

**The software and information services sector in Argentina:  
the pros and cons of an inward-oriented development strategy**

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## Abstract

The software and information services (SIS) sector is at the heart of “the new economy” and has been rapidly growing through the whole world during the last decades. This is also the case of Argentina where in the middle of a deep recession the turnover of the sector augmented by 40 % and employment by 43% between 1998 and 2000.

The objective of this paper is to analyze the evolution, present situation and prospects for the Argentine SIS sector, relying on a detailed survey recently made to 100 firms operating in this developing country.

Most of these firms are locally owned and young SMEs supplying the domestic market but there are also a few large firms accounting for the lion’s share of that market. Exports are negligible in terms of the sector’s turnover.

Argentina seems to have some advantages to exploit in order to make significant inroads in this sector: it has a relative abundance of high-skilled labor, a sizeable domestic market and a cultural influence in Spanish-speaking South America. SIS activities began in the 1970s and the sector has developed so far without any government support.

None the less, SIS firms in Argentina have been basically tied to one particular segment of the domestic market –i.e., software for accountancy, management, etc.-, where they enjoy advantages derived from the idiosyncratic feature of the domestic regulations and their knowledge about the business culture and the needs of their local clients. The firms find problems in competing via costs, while, apart from some isolated exception, have never competed through innovation. Besides, they lack marketing capabilities as well as access to investment and working capital. Programming and analysis skills are available but they are relatively expensive in comparison with the situation in other developing and latecomer countries, while management skills are deficient. In turn, networking mechanisms are weak, both among SIS firms as well as with their customers, R&D institutions, etc.

There is then a need both for actions aimed at improving the SIS firms capabilities and endowments, as well as for intelligent public policies to foster this sector and dramatically increase its export capacity. The experiences of other developing and late comer countries should help in finding ways to overcome the problems faced by this promising sector and significantly enhance its prospects.

## Introduction

The software and information services (SIS) sector has been rapidly growing everywhere in the last decades. This dynamism will persist in the foreseeable future, as long as this sector is at the heart of what has been called “the new economy”.

Developed countries are both the main producers and consumers of SIS. In turn, there are several large firms based in these countries that have consolidated dominant positions at world level in different segments of the SIS sector. Nonetheless, there seems to be room for firms from developing countries to enter and grow in this sector, as proven by the experience of India, Brazil, Singapore, Taiwan, Korea, Costa Rica, etc. The highly publicized cases of Ireland and Israel also show the possibilities of latecomer countries to play a significant role in this sector.

In this regard, it is important to take into account that the SIS sector is far from being a mature sector. Its technologies, markets and products are constantly evolving. Furthermore, since the sector is still on a sort of “handcraft” stage, there is room to advance in terms of “process technologies”. In this scenario, some firms from latecomer or developing countries have managed to compete in export markets through truly innovative products aimed at certain niches. In fact, there are several modes of entry of firms from developing countries in the SIS sector, each requiring different endowments and capabilities and each having different consequences in terms of the sectoral dynamics (Heeks, 1999).

In this scenario, the objective of this paper is to analyze the strengths, weaknesses and prospects of the Argentine SIS sector relying mainly on the results of a detailed survey made in 2000-2001 to nearly 100 SIS firms.

SIS activities began in Argentina in the 1970s and the sector has developed so far without any government support. In the middle of a recent deep recession the turnover of the sector augmented by 40% and employment by 43% between 1998 and 2000. Most of the producers are locally owned young SMEs supplying the domestic market but there are also a few large firms accounting for the lion’s share of that market.

Despite its recent good performance, perhaps no one in the world has ever heard of Argentine SIS firms making significant inroads in export markets. Argentina is still not seen as a country that may become a significant producer of software and information services.

Nonetheless, the country has some advantages to exploit in order to make significant inroads in this sector. First, it has a relative abundance of high-skilled labor, which is a key factor for competition in this sector. Second, it preserves at least some of its old cultural influence on the rest of the Spanish-speaking South America, a factor that could help Argentine firms to penetrate into those markets, taking advantage not only of the geographical but as well of the cultural proximity with them. Third, Argentina’s GDP in 2000 was around U\$S 280 billion with a GDP per capita above U\$S 7000. Hence, the domestic market, while being far from those of developed countries, offers a relatively adequate development base for local firms. Last but not least, there seems to be an expanding consensus on the need to modify Argentina’s trade specialization pattern. In addition to encouraging resources-based activities, the country should foster skilled labor intensive activities. Unskilled labor based productive branches have almost

disappeared due to trade liberalization in the 1990s, while scale intensive activities have to compete with their Brazilian counterparts, a country which is better endowed to compete through scale economies.

Section I deals briefly with the experience of the SIS sector in some developing and latecomer countries, and suggests some conceptual hypothesis to be discussed in the Argentine case. Section II presents the main results of the mentioned survey. Section III discusses the impact of some key institutional and macroeconomic variables on the evolution of the SIS sector. The main conclusions and policy suggestions are presented in section IV.

#### I) SIS in developing and latecomer countries: a brief review

Which are the main limitations that firms in developing countries usually face when trying to enter into the SIS sector? According to Heeks (1999) they are:

- the weaknesses in the physical and communications infrastructure of their home countries;
- the fact that their domestic home markets are usually small (and often supplied by illegal copies), a fact that hinders the chances of recovering the costs involved in the development of innovative products;
- access to finance is usually limited and interest rates are often high, while mechanisms such as venture capital are almost unknown;
- local firms rarely have strong marketing capabilities;
- the diffusion of stringent quality standards is usually very limited.

Furthermore, when trying to enter into foreign markets, firms from developing countries must face additional obstacles such as:

- the lack of trust about their technical capabilities and uncertainty about the compliance with quality standards, schedules, etc.;
- the lack of detailed knowledge about the requirements of the foreign customers;
- linguistic and cultural barriers, lack of knowledge of the business culture and norms in foreign markets, etc.

In this scenario, developing countries firms wishing to engage in this sector must adopt strategies that fit with their endogenous capabilities, as well as with the endowments and assets of their home country. At the same time, they must try to circumvent the limitations posed both by their own history and lack of certain skills. The State may help this process through different measures, both by trying to strengthen local technological and innovative capabilities and infrastructure, as well as by contributing to solve some market failures which constrain the development of the SIS sector.

In fact, there have been some successful experiences of developing and latecomer countries entering into this sector. Many firms from Asian and Latin American countries, as well as from some countries of the European periphery, have not only managed to acquire dominant positions in their home countries but have also entered into developed countries' markets. Besides, some large American and European SIS firms have made outward direct investments in developing as well as in latecomer countries, mostly aimed at adapting their products and services to the cultural, linguistic, institutional, etc. features of the different regional markets.

Different entry strategies may be observed. A first dividing line separates those countries whose firms have mainly followed "inward-oriented" strategies (i.e. Brazil, South Korea, etc.) from those where "export-oriented" strategies have been dominant (i.e. India, Ireland, Israel)<sup>3</sup>. The second dividing line depends on whether local firms or affiliates of foreign corporations have played a dominant role in the development of the SIS sector.

Among "export-oriented" strategies one may find different modes of competition. While Indian firms have mainly competed on the basis of low wages and the provision of information services (including the so-called "body-shopping" activities), Israel's firms have developed significant innovative capabilities in some niche areas such as anti-virus, software security and protection, encryption technologies, etc. In turn, Ireland has been chosen as a base for attending European markets by several large American –as well as by some European- firms, although some indigenous Irish firms have also made significant inroads in this sector.

Though SIS firms in developing and latecomer countries have been largely oriented towards the export of services, there are cases where the export of software products has been more relevant. In turn, the activity of exporting software products may assume different variants. While in Ireland most exports involve adaptations and "localizations" of American software products to the needs of the different European markets, in Israel domestic firms export locally developed products. In India there has been an upsurge of the activity of "offshore" software development.

Regarding the role played by different type of firms, while in Ireland foreign corporations are clearly dominant this is not the case in Israel and India. However, in those countries domestic firms have different arrangement with their counterparts in industrialized countries that include subcontracting arrangements, joint ventures, strategic alliances, etc.

Different strategies require different conditions and/or assets in order to be implemented successfully. For instance, in the case of Ireland the fact of having an English-speaking population played a major role in the decision of the American software companies to install affiliates in that country, but the public policies aimed at attracting foreign direct investment through tax incentives were also a major driver for those decisions. In fact, none of both factors alone would have led to the observed massive arrival of foreign investments in the SIS sector.

While having a relatively abundant endowment of skilled personnel with low wages has been a clear precondition for the success of the Indian strategy, strategies such as those followed by

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<sup>3</sup>. See, among other studies, Weber *et al* (2000) for Brazil, Zhang (2000) for the cases of the Asian developing countries, Teubal *et al* (2000) for Israel, Tallon and Kraemer (1999) and Coe (1999) for Ireland and Arora *et al* (1999), D'Costa (2000) and Heeks (1996) for India.

Israel's firms require high-skilled personnel, domestic research capabilities and sophisticated local customers (in the case of Israel, notably the Army).

In turn, the State played a significant role in fostering SIS activities through specific policies in most of the countries that have made significant inroads in this sector –such as India, Ireland, Brazil, etc.-, as well as in those that have entered more recently –Uruguay, Costa Rica, etc.-.

In spite of the variety of strategies followed by those countries where a vigorous SIS sector has arisen, Heeks (1999) identifies some key factors for developing countries firms to be successful in that attempt. On one hand, they include microeconomic or enterprise elements such as:

- identification of demand-growth markets and synergies;
- ability to compete via costs or service innovation;
- good marketing;
- access to investment and working capital;
- access to programming, analysis and management skills
- access to information technology;
- networking mechanisms, both intra-firm as well as with other software firms, potential or actual clients, etc.

On the other hand, public policies also play a key role in areas such as:

- finance (access to working and venture capital and tax incentives);
- education and training;
- research and development;
- intellectual property rights protection;
- State procurement;
- Infrastructure (telecommunications, etc.).

Last but not least, a sort of “national vision” is also needed (i.e. which is the desirable specialization and competitive pattern for the SIS sector in each country).

In the next section we will analyze to what extent these conditions are met in the Argentina's case.

## II) The SIS sector in Argentina

There was already an incipient activity in the SIS sector in Argentina in the 1970s during the import substitution industrialization process.

The first study on this sector was undertaken in the mid 1980s (SECYT, 1987). At that time, nearly 70% of the domestic market was supplied by imported software, but there were about 300 local firms engaged in the provision of SIS. The need to take into account idiosyncratic features of the fiscal and accountancy local regulations was the main advantage of domestic firms, jointly with the access to skilled human resources. In turn, their main limitations laid on the relatively small size of the domestic market, the lack of capabilities in R&D and marketing and the obstacles for having access to finance (see also Correa, 1990).

Some years later the situation had not changed very much. In the early 1990s –after the so-called “lost decade”, when the economy was stagnant and high inflation was the rule-, there were around 300 SIS firms, which employed nearly 4500 people. Two thirds of the local market was supplied by imports. In turn, exports were negligible (Correa, 1996).

In view of the significant structural reforms (such as trade liberalization and privatization) that have taken place in Argentina in the early 1990s, the sharp increase in imports of goods and services, the boom in FDI inflows and the rapid economic growth between 1991 and 1998, it could be expected that a different, and expectedly more vibrant, SIS sector would have emerged in the country. The analysis made in the next sections will shed light on to what extent this kind of transformation has effectively taken place.

#### The Argentina’s SIS sector: size and profile

Between 1998 and 2000 –a recessive period in the Argentine economy- the turnover of the SIS sector grew by a 40%, and the employment levels increased by a 43%. This performance is due both to the growing local demand of SIS as well as to the so-called “Y2K effect”<sup>4</sup>.

The sales of the surveyed firms amounted to U\$S 630 million in 2000 and their employment reached about 6,400 people in that same year. Taking into account that there are nearly 500 firms in the SIS sector in Argentina, and making certain assumptions about the market structure of the sector, it is possible to estimate that the annual turnover of the Argentine SIS sector reach around U\$S 2,000 million (0.7% of the GDP) and that the firms of the sector employ approximately 15,000 people (table 1).

The SIS firms employ high-skilled personnel; 45% of the employees of the surveyed firms are university graduates, while 37% are technicians and university students. Nearly 70% of those employees with graduate and post-graduate degrees come from informatics-related careers. Nonetheless, the proportion of employees with post-graduate studies is very low (4%, half of which correspond to informatics careers)<sup>5</sup>. In this regard, it must be noted that a recent survey shows that the Brazilian firms, on average, have 3 employees with post-graduate degrees, a figure that more than doubles that of Argentina.

**TABLE 1**  
**THE SIS SECTOR IN ARGENTINA. 2000 (U\$S million and %)**

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<sup>4</sup>. Although no precise data exist on this issue, the available information suggests that the sales of the SIS sector significantly fell during 2001, in the context of a deepening of the economic recession initiated in 1998.

<sup>5</sup>. Four firms, of which three are foreign owned, employ 40% of the personnel with post-graduate degrees in the SIS sector.

Activity	Surveyed firms (U\$S million)	Sectoral turnover (U\$S million)	Relative share
Software products	323.2	973	49%
-local products	109.9	346	17%
-foreign products	199.3	627	32%
Information services	323.4	1,017	51%
<i>Total sales</i>	632.6	1,990	100%
Employment	6,400	15,000	-
Exports	14.4	35	-

Nearly half of the sales of the surveyed firms correspond to sales of software products, while the other half comes from services activities. Local products represent about 36% of the sales of software products. Hence, it can be estimated that the annual sales of local software products reach about U\$S 350 million.

However, the share of imported software in the domestic market is not very different from what was registered in the past, though the data may not be strictly comparable. Furthermore, the market orientation of the SIS firms has not changed in a significant way.

The Argentine SIS sector is still strongly inward-oriented and the exports -which are made by a small number of firms<sup>6</sup>- are negligible in terms of the sector's turnover. Just 20 of the almost 100 surveyed firms made exports in 2000, and only 6 of them had exports/sales ratios above 10%, while in only three firms exports were above U\$S 1 million. This weak export performance is due both to microeconomic factors (the type of products and services offered by the local firms, their weaknesses in terms of quality and marketing capabilities, etc.) as well as to other elements related to the environment in which they operate (high labor costs, lack of access to finance, the absence of public policies supporting the exports of SIS, etc.). Below more is said about these issues.

How does the Argentinean SIS sector compare with those of other "latecomer" countries?

Table 2 clearly shows that Argentina is well behind countries such as India, Israel, Ireland and Singapore in terms not only of the sector's turnover but also in terms of the weak export performance. The same can be said if the comparison is made with a neighbor and much smaller country such as Uruguay.

In turn, even if in other countries, such as Brazil and Korea, exports are also very low, the domestic sales are much higher than in Argentina, a fact that may, to a certain extent, compensate the absence of exports.

<sup>6</sup>. 2/3 of the exports of the surveyed firms were made by the local affiliate of a German transnational corporation.



**TABLE 2**  
**THE SIS SECTOR. AN INTERNATIONAL COMPARISON –latest available year- (U\$S million)<sup>7</sup>**

	Turnover	Exports	Exports/Turnover ratio	Employment	Number of firms
India	5,700	4,000	70%	410,000	1,250
Ireland	6,245	5,907	94%	18,300	679
Israel	1,500	700	47%	20,000	300
Brazil	8,038	40	<1%	n.a.	2,500
Uruguay	180	60	33%	2,500-3,000	150
<b>Argentina</b>	<b>1,340</b>	<b>35</b>	<b>&lt;3%</b>	<b>15,000</b>	<b>500</b>
Costa Rica	n.a.	50	n.a.	3,500-4,000	150
Chile	125	15	12%	n.a.	n.a.
Singapore	1,660	476	29%	n.a.	n.a.
China	3,000	n.a.	n.a.	100,000	2,000
Korea	6,000	96	<2%	n.a.	n.a.

Sources: Weber *et al* (2000) and Bastos Tigre & Junqueira Botelho (1999) for Brazil, NASSCOM for India, Tallon & Kraemer (1999) for Ireland, Israel Association of Software Houses for Israel, Computerworld Chile (1999) and Baeza Yates (1995) for Chile, MIEM (1999) for Uruguay, Caprosoft for Costa Rica, Coe (1999) for Singapore, Zhang (2000) for Korea and China and our own estimates for Argentina.

#### Age, size, nationality and recent performance of SIS firms

Most Argentine SIS firms are young –the surveyed firms were, on average, 11 years old-. 65% of the surveyed firms were established after 1990, while there were few firms created before the 80s (and most of them are firms whose main activity is the provision of hardware and telecommunications equipment that also sell information services). In spite of being a minority within the sector, the firms that had been established before 1990 had more than 2/3 of the SIS sales in 2000. Besides, while their sales grew by a 57% between 1998 and 2000, the sales of the firms that were created after 1990 increased by a 48% in the same period.

Locally owned small and medium size enterprises (SMEs) are clearly prevalent in this sector; 80% of the firms that answered our survey were SMEs and 85% were locally owned.

However, foreign firms account for 2/3 and firms with more than 50 employees account for 86% of the turnover of the SIS sector (table 3). In turn, only 9% of the surveyed firms had annual sales above U\$S 15 million, while 46% of the firms sold less than U\$S 1 million a year, and 22% of the firms had sales between U\$S 1 and 2 million (table 4).

**TABLE 3**  
**SALES, EMPLOYMENT AND EXPORTS OF THE SURVEYED FIRMS. 2000**  
**(U\$S million, number of employees and %)**

<sup>7</sup>. The estimates of this table include the provision of information services and the sales of local software. We have tried to exclude, as far as it has been possible using the available data, the sales of foreign software. Nonetheless, given the heterogeneity of the sources, it is possible that the definition of the SIS sector in each country may slightly differ, a fact that may hinder, to some extent, the comparability of the figures.

By origin of capital	Sales		Employment		Exports	
	US\$ million	Share	Number of employees	Share	US\$ million	Share
Foreign firms	415.1	66%	2,702	42%	10.5	73%
Local firms	217.4	34%	3,697	58%	3.9	27%
<b>TOTAL</b>	<b>632.6</b>	<b>100%</b>	<b>6,399</b>	<b>100%</b>	<b>14.4</b>	<b>100%</b>
<b>By size</b>						
Large <sup>1</sup>	544.2	86%	4,598	72%	10.1	70%
Medium <sup>2</sup>	74.5	12%	1,340	21%	3.9	27%
Small <sup>3</sup>	13.9	2%	461	7%	0.4	3%
<b>TOTAL</b>	<b>632.6</b>	<b>100%</b>	<b>6,399</b>	<b>100%</b>	<b>14.4</b>	<b>100%</b>
<b>By main activity</b>						
Local products <sup>4</sup>	112.3	18%	2,082	33%	10.8	75%
Foreign products <sup>5</sup>	231.9	37%	1,164	18%	0	0%
Information services <sup>6</sup>	288.3	46%	3,153	49%	3.6	25%
<b>TOTAL</b>	<b>632.6</b>	<b>100%</b>	<b>6,399</b>	<b>100%</b>	<b>14.4</b>	<b>100%</b>

1: 50 employees or more.

2: Between 10 and 50 employees.

3: 10 employees or less.

4: local and foreign firms whose main activity in the SIS sector is the development of software products in Argentina.

5: local and foreign firms whose main activity in the SIS sector is the commercialization of foreign software products in Argentina.

6: local and foreign firms whose main activity in the SIS sector is the provision of information services (customized software, implementation of software packages, consultancy, etc.).

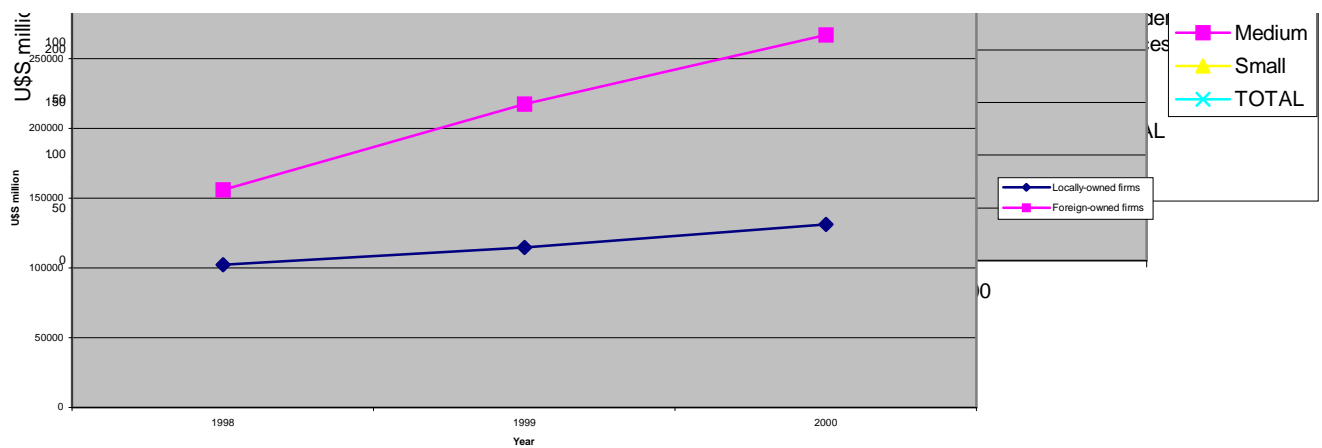
**TABLE 4**  
**TURNOVER LEVELS OF THE SIS FIRMS IN ARGENTINA (%)**

	Share
Less than U\$S 1 million a year	46%
Between U\$S 1 and 2 million a year	22%
Between U\$S 2 and 5 million a year	13%
Between U\$S 5 and 15 million a year	10%
More than U\$S 15 million a year	9%

Hence, the structure of the sector is very heterogeneous, with a small group of big and mostly foreign owned firms having the lion's share of the local market, and many domestic SMEs which have very low levels of sales and employment.

Those firms whose main activity is the provision of information services account for nearly half of the sector turnover and employment levels (table 3). A small group of firms that sell foreign packaged software products contribute with 37% of the sector's turnover. Finally, several local software developers account for 18% of the turnover and 33% of the employment of the sector.

The recent performance of the different groups of firms has been heterogeneous. The firms whose sales increased most were those dedicated to the provision of information services as well as those that sell foreign software products. In turn, the biggest firms grew more than the SMEs and foreign firms more than local firms (graphs 1, 2 and 3).



### Customer's profile

As shown in table 5, the main customers of the Argentine SIS sector are large firms, which account for 2/3 of the sectoral turnover.

In the case of big and medium SSI firms<sup>8</sup>, large firms, jointly with the government sector, contribute with more than 80% of their sales. These customers acquire mostly foreign software products and information services, which are mostly associated to the implementation and customization of complex software packages.

**TABLE 5  
TURNOVER STRUCTURE BY TYPE OF USER (%)**

	Type of SIS firms						
	Total	Local products	Foreign products	Information services	Big firms	Medium-size firms	Small firms
Home users	1%	0%	6%	0%	1%	0%	10%
SMEs	16%	29%	37%	3%	15%	17%	55%
Large firms	66%	55%	50%	77%	66%	74%	32%
Government	16%	16%	7%	19%	18%	7%	2%
Others	1%	0%	1%	1%	0%	2%	0%
<b>TOTAL</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

While home users are not relevant as customers for the SIS sector<sup>9</sup>, the government buys almost exclusively from big and medium firms. Many SMEs have reported that they find many difficulties for becoming suppliers of the government. It is frequent that they cannot even enter into the tenders for the provision of SIS to the public sector given the fact that they are usually open to "short lists" composed exclusively of foreign firms.

In contrast, the main customers of the small SIS firms are SMEs, which account for 50% of the sales of that group of firms. Hence, given the fact that SMEs in Argentina have been deeply affected by the recession that began in 1998, it is not surprising to find that, as said before, small

<sup>8</sup>: Medium sized firms were defined as those that have between 10 and 50 employees. Firms with less than 10 employees were defined as small, while big or large SIS firms are those that have more than 50 employees.

<sup>9</sup>: The low share of home users in the sales of the SIS sector is mainly due to the high piracy levels that exist in that segment of customers. Besides, home customers mostly, if not exclusively, buy foreign software products.

SIS firms' performance has been worse than that of medium and big firms between 1998 and 2000. It must also be taken into account that the share of SMEs customers is higher for those firms that sell packaged products –both local as well as foreign-, than for those that are specialized in professional services (which are mainly oriented towards large customers).

### Programming tools and platforms

Visual Basic is the most used programming language (nearly 2/3 of the surveyed firms use that language). HTML and Java, which are mostly oriented towards Internet applications, are also widely used (58 and 48% of the surveyed firms used those languages, respectively). Regarding object-oriented languages, as said before, Java is widely known, while the opposite occurs with Smalltalk (only 11% of the surveyed firms use this language). C++, which is partially an object-oriented language also, is used by 38% of the firms. The largest SIS firms are those which utilize the most advanced languages. While 21% of the big firms employ Smalltalk for programming, none small firm uses that language. In turn, Java is utilized by 68% of the big firms and by 29% of the small ones. Regarding C++, 53% of the big firms use it, against 21% of the small ones.

Almost all firms develop software products for personal computers, and many of them only offers software products for PCs. In turn, the different versions of Windows (NT/98/95/2000) are clearly dominant. In fact, 88% of the firms develop products for Windows NT, a fact that is consistent with the finding that most SIS firms are oriented towards business customers (see below). Expectedly, large and medium sized firms are the main providers of SIS for mainframes, AS/400 and workstations. There are few firms oriented towards less conventional platforms (such as industrial equipment and consumer devices).

Nearly half of the surveyed firms develop software products for UNIX-type operative systems, being Linux, Solaris and HP-UX the most popular ones. While large and medium sized firms are clearly dominant in the case of Solaris and HP-UX, it is important to highlight the fact that 25% of the firms that develop products for Linux are small sized.

### Quality standards and marketing capabilities

Large firms tend to adopt better quality standards than SMEs. Between 55 and 60% of the surveyed large firms makes strategic plans that are periodically updated, sets quality goals and measures quality indicators in a systematic way. In contrast the proportion of SMEs that undertakes those practices regularly vary between 20 and 30%.

Only 16% of the surveyed firms have a quality certification, a very low percentage in comparison with other developing countries (for instance, a survey made to Brazilian firms in 1999 showed that 26% of them had a quality certification in 1999<sup>10</sup>). Expectedly, 40% of the large firms had a quality certification against only 9% of the SMEs. In turn, 21% of the local developers had a certification, a proportion that is only of 9% in the case of information services providers.

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<sup>10</sup>: Weber *et al* (2000).

Regarding marketing channels, most firms employ two or more channels, but the preferred one is the direct contact with the customers. Consultancy activities are also a mean to get new contracts. In turn, subcontracting is almost absent. The key role played by the direct contact with the customers is consistent with the fact that local SIS firms are highly inward oriented. Nonetheless, it must be noted that some firms have open commercial offices abroad, trying to replicate the network of contacts that they have developed locally.

### Competitive advantages and disadvantages

The customers of the local software developers are mostly located in sectors such as banking, retail and wholesale trade, health care and telecommunications, as well as in the public administration. In any case, the firms that develop local software are mainly concentrated in making products for areas such as accountancy and enterprise management solutions. These products are mostly oriented towards domestic SMEs that cannot afford to buy the expensive software packages that are provided by the large international software firms (such as SAP, People Soft, etc.). Besides, there are highly “idiosyncratic” features of the local legislation in areas such as accountancy rules, fiscal and labor regulations, etc., that give some advantage to the domestic software providers –even if the software packages offered by the large international providers may obviously be adapted to meet the local requirements, the “customization” costs are far beyond the available budget of most of the domestic SMEs-.

In turn, this advantage of the local software developers may become a constraint when they try to sell their products abroad, since the same factors that prevent local customers to use foreign software packages act as barriers for the penetration of the Argentine software developers in third markets. Furthermore, in these markets Argentinean firms lack the knowledge about the “business culture” and the personal contacts that being key advantages for their survival in the domestic market, become handicaps when trying to sell abroad.

In fact, asked about their main strengths and weaknesses, local firms mostly answered that their main strength was their capacity of adapting to the specific requirements of their customers. In turn, their weaknesses seem to be mostly located in the lack of scale of their production and the inadequacy of their marketing channels.

Local SIS firms are highly diversified in terms of the activities that they develop and the kind of services/products that they offer. While, on one hand, this may reflect a great flexibility for adapting to different demands, on the other hand it may be the result of the impossibility of surviving through specialization strategies in a context where the local market is relatively small. The latter may specially be the case of the small SIS firms, which are forced to attend diversified demands if they pretend to keep on the market. Nonetheless, this may become a negative feature for the future development of this sector, since these firms are losing the potential gains which may be derived from following business strategies focused on developing “core” specialization areas.

Furthermore, the sort of “natural protection” that the local SIS firms used to enjoy due to the “idiosyncracies” of the local market is gradually eroding due to:

- the large international software providers are increasingly entering into the “top” of the SMEs market by offering less expensive packages suited to the needs of that kind of firms;
- many foreign firms (specially from Spain) are competing via prices in the SMEs segment with packaged products;
- technological changes (software updates through Internet, technical support via call centers, etc.) are eroding the localization advantages enjoyed by local firms;
- several local firms have been acquired by Transnational Corporations (TNCs), whose affiliates tend to prefer foreign software packages (see Stamm, 2000).

In turn, even if the market for local SIS firms could eventually grow since most domestic SMEs need to upgrade their informatics structure, doubts remain about the effective volume which may reach that market, since SMEs have been going through a difficult restructuring process during the last decade and face severe economic and financial problems.

Considering also the above mentioned limits that local SIS firms may face when trying to sell abroad business software products, it may be concluded that the specialization in that market segment does not look very promising for Argentine firms.

At the same time, even if previous studies have stated that Argentina has competitive advantages for developing SIS for certain market niches (edutainment, applications for health care systems, industrial automation, public administration and agricultural production, etc.)<sup>11</sup>, our survey does not show any trend towards the specialization of the local SIS firms in any of these areas.

Nonetheless, there are some firms working in SIS for telecommunications, and some investments by TNCs have been announced in this area. If these investments are materialized, a sort of cluster could emerge in this area.

Finally, even if we have been talking about local software “developers”, it must be highlighted that local firms rarely make true “innovations”, and are mostly dedicated to improve and adapt their products to new technologies and platforms or to widen the range of applications of their products, though it has been at least one case where a local firm build their market success on its innovation capability.

In this regard, notice must be taken of the fact that local firms have very few linkages with R&D institutions, universities, consultancy firms, etc. Besides, the relatively small size of the domestic market poses an obstacle for making innovative activities, since their costs should be difficult to recover. Last but not least, the local demand, specially that of SMEs, does not seemingly induce SIS firms to significantly upgrade their innovative and learning capabilities.

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<sup>11</sup>. According to Perazzo *et al* (1999) Argentina should have advantages to make inroads in these activities due to: i) a relatively high cultural level –at least by Latin American standards-; ii) domestic markets for these activities may reach significant dimensions –specially in agricultural and health applications, as well as in edutainment-; iii) information technologies are rather well diffused in the public sector –once more, compared with Latin American standards-; iv) the lack of linguistic barriers may facilitate the penetration in other Latin American countries.

### III) The impact of the macroeconomic and institutional environment

According to the surveyed firms, the Argentine macroeconomic and institutional environment has both positive as well as negative impacts on the development of the SIS sector.

Among the positive factors, the quality of the domestic human resources is clearly the most appreciated by the SIS firms, specially by large and medium size enterprises, as well as by those which provide information services and by those that develop local software products.

On the other hand, labor costs are relatively high. In fact, they are higher than those of some countries of the European periphery (Portugal, Greece, Ireland) that advantage Argentina as locations for developing export oriented SIS activities, since they are closer to the main markets and they belong to the European Union. However, with the huge devaluation of the peso in 2002 labor costs are now much lower than before and should be a positive factor for increasing the price competitiveness of the local SIS firms.

In turn, even if it is widely acknowledged that the Argentine graduates in informatics-related careers are well trained, according to Perazzo *et al* (1999) there are few university careers that have a staff of full-time professors and where research is done *pari passu* with teaching activities. Besides, there are very few post graduate courses, and their quality is assessed as mediocre. Since budget restrictions have for a long time prevented the country to have a wide program of grants for making studies abroad, it is then no surprise that only about 30 persons with doctoral degrees are working in the Argentine SIS firms at present.

Hence, the SIS sector lacks high-skilled professionals that may act in high-level consultancy or research activities. In turn, university teaching is also affected not only by this lack of high-quality personnel, but also by the fact that university wages are very low compared to those paid in the private sector. Besides the best students are often hired by private firms before ending their graduate courses, and many of those students never complete their studies. Furthermore, university careers do not seem to foster entrepreneurial attitudes among their students, a factor that may be hindering the upsurge of new firms.

In any case, it is clear that the scarcity of high-level personnel is a major limitation in order to develop innovative activities, and is as well a factor that may negatively affect the academic training of the students. Last but not least, if the local demand for professionals in this area continues to increase and the "brain drain" that has been taking place in the last years does not stop, it is foreseeable that in the medium term there might be a deficiency in the absolute supply of professional for local SIS firms.

Regarding other factors, even if the telecommunications infrastructure has substantially improved over the last decade, telecommunication costs were deemed as high by local firms. With the peso devaluation these costs are now lower than before but the quality of the service may be also lower due to the higher costs of importing inputs, components and equipment for telecom companies, a factor which may delay further technological modernization of the communications infrastructure.

In turn, the use of information technologies has substantially grown, both in the public as well as in the private sector. However, even if Argentina is above the Latin American average in terms of the diffusion of information and communication technologies, other countries such as Uruguay, Brazil, Chile and Mexico show comparable or even better indicators.

Another clearly negative factor is the access to finance. SIS firms –and specially SMEs- find troubles for getting into the formal financial system. In turn, there is a lack of financing alternatives, since the stock market is weak and systems such as venture capital are almost unknown<sup>12</sup>. Even if some public policies aimed at facilitating the access to credit by SMEs have been working for many years, they have not attended the specific situation of those high-tech sectors which mostly produce intangibles and are knowledge intensive. The situation has even worsened recently, since the current problems in the Argentina's financial sector after the foreign debt default and currency devaluation have for the time being closed the access to formal financial mechanisms.

In this scenario it comes as no surprise to find that some local firms wishing to expand their operations looked for funds abroad<sup>13</sup>. At least two firms who have taken this step have finally sold their majority stake to foreign owners. In any case, this is not necessarily bad insofar the management remains in local hands and domestic development activities are preserved.

Regarding research and technological institutions, being generally weak in the Argentina's case, this is still more visible in the case of those related to the SIS sector. There are almost no R&D activities in software neither in public institutions nor in universities and when those activities are undertaken they have no commercial impact. Even if the government put in place some initiatives aiming at fostering R&D activities in private firms since the mid 90s, they have had only a marginal effect on a mostly negative scenario. In this regard, it must be noticed that the size of the domestic market is judged by SIS firms as too small in order to recover the often high costs that the firms must face when trying to undertake truly innovative activities.

Which are the public policies that SIS firms think that would help most in order to foster the development of the SIS sector? Given the fact that firms judge that the tax burden is the factor that most hinders their operations, it comes as no surprise to find that fiscal incentives have been the policy measure most appreciated by the surveyed firms.

On the contrary, those policies aimed at facilitating the access to foreign markets have not been reputed as relevant by the firms. This is a reflection of the fact that SIS firms seem not be worried about the excessive inward-orientation of the sector. Policies geared at fostering entrepreneurship, such as incubators, etc., have also been judged as slightly relevant by the surveyed firms.

Finally, regarding piracy levels, they are above the Latin American average. This is more due to the low level of enforcement of the domestic laws, rather than to the absence of regulations

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<sup>12</sup>. The problem of access to finance is common to all high-tech SMEs in Argentina.

<sup>13</sup>. In fact, this is not something unusual for this sector, since the same has happened even with some successful European firms.



about software piracy<sup>14</sup>. Expectedly, the firms that distribute foreign software products are the most worried about this situation.

#### IV) Conclusions and policy suggestions

From what has been said it seems clear that the Argentine SIS sector lacks most of the conditions that Heeks (1999) considers as key for having a successful entry into this activity.

It has been suggested that some cases where an export-oriented has been followed may be locked-in a low-innovation trajectory (see D'Costa, 2000, for the case of India). The case of Argentina shows that those strategies that are strongly based on attending the domestic markets taking advantage of the geographic and cultural proximity with the customers, as well as of the idiosyncratic features of the domestic accounting, fiscal, labor, etc. regulations, may also lead to the same type of "lock-in". The factors that help SIS firms to survive in their local environment, may also prevent them from developing an evolutionary learning process which is a precondition for a sustainable strategy of expansion in this sector.

The Argentine SIS sector is dominated by a small group of large firms, many of them foreign-owned, which mainly sell foreign software products and/or provide information services. These services are mostly associated to the implementation and customization of complex software packages for large customers –including private firms as well as government organizations-. This group of dominant firms had a relatively better performance between 1998 and 2000 *vis a vis* other SIS firms. On the other hand, there are several small and young local firms that develop software products as well as provide different information services, and whose main clients are SMES. As a whole, this group of firms had a worse performance than the large SIS firms.

Domestic firms have been basically tied to one particular segment of the domestic market –i.e., software for accountancy, management, etc.-, where they enjoy advantages derived from the idiosyncratic feature of the domestic regulations and their knowledge about the business culture and the needs of their local clients. However, for different reasons, these advantages seem to be eroding and the SIS firms –or at least the majority of them- do not seem to have been able to redefine their market strategy and their specialization pattern, and mostly survive by attending any demand that they deem to be able to satisfy.

While the peso devaluation may have solved some of the problems Argentine SIS firms had for competing via skilled labor costs, it does not solve many of the systemic problems of the sector.

- Apart from some isolated exception, Argentine SIS firms have never competed through innovation.
- There is a lack of marketing and management capabilities.
- Networking mechanisms are weak, both among SIS firms as well as with their customers, R&D institutions, etc.

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<sup>14</sup>. According to the Business Software Alliance, piracy rates in Argentina amount to 62%, against 36% at world level and 59% in the Latin American average. However, piracy has been declining, from 80% in 1994-95 to 62% in 1998-99.

- Access to investment and working capital has always been a problem and presently it does not even exist either from local or international sources.

Regarding public policies, the situation is even worse. The lack of access to finance is a problem not only for SIS firms, but for most Argentine SMEs. Venture capital is almost unknown and tax incentives are absent. R&D capabilities are very weak, there are problems with the enforcement of intellectual property rights, the telecommunications infrastructure is modern but expensive and State procurement does not favor local provision of SIS. Regarding human capital, the level of the graduates in informatics is good, but there is a lack of high-skilled personnel. Last but not least, nothing like a “national vision” of the SIS sector exists in the Argentine case.

In this light, it may not come as a surprise to find that even if the SIS sector has grown during the last ten years, it does not seem to have overcome the problems that had been diagnosed in the 1980s and early 1990s: lack of access to finance, excessive inward-orientation, lack of marketing and R&D capabilities, etc.

The fact that this sector has grown in absence of stimulating public policies may be considered as a proof of the ability of the SIS firms for surviving without public support. However, is it quite clear that the dynamic perspectives of this trajectory are, to say the least, very uncertain.

As said before, there is a small number of large, mostly foreign owned firms, that have performed very well in recent years and that are aimed at selling foreign software products and at providing information services for the public sector and for large domestic customers. These firms have a relatively better access, *vis a vis* SMES SIS firms, to human resources and finance, have advanced more in terms of quality management systems and dominate the most modern programming tools. However, they seldom undertake innovation activities and do rarely export their products and services.

On the other hand, there are several small and medium SIS firms that lack the size and the access to human resources and capital as to undertake truly innovative processes, and mostly survive through inward oriented strategies in which they make use of the “localization advantages” that come from their knowledge and their capability of adaptation to the local regulations, customers requirements, business culture, etc.

In this scenario, the Argentine SIS sector may continue growing *pari passu* the local demand, but it is highly improbable that it may turn into a dynamic and internationally competitive sector, since the limits to its development arise from the relatively low size of the domestic market, the lack of access to finance and of marketing and R&D capabilities, the absence of networking mechanisms, the lack of public support (i.e tax incentives, State procurement, etc.), the weaknesses of the quality management systems and the deficiencies in the availability of high-skilled personnel, among other factors.

In order to revert these negative prospects, there is a need both for actions aimed at improving the SIS firms capabilities and endowments, as well as for public policies in support of this sector. The objective should be to restructure the SIS sector in order to dramatically increment its export capacity. While the peso devaluation certainly helps the key issue is to work on the non price competitiveness issues as soon as possible. This should be accomplished through a gradual

process, in which the improvements of the firms competitive position might allow them to increasingly penetrate into foreign markets. In turn, this might give place to a sort of “virtuous circle”, since local firms could have access to expanded markets and could enter in contact with the requirements of foreign customers, which could not only be different but in some cases stringent than those of local customers. The State should help this process through some support measures, as well as through the enhancement of the local technological structure and of the system of human resources formation. An environment full of incentives for young entrepreneurs to engage in this sector –through dismantling red tape barriers, facilitating the access to finance, etc.- should also be a major task for the State. Last but not least, *pari passu* the strengthening of the domestic SIS firms, it could also be explored the possibility of attracting large international SIS firms in order to install their regional basis for South America, since Argentina, in spite of all the abovementioned problems, has some key advantages that might allow the country to have a dominating presence in that region.

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