths are trained to work in a global market, giving them the professional skills to be applied in other areas of the national economy.

This is how the industry of Contact Centers for export is one of the main industries in demand of "First Job Seekers" and one of the most efficient trainers.

In the United States, that role was traditionally played by the military but in the last 20 years the fast food chains outstripped them.

To render assistance in English from Argentina to users that are in the farthest corners of the globe is a more challenging and rewarding job than frying chips.

ACTION INCORPORATED TO THE 2004-2007 SITS PLAN

TO TRANSFORM THE CURRENT COMPARATIVE ADVANTAGES OF HELP DESKS AND CALL CENTERS INTO COMPETITIVE ADVANTAGES BY SUPPORTING TRAINING AND THE REHIERARCHIZATION OF HUMAN RESOURCES BASED ON THE GENERATION OF NEW JOBS.

This action will be implemented as from the signature of a sectoral agreement between the Secretariat of Industry of the Nation and the Ministry of Labor and Employment, through its National Training Department.

Software and IT Services

ACTION PLAN- 2004-2007

PARTICIPANTS

- **STATE:** Ministry of Economy and Production; Ministry of Foreign Affairs; Ministry of Education; Ministry of Labor and Employment; Secretariat of Industry, Trade and SMEs; Secretariat of Science, Technology and Productive Innovation; Secretariat of Foreign Trade; Secretariat of Communications; Secretariat of Economic Policy; Undersecretariat of Public Management; INTI (National Institute of Industrial Technology); ONTI (National IT Office); ONIG (National Office of Management Innovation); CONICET (National Council of Technical and Scientific Research):Provincial Governments; Government of the City of Buenos Aires; Municipalities

- **PRIVATE SECTOR:** BUSINESS CHAMBERS (CESSI, CABASE EDUTIC, CADIEEL, CATYA, AADS, UIA, CAME); POLES AND CLUSTERS (ROSARIO, TANDIL, CORDOBA, BUENOS AIRES, GUALEGUAYCHÚ); LARGE COMPANIES ; BUSINESS COMMUNITY: UIA, SADIO,IMES, CAME.

- **ACADEMIC SECTOR**: UNIVERSITY OF LA PLATA, BUENOS AIRES, CENTRO, DEL SUR, DEL COMAHUE, UTN, BLAS PASCAL, GRAL SARMIENTO, SAN MARTIN, LA MATANZA, JUJUY, CORDOBA, ROSARIO, RIO CUARTO, ITBA.

- **REGIONAL FORUMS:** NORTHWEST, TANDIL, ROSARIO, CORDOBA, NEUQUEN, BAHIA BLANCA. (**PRE-CONSTITUTED:** MENDOZA, SANTA FE, SALTA, SANTA CRUZ)

VISION

TRANSFORMING ARGENTINA, A NON-CENTRAL COUNTRY, INTO A RELEVANT PLAYER OF THE WORLD MARKET OF SOFTWARE AND INFORMATION SERVICES BY THE BEGINNING OF NEXT DECADE

OUR MODEL

THE INTENTION IS TO INSTALL AN ORIGINAL DEVELOPMENT MODEL WHICH, WHILE DRAWING FROM INTERNATIONAL EXPERIENCES, SHALL BE BASED ON OUR ECONOMIC, SOCIAL, EDUCATION, SCIENTIFIC, TECHNOLOGICAL AND HISTORICAL CHARACTERISTICS FOR THE CLEAR PURPOSE OF:

- FOLLOWING A DEVELOPMENT PATH BASED ON THE INNOVATION AND GENERATION OF ADDED VALUE, ROOTED IN THE MOST DYNAMIC SECTORS OF THE ECONOMY AND IN THE AREAS WITH THE HIGHEST POTENTIAL FOR TECHNOLOGICAL DEVELOPMENT.

- DEVELOPING STATE-OF-THE-ART INTERNATIONAL TECHNOLOGICAL SOLUTIONS FOR THE DOMESTIC MARKET AND FOR CERTAIN SPECIFIC NICHES OF THE INTERNATIONAL MARKET.

- INCREASING THE GENERAL COMPETITIVENESS OF THE ECONOMY AND IMPROVE THE STANDARD OF LIVING OF ITS INHABITANTS.

- AGGRESSIVELY PROMOTING THE EXPORTS OF HIGH VALUE ADDED SOFTWARE AND IT SERVICES

THE STARTING POINT

Despite the historical lack of incentives for the sector, both for companies and scientific and technological research, the chronic lack of financing and the asymmetries with the promotion schemes in force in neighboring countries and elsewhere, the SITS sector comprises and contributes:

- AROUND 600 COMPANIES AND 1,300 MICRO BUSINESSES, 25,000 DIRECT JOBS, $ 3,1 BILLION IN SALES, ACCOUNTING FOR 0.68% OF GDP, EXPORTS FOR USD 180 MILLION AND OVER 105,000 IT STUDENTS IN OUR UNIVERSITIES.

GENERAL OBJECTIVES 2004-2207 ACTION PLAN

- **50,000 DIRECT JOBS**

- **USD 350 MILLION IN EXPORTS**

- **ACCRUED SALES GROWTH: 60% (FROM $ 3,1 TO $ 5 BILLION)**

2004-2207 ACTION PLAN

BASED ON 30 MEASURES DRAFTED IN 9 MONTHS, WITH THE PARTICIPATION AND CONTRIBUTION OF 280 PEOPLE, REPRESENTING DIFFERENT LEVELS OF GOVERNMENT, THE PRIVATE SECTOR, UNIVERSITIES AND NGOs, WORKING IN 9 THEMATIC GROUPS AND 6 REGIONAL FORUMS.

1. ESTABLISH A FUND FOR THE IMPROVEMENT IN IT TRAINING (FOMENI)

OBJECTIVES

- Integration of all the educational system levels
- Promotion of links between the education system and the business sector
- Improvement of the qualifications of technical and teaching staff
- Encourage entrepreneurship through education and interaction with the productive sector

IMPLEMENTATION

- Fonsoft (Secyt)
- Ministry of Education
- Universities

GOALS
Year 2005

Postgraduate scholarships: 15

Univer/Business Joint Projects: 10

Univer/Secondary Joint Projects: 10

2. CREATE CAREERS FOR THE SPECIALIZATION AND TRAINING OF HUMAN RESOURCES FOR THE NETWORKS TARGETED AT DYNAMIC SECTORS OR TECHNOLOGICAL NICHES

OBJECTIVES

- To train the human resources necessary to meet the needs of companies of selected productive sectors.
- To train professionals and technicians specialized in technologies, products and services of the selected technological niche.
- To train human resources to become PhDs and or Masters specialized in the selected fields of expertise

IMPLEMENTATION

- Fonsoft (Secyt)
- Ministry of Education - INET
- Universities

GOALS
Year 2005

Postgraduate: 2

Graduate: 5

Technical: 10

3. SECTORAL PROGRAM TO SUPPORT HUMAN RESOURCES TRAINING

OBJECTIVES

- To transform the current comparative advantages of help desks and call centers into competitive advantages by supporting training and the rehierarchization of human resources based on the generation of new jobs.

- To support the training and the "first job" of young programmers that graduated from secondary school.

IMPLEMENTATION

- Ministry of Labor
- Industry Secretariat

GOALS

2004: Sectoral Agreement

2005: 3,000 people trained

4. ESTABLISH A NATIONAL ICT OBSERVATORY

OBJECTIVES

To have a national entity that, apart from generating detailed and updated knowledge, becomes a central instrument in the definition of policies, provides guidance as to the allocation of investment and credit and helps generate a good business environment.

IMPLEMENTATION

- Industry Secretariat
- Secyt

GOALS

2004: pilot phase

2005: start-up

5. ESTABLISH REGIONAL AND SECTORAL OBSERVATORIES

OBJECTIVES

To facilitate the introduction of ICTs into the productive and social fabric by setting up local spaces with the involvement of universities and the public and private sectors, to enable the survey of supply, demand and capabilities as well as local and general interaction

IMPLEMENTATION

National ICT Observatory

GOALS

Number of Observatories

2004: 3

2005: 6

6. CENSUS AND PERMANENT UPDATE OF THE GENERAL AND EXPORTABLE SUPPLY, AS WELL AS THE DEMAND TYPES AND IT WORKERS COMPETENCIES

OBJECTIVES

- To get to know, segment and classify exportable supply.
- To get to know, segment and classify the demand in productive regions and sectors
- Awareness of IT workers competencies
- To have a tool available to visualize, segment and classify supply, demand and competencies

IMPLEMENTATION

NATIONAL ICT OBSERVATORY

GOALS

Supply companies: 200

Demand companies: 2000

Census: 500 workers

7. APPROVE AND REGULATE THE SOFTWARE INDUSTRY PROMOTION LAW

OBJECTIVES

- To remove asymmetries with neighboring countries.
- To generate certainty in the institutional and tax framework.
- To promote internal and external investments
- To promote software creation and development in Argentina
- To set up a specific fund to promote R & D, Human Resources and new businesses

IMPLEMENTATION

- National Congress
- Industry Secretariat

GOALS

TOTAL NUMBER OF COMPANIES INCLUDED IN THE PROMOTION PROGRAM

2005: 200

8. FOSTER A DIGITAL LEGISLATIVE AGENDA

OBJECTIVES

Create a suitable legislative framework to leverage the opportunities offered by the Information Society and encourage competitiveness within the SITS industry

Digital Invoicing, E-mailing, Intellectual Property, Venture Capital Law, E-commerce, Recognition of the Legal Validity of Electronic Records, Enforcement of national laws, Other

IMPLEMENTATION

- National Congress
- National and Provincial Executive

GOALS

2004/5: Introduction of five bills

9. STRENGTHENING THE COUNTRY POSITIONING PROGRAM AS "A PLACE FOR INNOVATION" IN THE SITS SECTOR

OBJECTIVES

- Continue with the positioning of ARGENTINA "A PLACE FOR INNOVATION".
- 5 principal markets (Mexico, Chile, USA, Spain, Brazil).
- 95 target markets (Canada, the United Kingdom, Italy, Japan and China)
- 5 vertical markets
- Strengthen the trade mission program for target countries participating in major international events

IMPLEMENTATION

- Secretariat of Trade and International Economic Relations, Ministry of Foreign Affairs
- Provincial exporting agencies

GOALS

Seminars, fairs and trade missions

2004: 5
2005: 8
2006: 10

10. STRENGTHENING AND FINE TUNING THE SITS NEGOTIATING STRATEGY

OBJECTIVES

- To train negotiators in the field of SITS.
- To get involved at the level of the WTO, MERCOSUR, FTAA and promote bilateral agreements.
- To set up a team of experts from the public and private sectors.
- To work on the objectives relevant to the markets selected.

IMPLEMENTATION

- Secretariat of Trade and International Economic Relations, Ministry of Foreign Affairs.

GOALS
Year 2004

To include the SITS sector in the negotiating agenda and have two expert negotiators to that effect.

11. CARRY OUT A PERMANENT AND DYNAMIC SURVEY OF EXPORTABLE SUPPLY AND DEMAND IN TARGET MARKETS

OBJECTIVES

- Survey, sort out and segment exportable supply, channel opportunities and address the shortcomings.
- Probe into the demand of target and strategic external markets.
- Generate commercial intelligence in the markets identified.

IMPLEMENTATION

- Secretariat of Trade and International Economic Relations
- Industry Secretariat
- Fundación Exportar

GOALS

2004: Survey of the exportable supply of 100 companies and US and Mexican market study

2005: Complete the survey of the exportable supply and carry out 3 target and strategic market studies.

12. ENCOURAGE ASSOCIATIVITY AND CLUSTERING OF SUPPLY TO GAIN SCALE AND COMPETITIVENESS

OBJECTIVES

- To create multi-company value chains for the exportable supply and focus development in the vertical sectors defined.
- Promote joint settlement of companies in markets and their complementarity.

IMPLEMENTATION

- Secretariat of Trade and International Economic Relations
- Industry Secretariat
- Fundación Exportar
- Provincial export-promotion agencies

GOALS

2004: Study of niches, establishment of 1 Cluster or Associative Chain

2005: 4 Clusters or Associative Chains.

23006: 8 Clusters or Associative Chains.

13. ENCOURAGE MORE WIDESPREAD USE OF THE TECHNOLOGY IN ALL THE ARGENTINE EXPORTABLE SUPPLY

OBJECTIVES

- To promote the a more widespread use of the technology, especially those related to ICTs throughout the exportable supply in Argentina
- To imbed technology in the most competitive products
- To develop applications and competitiveness for low value added segments
- To generate exportable supply for the sector selected (for example, Agribusiness)

IMPLEMENTATION

- Secretariat of Trade and International Economic Relations, Ministry of Foreign Affairs
- Industry Secretariat
- Science and Technology Secretariat
- Fundación Exportar

GOALS

2004: Holding awareness seminars

2005: 4 value chains or technified industries

14. CREATE A PERMANENT COMMITTEE IN CHARGE OF MONITORING THE PROMOTION OF SOFTWARE EXPORTS

OBJECTIVES

To transform the current work group into a permanent committee in charge of monitoring and defining the niches and target markets to be promoted, as well as the relations with productive sectors

IMPLEMENTATION

- Secretariat of Trade and International Economic Relations, Ministry of Foreign Affairs
- Provincial export-promotion agencies
- Fundación Exportar

GOALS

2004: Establishment of the Committee

2005: Hold 12 meetings

15. CREATE AN INNOVATION NETWORK FOR THE AGRIBUSINESS

OBJECTIVES

- Encourage the use of ICTs in the agribusiness sector
- To train specialized Human Resources
- To foster R & D in ICTs of use for the agribusiness
- To strengthen existing companies and promote the creation of new technology companies
- To disseminate information and raise awareness among producers and the population in general.

IMPLEMENTATION

- Industry and Agriculture Secretariat
- Ministry of Education
- Banco Nación, other banks
- Secyt, SENASA, INTA
- Universities, Technical Schools and local companies
- Municipalities, co-ops, producer organizations.

GOALS

2005: Establishment of the network.

16. CREATE AN IT SECURITY INNOVATION NETWORK

OBJECTIVES

- To establish a network of centers of excellence and reference in IT security
- To position Argentina as a high quality producer of IT security software and services.
- To develop products and services in strategic fields (defense, government, finance, etc)
- Creation of new companies specialized in IT security

IMPLEMENTATION

- Secyt, ONTI, SECOM
- CITEFA – Armed Forces
- Universities
- Banks, financial sector

GOALS

Establishment of the network in 2005

Companies: 3

R & D Groups: 3

17. FOSTER THE CREATION OF AN OBSERVATORY IN CHARGE OF IDENTIFYING FUTURE TECHNOLOGICAL CAPABILITIES

OBJECTIVES

- To identify key technologies in line with the needs and interests of Argentina
- To get to know and keep technological capabilities updated at a national, regional and sectoral level.
- To develop products and services in strategic fields (defense, government, finance, etc)
- To suggest a possible setup for innovation networks and assess their performance in ICT-specific thematic focal points.

IMPLEMENTATION

- Science and Technology Secretariat

GOALS

Year 2005: identification of key technologies for the country

Years 2005-6: Census of the technological capabilities of the R & D and innovation groups

18. SPECIFIC CALL FOR THE COMPANIES OF THE SECTOR IN THE PROGRAMS OF NATIONAL AND PROVINCIAL BODIES

OBJECTIVES

To reach an agreement with those public policy makers on the need to cater for the specificity of the sector with specially designed programs that contemplate:

- The potentiality of the sector
- The insertion into the model of the so-called “new economy”, producer of intangibles and, in general, outside of the traditional banking financing channels

IMPLEMENTATION

National and Provincial Bodies

GOALS

Number of specific Programs

2004: 3
2005: 5

19. GENERATE CREDIT LINES TO FINANCE SOFTWARE AND IT SERVICES DEMAND

OBJECTIVES

- To facilitate the introduction of SITS into the productive sector by funding firm transactions between suppliers and those demanding the service
- To resolve the problem of SMEs that do not have access to traditional banking loans with the participation of reciprocal guarantee companies

IMPLEMENTATION

- Banco Nación, BICE, Banco Credicoop, Other banks
- Garantizar, FOGABA, Other Reciprocal Guarantee Companies

GOALS

Number of Companies to be funded

2004: 25
2005: 200

20. GENERATE CREDIT LINES FOR THE COMPANIES OF THE SECTOR

OBJECTIVES

- To facilitate access to credit and financing of SITS companies for Working Capital, Export Financing, etc.
- To resolve the problem of collaterals due to the net worth structure of intangible assets with the participation of Reciprocal Guarantee Companies

IMPLEMENTATION

- Banco Nación, BICE, Banco Credicoop, Other banks
- Garantizar, FOGABA, Other Reciprocal Guarantee Companies

GOALS

Number of Companies to be funded

2005: 100

21. SET UP A WORK TEAM TO PROMOTE, IDENTIFY AND CAPTURE DIRECT FOREIGN INVESTMENTS AND CREATE STRATEGIC ALLIANCES

OBJECTIVES

- To take advantage of all windows of opportunity to attract investments and generate alliances in line with the development model to be implemented.
- Promote the interaction with Argentine academics and technologists from the diaspora, in close association with academia and multinationals.

IMPLEMENTATION

- Ministry of Foreign Affairs
- Industry Secretariat (ADI)
- Secyt (Programa Raíces)

GOALS

Investments in millions of USD

2005: 130

22. PROVIDE FACILITIES AND FINANCE TO ACCESS QUALITY CERTIFICATION PROCESSES

OBJECTIVES

- To increase the quality and reliability of SITS processes and products.
- To get financing at reasonable rates.
- To implement subsidy programs that support a percentage of the total costs of the certification process

IMPLEMENTATION

- Fonsoft (Secyt)
- INTI
- Banks
- National and Provincial Agencies

GOALS

Number of certified companies:
2005: 20
Number of certified products:
2005: 30

23. ESTABLISH *SITS* QUALITY CENTERS AND IMPLEMENT TECHNICAL SUPPORT MECHANISMS AND AWARENESS CAMPAIGNS

OBJECTIVES

- Availability for the sector's companies of centers specialized in consulting and testing; to facilitate quality processes introduction and testing of products and services.
- To implement dissemination and awareness-raising programs about the importance of quality certification
- To implement technical support mechanisms

IMPLEMENTATION

- INTI
- Technological Poles and Clusters
- IRAM

GOALS

Number of centers
2005: 2

24. IMPLEMENT A CERTIFICATION SYSTEM FOR *SITS* PRODUCTS

OBJECTIVES

- Implementation of a certification system that gradually allows companies to reach a more demanding quality level.
- Quality and reliability increase of the SITS products

IMPLEMENTATION

- INTI
- Business Chambers

GOALS

2004: Training of the implementation team

2005: 30 products certified.

25. ESTABLISH A PERMANENT COMMITTEE OF BUSINESS MEN AND *IT* LEADERS IN CHARGE OF MAKING A DIAGNOSIS AND FOLLOWING UP ON THE *SITS* DEMAND BY THE STATE AND THE PROMOTION OF PROGRAMS FOR STRATEGIC AREAS

OBJECTIVES

- To leverage the role played by the State as a key player in demand of technology to stimulate research and development of new products and promote the strengthening of local companies
- To identify projects and programs for specific areas

IMPLEMENTATION

National Office of Information Technologies (ONTI)

GOALS

2004: Establishment of the Permanent Committee

26. INCLUDE *SITS* IN THE TECHNICAL STANDARDS FOR THE PUBLIC ADMINISTRATION – ETAPs

OBJECTIVES

TO PROVIDE PUBLIC ADMINISTRATION AGENCIES WITH THE TECHNICAL AND STANDARDIZED FOUNDATIONS FOR THE INTRODUCTION OF SOFTWARE AND INFORMATION SERVICES, TAKING INTO ACCOUNT THE QUALITY OF THE PRODUCTS AND SERVICES AS WELL AS THE LOCAL INDUSTRY DEVELOPMENT NEEDS.

IMPLEMENTATION

National Office of Information Technologies (ONTI)

GOALS

2005: Implementation

27. ADAPT ADMINISTRATIVE REGULATIONS IN STATE AGENCIES

OBJECTIVES

- To modify, eliminate and adapt administrative provisions that block the development of the sector, investments and job creation
- Establishment of liaison spaces for the exchange of opinions on and analysis of specific issues

IMPLEMENTATION

- Economy Ministry
- Labour Ministry
- AFIP
- Customs

GOALS

2004: Establishment of a work team to interact with relevant agencies

28. DESIGN AND IMPLEMENT A NATIONAL E-GOVERNMENT PROGRAM

OBJECTIVES

To leverage the momentum provided by the development and implementation of the program to promote technological innovation, the digital thrive, the strengthening of local companies and the generation of successful and tested products

IMPLEMENTATION

National Office of Information Technologies (ONTI

GOALS

2004: Program launch

29. IDENTIFY SUPPLY, DEMAND AND CAPABILITIES IN EMBEDDED SOFTWARE AND ELECTRONICS INDUSTRY

OBJECTIVES

Detailed map-out of the supply, demand, capabilities and prospective technological niches to generate an action program to favor the insertion of Argentina in the so-called “third wave of electronic development”

IMPLEMENTATION

- Secretariat of Industry
- Secretariat of Science and Technology

GOALS

2004-5: Implementation of the Survey

30. PROPOSAL TO BE AGREED BETWEEN THE EXECUTIVE AND PRIVATE AND ACADEMIC SECTORS. CREATION OF A PUBLIC-PRIVATE FOUNDATION TO MANAGE THE STRATEGIC PLAN

OBJECTIVES

- The coordination of the strategic plan should be entrusted to a standing entity in close interaction with the government.
- To articulate and direct actions by involving the private, public and academic sectors in the Administration Council

IMPLEMENTATION

- Economy Ministry
- Industry Secretariat

GOALS

2004: Creation and start-up of the Foundation